The Ford Amateur Astronomy Club Newsletter

FERA
FORD EMPLOYEES RECREATION ASSOCIATION

Ford

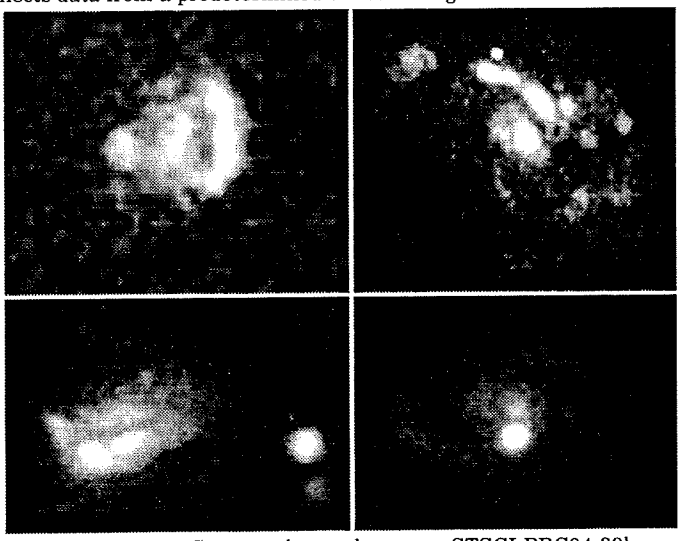
Volume 4, Number 4 **August 1995**

HUBBLE SHEDS LIGHT ON THE "FAINT BLUE GALAXY" MYSTERY

Astronomers using NASA's Hubble Space Telescope have solved a 20-year-old mystery by showing that a class of galaxy once thought to be rare is actually the most common type of galaxy in the universe. Analyzing some of the deepest images ever taken of the heavens, the astronomers conclude that small irregular objects called "blue dwarfs" were more numerous several billion years ago, outnumbering the spiral galaxies like our Milky Way, and giant elliptical galaxies as well. This means the blue dwarfs are a more important constituent of the universe and figure more prominently in the evolution of galaxies than previously thought, researchers say.

The discovery was made by the international Medium Deep Survey team, led by Richard Griffiths of the Johns Hopkins University, Baltimore, MD, and extended by a deeper survey with Hubble Space Telescope by a team led by Rogier Windhorst of Arizona State University, Tempe, AZ. "The new results have overturned the conventional picture of a universe dominated by giant grand-design spiral systems and elliptical galaxies," said Griffiths. "Instead, we're going to have to come up with a new way of understanding the distorted galaxies we see in huge numbers, which seemed to have formed later than the giant galaxies." However, they say it is not clear whether these small irregular systems are indeed the building blocks of galaxies like the Milky Way, or have simply faded into obscurity.

"Most of these faint objects are extremely blue in color, a strong indication that they are undergoing a brief, rapid burst of star formation," said Windhorst, who along with William Keel of the University of Alabama,Birmingham, AL, conducted a separate survey of remote galaxies. These faint galaxies were randomly imaged as part of a key Hubble Space Telescope project, called the "Medium Deep Survey. "The survey uses Hubble's Wide Field and Planetary Camera 2 (WFPC2) to search for unexpected objects in uncharted areas of sky. This highly efficient and cost-effective survey is conducted in "parallel mode" where the WFPC2 takes detailed pictures while a "primary" instrument, such as a spectrograph, collects data from a predetermined celestial target.



Medium Deep Survey; photo release no.: STSCI-PRC94-39b

For the past 17 months, Griffiths and co-investigators from the United States (Richard Green, John Huchra, Garth Illingworth, David Koo, Kavan Ratnatunga, Tony Tyson, Rogier Windhorst) and the United Kingdom (Richard Ellis, Gerry Gilmore), have studied more than 50 random snapshots containing high resolution information for a total of tens of thousands of galaxies. "We were immediately struck by the large numbers of irregular and peculiar galaxies in these HST random images," said Griffiths.

Another deeper Hubble image has further extended these exciting results. The image was obtained by Windhorst and Keel, and analyzed by Simon Driver of Arizona State, Windhorst, and associates. "At last, Hubble has allowed crystal clear images of these extremely faint objects, and we find that our universe is dominated by distorted systems of stars," said Driver. "At the faintest limits more than half the galaxies seen are such systems."

"We all know that the (clear) sky during the day is blue — due to scattered sunlight — but if your eyes had much more sensitivity, they would also see a very dim blue glow in the sky at night caused by myriads of faint blue galaxies, the mysterious nature of which was unknown until we imaged them in detail with Hubble," said Windhorst. The researchers are now measuring the distances to these galaxies using the new generation giant telescopes on Earth.

SCIENCE BACKGROUND

"THE FAINT BLUE GALAXY MYSTERY" A CENSUS OF GALAXIES

In the 1920s, when Edwin Hubble first discovered that the universe contained countless "island universes" called galaxies, astronomers believed that giant spiral galaxies, such as our own Milky Way and nearby Andromeda, as well as luminous elliptical galaxies, such as Messier 87 in the Virgo cluster, dominated the vast volume of space.

However, since the 1970s astronomers have been perplexed by the enormous numbers of "faint blue galaxies" seen in the deepest images gathered by the world's largest telescopes. Several Hubble Medium Deep Survey team members including David Koo of Lick Observatory, Richard Ellis of the Institute of Astronomy at Cambridge University, England, and Tony Tyson of AT&T Bell Laboratories, have grappled with this problem over the last two decades. In recent years, some hints to the nature of the faint blue galaxies also have come from ground-based surveys of nearby galaxies, including work done by John Huchra and colleagues at the Center for Astrophysics in Cambridge, MA. Due to distortion by Earth's atmosphere, these mysterious objects have remained murky blobs seen against the background glow of the ground-based night sky.

"The clue to further progress lies in extensive spectroscopic studies of these remarkable galaxies using ground-based telescopes," concluded Ellis. Ellis, Karl Glazebrook (Institute of Astronomy at Cambridge University, England) and colleagues have pioneered the construction of multiple object spectrographs precisely for this purpose on Britain's large telescopes. "Thus far we can say that many of these peculiar systems are being seen during an unusually active stage of star formation. Finding the cause of this activity is the remaining puzzle." ✪

BRIGHT LIGHT SOURCE FOUND TO BE AN ILLUSION

A celestial light source 10 billion light-years from Earth, thought for several years to be among the brightest sources of radiation in the universe, is really a mirage caused by distortion from the gravity of a nearby galaxy, according to NASA astronomers. The light source is the most distant known object among the more than 300,000 sources catalogued by the Infrared Astronomical Satellite, an orbiting telescope launched in 1983 by the United States, the Netherlands and the United Kingdom. The light source's distance was later measured in 1991 by British astronomers.

Dr. Peter Eisenhardt and his colleagues at NASA's Jet Propulsion Laboratory, Pasadena, CA, and the California Institute of Technology used the Wide-Field and Planetary Camera 2 onboard the orbiting Hubble Space Telescope to image the source last December. The source, catalogued as FSC10214+4728, is about 10 billion light-years away, or 5/6ths of the way back to the moment of the Big Bang, the cataclysmic event thought to have been responsible for the creation of the visible universe.

Because of its great distance, it was earlier suggested that the source might be either an extremely luminous, dust-embedded quasar — or quasi-stellar object — or a representative of a new class of astronomical object such as a protogalaxy, a galaxy in the process of forming. The Hubble Space Telescope image studied by Eisenhardt and his colleagues shows the bright source is magnified about 100 times and distorted into the shape of an arc by a "gravitational lens" formed by the nearby galaxy. The galaxy is between Earth and the distant light source. An additional gravitational "counter image," which provides a relatively undistorted view of the original light source, can be seen very faintly beyond the galaxy.

Even the bright arc is a million times fainter than could be seen by the naked eye. In the Hubble image the brightest source occupies only 7/10th of an arc-second of sky. By comparison, the full Moon occupies 1,800 arc-seconds of sky. The work was carried out by Eisenhardt and Dr. Michael Werner of JPL, along with colleagues Drs. B. T. Soifer and Gerry Neugebauer, and graduate students Lee Armus and David Hoag of Caltech. The work was supported by the Space Telescope Science Institute in Baltimore, MD, and NASA's Office of Space Science, Washington, D.C. ✪

HUBBLE DISCOVERS NEW MOONS ORBITING SATURN

Astronomers have announced the discovery of at least two, and possibly as many as four, new moons orbiting the giant planet Saturn. This discovery was based upon NASA Hubble Space Telescope images taken on May 22, 1995, when Saturn's rings were tilted edge-on to Earth.

The discovery, reported in the July 27th International Astronomical Union Telegram (Circular No. 6192), was made by Amanda S. Bosh of Lowell Observatory, Flagstaff, AZ, and Andrew S. Rivkin (also of Lowell Observatory and the University of Arizona/Lunar and Planetary Laboratory). "We were excited to see new satellites in the Hubble pictures. This was not a primary goal of our observations, so we were quite surprised," said Bosh.

Two of the satellites seen by Hubble are in orbits similar to those of Atlas and Prometheus, a pair of moons discovered in 1980 by the Voyager 1 spacecraft. "If these two satellites are the same seen by Voyager, then their orbital longitudes are different from what we expected," said Bosh. Additional Hubble observations of Saturn, taken when the Earth again crosses the ring plane on August 10, will provide more images that can be used to determine whether two of the four satellites detected by Hubble are truly new or not. If all four satellites are new, then the total number of known moons orbiting Saturn will grow from 18 to 22.

Two of the new moons (called S/1995 S1 and S2) lie inside Saturn's thin, eccentric "F" ring; a third moon (S3) lies just outside the F ring; and the fourth moon (S4) is 3,700 miles (6,000 kilometers) beyond the F ring. The moons are no bigger than about 45 miles (70 kilometers) across.

Hubble's sharp view is ideal for detecting faint new satellites that have previously gone unseen. The astronomers identified the new moons by first processing the Hubble pictures to remove residual light from the ring edge, and noting the locations of Saturn's known satellites. After this was done, the researchers saw four objects moving from frame to frame that did not correspond with any of the known satellites. "With the exception of S4, which we're having trouble finding in a few frames, we can follow the other three satellites for 10 hours as they go around the planet," said Bosh. ✪

STAR STUFF
Monthly Publication of the Ford Amateur Astronomy Club

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

1995 CLUB OFFICERS

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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 at the Ford Motor Credit Company (FMCC) building, Northeast of the World Headquarters build in Dearborn, in conference room 1491, lower floor, East side of the building.

OBSERVING SITE

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

OBSERVING HOTLINE NUMBER - (313) 39-05456

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

MEMBERSHIP AND DUES

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

Annual Individual/Family	$20.00
Lifetime Membership	$100.00

Membership benefits include a subscription to the Star Stuff newsletter, discounts on subscriptions to Astronomy and/or Sky & Telescope magazine(s), after hour use of the observing site at Island Lake Recreation Area, 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. Subscription are free to any other astronomy clubs wishing to participate in a newsletter exchange.

AUGUST 1995

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

AUGUST 1995 EVENTS

The following August 1995 events come from the 6/29/95 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.

Aug 01 Alpha Capricornids Meteor Shower
Aug 03 Koreasat-1 Delta 2 Launch
First Quarter Moon (11:19 pm EDT)
Aug 10 Full Moon (2:18 pm EDT)
SICH-1/FASAT Cyclone Launch (Russian)
Aug 11 Saturn Rings Edge-On from Earth's Perspective
Aug 12 Perseids Meteor Shower (Potential Meteor Storm)
Aug 17 Last Quarter Moon (11:16 pm EDT)
Aug 22 FAST (Fast Auroral Snapshot) XL Pegasus Launch
Aug 25 New Moon (12:33 pm EDT)
Aug 28 Soyuz TM-22 Launch (Russian)
JCSAT Atlas IIAS Launch
Aug 29 Galileo, Trajectory Correction Maneuver #26 (TCM-26)
Aug 31 XTE (X-Ray Timing Explorer) Delta 2 Launch

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, August 24, at 5:00 p.m.**

The program for the meeting has not been determined at this time.

The FAAC meets in the Ford Motor Credit Company (FMCC) building, conference room 1491, located on the lower floor on the 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 door or the lower east door. At 5:00 pm no one seems to have much 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 that you are here to attend a Ford club meeting, and security will admit you. You may, of course, find your way into the building any way you see fit, but direction signs will only be posted fromthe lower northeast and lower east doors.

MEETING MINUTES 7/27/95

The July 27, 1995 F.A.A.C. meeting was cancelled by club president Chuck Boren due to SMURFS attendance.

AUGUST TRIVIA

by Harry A. Kindt

Aug 03 1976 First Viking 1 images of Mars beamed back to Earth.
Aug 04 1540 Born, Joseph Scaliger, French inventor of "Julian Period".
1971 First satellite launched from manned spacecraft (Apollo 15).
Aug 05 1930 Born, Neil Alden Armstrong, US Astronaut
Aug 06 1961 Vostok 2 (USSR), launched.
Aug 07 1954 First photograph of Earth taken from space (Explorer Vl)
1961 Titov orbited the Earth 17 times.
1971 Apollo-15 splashed down despite the failure of one of its three parachutes.
Aug 08 1978 Pioneer Venus Multiprobe (US), launched.
Aug 10 1945 Robert Hutchings Goddard, "father of the space age", died.
1960 Discoverer 13 (US), launched.
1966 Lunar Orbiter 1 (US), launched.
Aug 11 1877 Asaph Hall, US astronomer, discovered the two moons of Mars (Phobos and Deimos).
1962 Vostok 3 (USSR), launched.
Aug 12 1977 First successful flight of spacecraft on its own in Earth's atmosphere.
Aug 13 1831 Blue Sun observed throughout the South.
Aug 16 1987 Harmonic convergence began
Aug 17 1877 Phobos (Martian satellite) discovered (A. Hall)
Aug 19 1940 Civil Aeronautics Administration, honorary license awarded to Orville Wright.
1960 Sputnik 5 (USSR), launched
1982 Soyuz T-7 (USSR), launched
Aug 20 1960 Two dogs and six mice survive Sputnik V orbit
1975 Viking 1 (US), launched
1977 Voyager 2 (US), launched
Aug 21 1965 Gemini 5 (US), launched
Aug 22 1834 Born, Samuel Langley, American astronomer and physicist
1932 Born, Gerald Paul Carr, American astronaut
Aug 23 1966 First Earth image from vicinity of Moon (Lunar Orbiter 7)
1973 Intelsat-4 F-7 (US), launched
1977 First man-powered flight
Aug 24 1944 Born, Gregory B. Jarvis, payload specialist aboard Space Shuttle Challenger
1989 Voyager ll. scheduled to encounter Neptune
Aug 25 1981 Voyager 2 (US), at closest approach to Saturn
Aug 26 1957 Soviet Union announced it had successfully tested an ICBM
1974 Soyuz 15 (USSR), launched
1978 Soyuz 31 (USSR), launched
Aug 27 1962 Mariner ll. (US), launched
Aug 29 1965 Gemini 5 returned to Earth (G. Cooper and C. Conrad)
1975 Star in Cygnus was observed to go nova and become the fourth brightest star in the sky
Aug 30 1983 STS-8 (US), first black astronaut in space (Guion Bluford), launched
1984 Space Shuttle Discovery (US) launched for the first time
Aug 31 1913 Born, Sir Bernard Lovell, astronomer

FOR SALE

NOTE: The following equipment is advertised "as is." The F.A.A.C. does not endorse or offer any guarantee or warranty for the equipment being sold. Club members may advertise items without a fee, but must contact the newsletter to rerun the ad. Non club members may advertise for a fee of $5.00 per issue (checks can be mailed to the P.O. Box and made out to the Ford Amateur Astronomy Club). Only astronomy equipment can be advertised. Scopes, eye pieces, finder scopes, mountings, software (only that which is not public domain, shareware, or bootlegged), and related euipment that is needed to perform astronomy activities.

For Sale:
Coulter Odyssey 8" f/4 telescope including the following items: upgraded 9-point Novak mirror mount, 8x50 finder scope, Thousand Oaks solar filter, Celestron 26mm plossl eyepiece, Tele Vue 13mm plossl eyepiece, and 2.5x barlow. Asking $500. Contact Steve at 313-561-3457.

WEATHER AND ASTRONOMY

by Todd Gross
Toddg@shore.net

Starting April 1, 1995, I began publishing a 12-month series of articles devoted to Weather and Amateur Astronomy. This month's feature is "El Nino, or Why was it so cloudy," and deals with the unusual weather of this past winter and spring, especially in the Western United States, where observing has been unusually difficult to do.

World-wide, the weather went bananas again this past winter. From almost no snow in the Northeastern U.S., to storm after storm on the West Coast of the U.S., to harsh winter storms in Europe, there was no doubt about it.. El Nino had returned! Amateur astronomers in the Southwestern U.S. put up with the "seasonal" bad weather over the winter, as they have become accustomed to occasionally dreary winters, but when spring returned, they started asking if the clouds and rain would ever end!

While I am happy to report that for the time being, the big storms have migrated northward to Western Canada, I must tell you that we are not totally out of the pattern that started the stormy cycle in the first place: El Nino. What is El Nino? A friend of mine, Gary Gray, wrote this about it on the Internet "Newsgroup" Ne.weather:

"El Nino is caused by a breakdown in the trade winds in the equatorial Pacific. Why the trade winds break down is, as yet, unknown. However, we do know that the trade winds (blowing east to west) tend to push the top layer of ocean water, which is the warmest layer, to the west. This means there is a pooling of warm water in the western Pacific and cool (relatively cool... it is still quite warm) in the eastern Pacific. Those are normal conditions. However, when the trades break down warm water is allowed to remain in the eastern Pacific.

Because the trade winds break down gradually successive sea surface temperatures will give the appearance that the warm waters are migratory (meaning that the warm water appears to move toward the east). The warm water, in reality, is simply being allowed to "build up" in the east. This is El Nino, a significant increase in sea surface temperatures in the eastern near-equatorial Pacific. The associated weather effects are as follows:

Water has a much higher heat capacity than air. Therefore, a warming of only a few degrees in the ocean waters is a huge increase in energy. Therefore, in El Nino events a huge amount of energy is pumped into the southern jet stream (usually there are two - occasionally three - jet streams, the subtropical jet being the "southern" one). This then allows many storms to develop off the west coas of the United States. This is why flooding in California is frequently related to El Ninos.

Also, places like Texas can get flooded, like a couple of years ago during El Nino, becausethe subtropical jet is so strong. Meanwhile, these systems are completely"wound up" (frequently it is a secondary storm from the Gulf of Mexico that takes over as the "wound up" storm) by the time they get to the mid-section of the country. As with most "peaked out" storms, they turn north - this is due to vertical structure. So, they frequently wind up going up the Ohio Valley or Appalachians. Given the couterclockwise spin of storm systems, this pumps warm air up the East Coast of the U.S."

Weather elsewhere, world-wide gets thrown out of whack as well. Depending on your locale, you either enjoyed a rather mild winter and spring, or one that was unusually stormy. It is unlikely that you had a "typical" winter and spring.

The big question on many amateur astronomer's minds is whether or not El Nino has had it's run, or if it will return this next season. The current long range forecasts are for El Nino to die out only slowly, leaving this winter again open prey to some unusual weather! However, in recent weeks there have been some new signs that this El Nino episode may indeed be ending. Nevertheless, El Nino usually returns every 4-6 years, so even if we are through with the offbeat weather for this year, it will return to a sky near you, in years ahead!

Please note, that while I may speak authoritatively, I am just an amateur astronomer, like you, and all the information above reflects my personal opinion(s) only based on my experiences to date.

ASTRO TRIVIA

by Paul Mrozek
pmrozek@pms064.pms.ford.com, or pmrozek (PROFS)

Q: What are the different kinds of month's in astronomy?
A: The word "month" is rooted in the Moon. Early Mesopotamians started the month with the first crescent Moon and kept counting days until they spotted another one a "moonth" later [1]. Most people are familiar with the calendar months, lasting 28 to 31 days, and the lunar months, the interval between two occurrences of the same lunar phase. In astronomy, the different kinds of months are as follows: [2]

Anomalistic - 27.55455 days - The time between successive passages through perigee (the point of closest approach to the Earth).
Draconitic (nodical) - 27.21222 days - The time between successive passages through the same node. A node is the point where a plane of orbit intersects a reference plane.
Sidereal - 27.32166 days - The time taken to rotate around the Earth with respect to a particular background star.
Solar - 30.43685 days - One twelfth of a tropical year. A tropical year is the time taken to rotate around the Sun, with respect to the same equinox. An equinox is either of the two points at which the celestial equator intersects the ecliptic. The ecliptic is the mean plane of the Earth's orbit around the Sun. The name arises because eclipses of the Sun or Moon can occur only when the Moon passes through this plane.
Synodic (lunar) - 29.53059 days - The time between successive positions of the Sun, Moon, and Earth.
Tropical - 27.32158 days - The time between successive passages through the vernal (passing south to north) equinox.

The lengths listed for each of the above months are averages. Short and long-term trends can cause these values to vary slightly. For example, the synodic month can last anywhere from 29.27153 to 29.83264 days [3].

Q: What are Moon cakes?
A: Moon cakes are the traditional food Chinese people eat during the Midautum Moon Festival. This celebration occurs on the 15th day of the eight month of the lunar (synodic) calendar. A traditional moon cake has an egg yolk embedded in a dark bean paste. [1]

Q: What was the first meal on the moon the Moon?
A: Before their moon walk, Neil Armstrong and Edwin Aldrin, Jr. ate four bacon squares, three sugar cookies, peaches, pineapple-grapefruit drink, and coffee. [4]

Q: What is an Einstein's ring?
A: An Einstein's ring is the circular image of a distant light source formed when a mass acts as a gravitational lens along the line of sight. [5]

References:
[1] "The Midautum Moon Goddess" by E. C. Krupp, Sky & Telescope, 9/93
[2] Oxford Illustrated Encyclopedia of the Universe by Archie Roy
[3] "How Long Is a Lunar Month?" by R. W. Sinnott, Sky & Tel., 11/93.
[4] The Handy Science Answer Book by the Caregie Library of Pittsburgh
[5] The Penguin Dictionary of Astronomy by Jacqueline Mitton

WHY A 12 MONTH YEAR?

by Keith Marzullo (marzullo@cs.ucsd.edu)

The following contains a long exerpt (pp 80-81, Chapter IV, Egyptian Mathematics and Astronomy, Section 39) from The Exact Sciences in Antiquity by O. Negerbauer (Second Edition) Dover, that goes into some detail why our civil calendar has 12 months instead of 13. Others have pointed out the origin of the Julian calendar but as the following describes, the civil calander has had an interesting history going back to Egypt.

By the way, this is an excellent book that describes mathematics and astronomical computations by the Egyptians, the Babylonians, and the Greeks. The material is from the '50s, and so it lacks a discussion on the new world mathematics The material was originally from a set of lectures he gave at Cornell University in 1949. It must have been a wonderful set of lectures. It would still be.
(continued on page 5)

(continued from page 4)
The role of Egyptian mathematics is probably best described as a retarding force upon numerical procedures. Egyptian astronomy had much less influence on the outside world for the simple reason that it remained all through its history on a very crude level which had practically no relations to the growing mathematical astronomy of the Hellenistic age. Only in one point does the Egyptian tradition show a very beneficial influence, that is, in the use of the Egyptian calendar by the Hellenistic astronomers. This calendar is, indeed, the only intelligent calendar which ever existed in human history. A year consists of 12 months of 30 days each and 5 additional days at the end of each year. Though this calendar originated on purely practical grounds, with no relation to astronomical problems, its value for astronomical calculations was fully recognized by the Hellenistic astronomers. Indeed a fixed time scale without any intercalations whatsoever was exactly what was needed for astronomical calculations. The strictly lunar calendar of the Babylonians, with its dependence on all the complicated variations of the lunar motion, as well as the chaotic Greek calendars, depending not only on the moon but also on local politics for its intercalations, were obviously far inferior to the invariable Egyptian calendar. It is a serious problem to determine the number of days between two Babylonian or Greek new year's days, say 50 years apart. In Egypt this interval is simply 50 times 365. No wonder that the Egyptian calendar became the standard astronomical system of reference which was kept alive through the Middle Ages and was still used by Copernicus in his lunar and planetary tables. Even in a civil calendar the Egyptian year of 365 days was revived during the Middle Ages. The last Sasanian king, Yazdigerd, based the reformed Persian calendar on this year, shortly before the Sasanian monarchy collapsed under the impact of expanding Islam. Nevertheless the "Persian" years of the Era Yazdigerd (beginning A.D. 632) survived and are often referred to in Islamic and Byzantine astronomical treatises.

A second Egyptian contribution to astronomy is the division of the day into 24 hours, though these "hours" were originally not of even length but were dependent on the seasons. These "seasonal hours", 12 for daylight, 12 for night, were replaced by "equinoctial hours" of constant length only in theoretical works of Hellenistic astronomy. Since at this period all astronomical computations were carried out in the sexagesimal system, at least as far as fractions were concerned, the equinoctial hours were divided sexagesimally. Thus our present division of the day into 24 hours of 60 minutes each is the result of a Hellenistic modification of an Egyptian practice combined with Babylonian numerical procedures.

Finally, we have to mention the "decans" (to use a Greek term) which have left no direct traces in modern astronomy. This is curious enough since the decans are the actual reason for the 12-division of the night and hence, in the last analysis, of the 24-hour system. Again in Hellenistic times the Egyptian decans were brought into a fixed relation to the Babylonian zodiac which is attested in Egypt only since the reign of Alexander's successors. In this final version the 36 "decans" are simply the thirds of the zodiacal signs, each decan representing 10 degrees of the ecliptic. Since the same period witnesses the rapid development of astrology, the decans assumed in important position in astrological lore and in kindred fields such as alchemy, the magic of stones and plants and thier use in medicine. In this disguise the decans reached India, only to be returned in still more fantastic form to the Muslims and the West. Their final triumph lies in the frescoes of the Palazzo Schifanoria in Ferrara under Borso d'Este (about 1460).

In tracing back the history of the Egyptian decans we discover the interaction of the two main components of Egyptian time reckoning: the rising of Sirius as the harbinger of the inundation, and the simple scheme of the civil year of 12 months of three decades each.

ASTRONOMY WORKSHOP

The following article was reprinted from ASTRONET, Issue 14, May 15, 1995. For more information, please contact resource@rahul.net.

CARESSING YOUR MIRROR

by Jack Kramer, Libertyville, Illinois

The cell that holds the mirror in your telescope is one of the least visible components. Because of that, we tend not to think very much about it, except during the process of building or upgrading a telescope. But just as each component plays a part in providing good images in your scope, the cell is critical. Especially with a Newtonian, you use it on a regular basis to re-collimate the mirror system.

Not only is it important to have a cell that's easy to adjust during collimation, but the cell must also hold your mirror with just the right amount of tension. It must truly caress the mirror! The cell must not induce a warping effect on the mirror nor should it hold the mirror so tightly that it affects the figure. Mirrors, especially the thinner, light-weight ones, are not as rock-hard as they appear. Jeff Inman encountered this problem some years ago when he found that the images in his scope could not quite be brought to a good focus. It turned out that the answer was simply to loosen the clips that hold the mirror in the cell. Once this was done, the images turned sharp again. The clips had induced a very slight strain on the mirror, which was just enough to distort the surface figure. With accuracy of mirrors measured in waves of light, it doesn't take much to affect the surface. In fact, I've heard it said that the mirror should be held so gently that it can be moved about in the cell without loosening the clips. The down side is that the scope may have to be re-collimated more frequently. Even if you don't intend to build a telescope, it's good to keep this in mind so when you re-install the mirror of your commercially-made telescope after a cleaning, you don't induce a stress by over-tightening the clips.

The Clips That Hold The Mirror

The purpose of the clips is simply to keep the mirror from falling out of the cell. The edges of the clips should not interfere with the light path by intruding too far onto the surface of the mirror. Typically, what little pressure they exert is against the beveled front edge of the mirror. On most commercially-made cells, the clips are screwed to the collar that holds the circumference of the mirror.

Flotation Cells

In a floatation cell, the mirror is supported at the back of the cell by triangular-shaped plates. Each plate has three pads on which the mirror rests. A typical arrangement would be a 9-point flotation cell with three plates. Larger mirrors often employ an 18-point flotation, using six triangular plates. By being free to pivot, the plates conform to the orientation of the mirror as it rests (or "floats") on them. This minimizes stress on the mirror. The plates themselves can be balanced on "dome nuts" or supported by a post that's spring loaded into a hole on the inside back surface of the cell. The flotation design is similar to other types of cells in that clips hold the mirror in the cell and the base of the cell has three screws for collimation.

Variations

While flotation cells are commonly used on Newtonian telescopes, there are some alternative designs. I have had very good luck with some variations on the "normal" cell. For one thing, the clips that hold my mirror are held in place with a large pipe clamp. They're clamped to the circular wooden backplate on which the mirror rests; this plate is slightly larger than the 10" mirror to prevent the clips from pressing tightly against the side of the mirror. A dab of silicon sealer under each clip cushions the force with which the clip presses against the edge of the mirror. There are eight clips evenly spaced around the circumference. The clips are not secured anywhere, but must be re-inserted under the pipe clamp each time the mirror is reinstalled after removal from the cell. This holds the mirror very securely, yet without inducing any perceptible distortion. Instead of resting on flotation pads, the back of the mirror rests on thirty rubber pads glued to the backplate. These are the type of adhesive-backed rubber squares (each about 1"x1") commonly used as anti-skid pads under the bases of electronic equipment. As an alternative, some telescope makers have used a large piece of cork as a cushion between the mirror and backplate.

The Sling-Type Cell

The situation in a Dobsonian telescope is a bit different than in other designs, because a "Dob" moves through a relatively small arc in altitude - from horizontal to straight overhead. The mirror thus isn't turned every which way during observation. While one of the other cell designs would be usable in a Dobsonian, many telescope makers opt for a sling-type mirror mount. This has the virtue of simplicity, plus it handles thin mirrors very gently. The mirror is supported by a sling made of heavy canvas-type strapping, though the best material is an old automobile seat belt. This material is flexible, yet it hardly stretches. Plastic webbing of the type used in lawn furniture is unsatisfactory because it stretches so much that it's impossible to keep the optical system collimated. The mirror is held in place by three pins that bear against the edge of the mirror, spaced 120 degrees apart with one pin at top center. These pins have tabs that keep the mirror from falling away from the cell. The pins are generally made as eccentrics, with an off-center hole, so they can be rotated to bear more or less tightly against the mirror edge. The eccentrics and the bolts that hold the strap are

(continued from page 6)

(continued from page 5)
mounted to a backplate like on the other cells. In a sling arrangement, the back of the mirror may rest on 9 or 18 point flotation pads, on rubber cushions, cork, or similar backing. The three-point adjustments can be the same as with other cell designs. An alternative is to have the collimation bolts connected to the flotation pads. On Grant Barlow's 18-point flotation (based on the Dave Kriege design), there are six triangles, joined into three pairs with a metal rod between them. The bolts bear against these rods.

In an effort to keep costs to a minimum, the mirrors in some Dobsonian telescopes on the market are mounted in cells of the utmost simplicity. The mirrors are held onto the backplate with a long strip of duct tape wrapped several times around the edge of the mirror. On their 17+" mirrors, Coulter also uses large pipe clamps over the tape. Coulter uses no backing for the mirror; it simply rests directly against a piece of wood or particle board. Others use silicon sealer as a backing. In some cases, the three adjustment screws bear directly against the back of the board. Surprisingly, this minimalist approach does work, though it's not easy to remove the mirror for cleaning, nor is it easy to collimate the scope.

The Collimating Screws

The three screws that are used to adjust the mirror during collimation require a "stop" of some sort to hold the mirror in the collimated position. Many commercial telescopes come with two sets of three screws. One set moves the back of the cell for collimation. The other set bears against the back of the cell. This second set is first loosened, then tightened once collimation is completed. I prefer spring-mounted screws. The springs eliminate the bother of adjusting two sets of screws. If these springs are sufficiently stiff, they'll hold the mirror in position well enough so that it seldom goes out of collimation. Most commercially-made cells sold as separate components use this design.

Choose the cell design that meets your needs...but make sure the finished product caresses your mirror securely, but ever so tenderly. ✪

S. HEMISPHERE TRIP REPORT

by Tim Klepaczyk (PROFS: TKLEPACZ, Internet: tklepacz@ford.com)

I just got back from a two week vacation to Peru. Much to my enjoyment I was able to do a little southern hemisphere astronomy. It was the first time I'd ever travelled south of the equator and I thought some of the FAAC members might take an interest in some of my experiences.

Since I wasn't counting on doing any astronomy, I took only limited materials: my 7x35 binoculars and my Peterson's Field Guide to the Stars and Planets. This guide proved more than adequate; it has sky maps for the southern hemisphere looking north and south, and a complete star atlas. My observations were done in two locations: near Puno on Lake Titicaca at 13000 feet, and at the Explorer's Inn, 50ish kilometers from Puerto Moldanado in the Peruvian Amazon relatively close to sea level.

I was closer to Puno, a city around the size of Ann Arbor, than I would have liked. Fortunately I found a well placed hill to shield most of the city lights. The dark sky conditions were very good. The southern cross was very prominent, as was all of Centaurus and Octans and some other southern constellations. The area of the sky near the south celestial pole was clearly visible although there really was nothing to see. I positively identified Alpha Centauri for the first time although I had difficulty resolving it as a double star in my binoculars. The Coal Sack near Crux was easy to see with my binoculars. The great globular cluster Omega Centauri was very easy to resolve and quite impressive, although I'd seen it many times when I lived in California. It was higher in the sky than I'd ever seen it before. I tried to resolve the Small Magellanic Cloud with no success. By my estimation it should have been just above the horizon but this and light pollution probably conspired to reduce its resolvibility. Nearby is the other great globular cluster of the southern hemisphere, 47 Tucanae. I could not resolve this either. The Large Magallanic Cloud, by my estimation, was still below the horizon, as was Canopus, the second brightest star in the sky.

Viewing conditions in the jungle were actually better. Unfortunately, the tree line to the south was too high so I was still restricted. The Milky Way from Cygnus to Sagittarius to Scorpius to Crux was glorious. Dark lanes were very prominent, and the Coal Sack could be seen with the naked eye. Unfortunately, I was still not afforded the opportunity to see the SMC, LMC, 47 Tucanae or Canopus. I did manage a direct comparsion between Omega Centauri and M13 in Hercules. M13 doesn't even come close to Omega Centauri. As far as for comfort, it was warmer in the jungle, but if I ever manage to make a trip down under with my REAL telescope, Lake Titicaca is almost ideal. It's very high altitude and it is not difficult to get away from development. In fact, I would recommend taking your telescope to Taquile or Amantani, two islands in the middle of the lake that I was told had unbelievable sky conditions. It does get VERY cold, however.

If other members have some southern hemisphere observations to share I'd enjoy hearing them.

✪

THE STAR STUFF CATALOG

Conducted by Greg Burnett
PROFS = GBURNETT
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Each month another interesting astronomical object is added to The Star Stuff Catalog. Entries include favorite observing targets, objects of current or seasonal interest, and objects with long-standing scientific or cultural significance.

Readers are encouraged to submit write-ups on their favorite objects for inclusion in the Star Stuff Catalog. This month we add the third catalog entry, the Hyades star cluster....

SSC 3: The Hyades (RA 4^h 27^m DEC $+16^o$ (2000))

The Hyades cluster, also known as the Taurus Moving Cluster, is the nearest "galactic" or "open" cluster (with the exception of the Ursa Major Moving Group, which we don't normally recognize as a cluster). Its distance is about 40 parsecs, or about 130 light-years. It is moving at about 26 miles per second toward a point a few degrees from Betelgeuse in the constellation of Orion. It was closest to us about 800,000 years ago and is now moving away. The cluster is moderately old, by cluster standards, the most commonly accepted estimate being 400 million years. It exhibits no visible nebulosity, as do many younger clusters.

In mythology the brighter stars of the Hyades represented the seven (by some accounts six) daughters of Atlas and Aethra, making them half-sisters of the Pleiades. The ancient Greeks associated the Hyades with rain or stormy weather. Strangely enough, the Chinese recorded a similar association with rain as far back as 1100 B.C.! However, ancient Roman country folk knew them as the "little pigs" (which may still be tied to the rain theme through the concept of mud!).

According to counts made by H.G. Van Bueren in 1952, the cluster contains 132 stars brighter than 9-th magnitude, and includes several hundred fainter members. A 1962 survey yielded 259 probable members fainter than 9-th magnitude. At the same distance our Sun would be magnitude 7.7, not even a naked-eye star. Aldebaran (Alpha Tauri), the brightest star in same area, is not a true member of the cluster, being roughly half as distant. The brightest of the cluster residents is Theta-2 Tauri at magnitude 3.34. It is a A7-III star having about 50 times the luminosity of the Sun. Most of the members are main-sequence stars of types A,F,G,K, and M. There are no B giants, owing to the moderate age of the cluster. The cluster contains about a dozen white dwarf stars, the brightest shining at a modest 14-th magnitude. Visual and spectroscopic doubles are common within the cluster.

In total extent the cluster is 24 degrees in apparent diameter, about 80 light-years in actual diameter. The prominent central concentration of the cluster is only about 8 light-years across. The Hyades form the face and horns of Taurus, the bull. Each side of the "V" of the horns is about 4-1/2 degrees long and the "V" is about 3-1/2 degrees wide, making the Hyades one of the largest asterisms in the sky that is not a constellation. For the amateur observer, the Hyades provides a number of double stars, but not much else. It is best appreciated at very low magnifications, such as with binoculars.

Thanks to its nearness to us, the Hyades is an important rung in the "cosmic distance ladder." By observing the convergence of the proper motion paths of the cluster members (called the "moving cluster method"), very accurate distances can be calculated, which aid in calibrating the scale of the cosmos. ✪

ULYSSES UPDATE

The European Space Agency's (ESA) Ulysses spacecraft, the first probe ever to fly over the poles of the Sun, will climb to its maximum latitude of 80.2 degrees north of the Sun's equator on Monday, July 31, and survey the solar forces at work from this unique vantage point in space. The spacecraft will have traveled about 1.86 billion miles when it reaches the summit of its trajectory over the Sun at 11 a.m. EDT, according to mission operations team members at NASA's Jet Propulsion Laboratory, Pasadena, CA.

All Ulysses operations and science experiments continue to go well in this unique, five-year journey out of the ecliptic plane. NASA's tracking facilities near Madrid, Spain and at Goldstone, CA, are monitoring the spacecraft 24 hours a day as maneuvers are performed to keep Ulysses' radio antenna pointed to Earth.

Launched on October 6, 1990, aboard the Space Shuttle Discovery, the 810-pound ESA probe was designed to study the heliosphere — that region of space dominated by the solar wind — at all latitudes above and below the Sun's equatorial plane. These high latitude regions have never been explored before. Named for the legendary Greek adventurer who journeyed to the hidden side of the Sun, Ulysses carries nine scientific instruments provided by European countries and the United States to make detailed studies of solar wind, magnetic fields and particles, interplanetary dust and gas, and cosmic rays entering the solar system from the Milky Way galaxy. In addition, Ulysses' radio data have been used for other experiments to study the Sun's outer atmosphere, or corona, and to search for gravitational waves in interplanetary space, and the gamma ray burst detector helps triangulate the brightest cosmic gamma ray bursts.

Today the spacecraft is traveling at about 55,300 mph with respect to the Sun. Ulysses will begin to descend in latitude as it loops over the northern solar polar region. On September 29, the spacecraft will complete the northern polar pass and begin to journey back out to the orbit of Jupiter, reaching Jupiter's distance of 5.4 AU (about 500 million miles) on April 17, 1998. Ulysses will then head back on its high latitude trajectory toward the Sun, returning again to its vicinity in September 2000.

Ulysses is managed jointly by NASA and ESA to study the regions above the Sun's poles. The Jet Propulsion Laboratory manages the U.S. portion of the mission for NASA's Office of Space Science, Washington, DC. ✪

STAR TRAK FOR AUGUST 1995

star-trak@enif.astro.indiana.edu

BLOOMINGTON, Ind.—The Perseid meteor shower in August is probably the most popular of the year, with 50 or 60 meteors per hour often visible at the peak. Unfortunately, not this year (again). The Perseid shower will peak on the night of Aug. 12-13, according to Indiana University astronomers. But the moon will be just two days past full, so it will shine brightly all night, washing out the fainter Perseids as it did two years ago.

Still, the brighter Perseids in moonlight are better than most other meteors in a dark sky, and there will be a good deal of meteor activity during the nights before and after the peak as well. So it's worth the time and mosquito bites to have a look.

Start watching after midnight, when the most meteors will appear. They may be in any part of the sky, but usually the best strategy is to look about halfway between the horizon and straight overhead. Get away from city lights if you can, especially since the moon will be so bright. Try to pick a site that gives a clear view of most of the sky, and bring along a blanket to stay warm. A reclining lawn chair will help prevent a sore neck. You can try to beat the moon by watching during the few hours between moonset and dawn on the nights of Aug. 5-8, though there will not be as many meteors.

Meteors are caused by bits of dust left behind in space by a passing comet. In the case of the Perseids it was Comet Swift-Tuttle, which last came by in 1992, strewing more litter as it went. When Earth moves through the comet's orbit, the dust particles collide with our atmosphere at about 135,000 miles per hour and are quickly burned up by friction with the air 60-70 miles above the ground. The intense heat makes the air molecules around a particle glow brightly for an instant, and we see a meteor. ✪

COMET COMMENTS FOR 8/1995

by Don Machholz (DonM353259)

Periodic Comet d'Arrest moves rapidly south as the earth overtakes it in our path around the sun. Meanwhile, Periodic Comet Jackson-Neujmin begins to brighten in our morning sky. It should become magnitude 11 in September, when it approaches to within 0.43 AU of us. Two faint comets have been recovered recently by Jim Scotti at Kitt Peak. Comet P/1995 M1 (Shoemaker-Levy 4) was recovered on June 22 at magnitude 22. The following night Scotti recovered Comet P/1995 M2 (Parker-Hartley). It orbits the sun in 8.9 years. Neither will become bright enough for amateur's scopes.

Kazimeras Cernis of Vilnius, Luthuania has recently presented a paper on comet hunting. With over 2000 hours of comet hunting over 20 years, Cernis makes some keen observations on the current state of the subject. He found the average search time for a visual comet discovery from 1975 through 1994 was 410 hours. But when we compare the Northern and Southern Hemisphere, we find a large difference. In the Northern Hemisphere Cernis averaged 615 hours per find, while the Japanese observers averaged 627 hours for 25 finds and I averaged 621 hours. For Southern Hemisphere comet hunters the average is only 180 hours for each comet discovery.

6P/d'ARREST

DATE(00UT)	R.A.(2000)	DEC	EL	SKY	MAG
08-06	23h46.6m	-08d23m	139d	M	9.1
08-11	23h58.8m	-11d58m	142d	M	9.1
08-16	00h09.8m	-15d35m	144d	M	9.2
08-21	00h19.5m	-19d06m	146d	M	9.3
08-26	00h27.7m	-22d24m	147d	M	9.5
08-31	00h34.4m	-25d24m	147d	M	9.7

58P/JACKSON-NEUJMIN

DATE(00UT)	R.A.(2000)	DEC	EL	SKY	MAG
08-06	21h28.7m	+01d09m	161d	M	12.7
08-11	21h30.7m	-00d05m	165d	M	12.4
08-16	21h32.8m	-01d38m	168d	M	12.2
08-21	21h35.2m	-03d28m	169d	M	12.0
08-26	21h38.2m	-05d34m	169d	E	11.9
08-31	21h41.8m	-07d53m	167d	E	11.7

COMET HUNTING TIPS

by Don Machholz, Colfax, CA.

Comets are named with two designations:
1) The year of discovery followed by an uppercase letter for the half-month, then a numeral for the order the comet was found during the half-month.
2) The name of the discoverer, with no more than three names.

Between 1975 and 1995, amateurs visually discovered 67 comets, or 38% of all comets found. This averages to 3.4 comets per year. The average comet hunter takes about 420 hours to find a comet, but this "high" avarage is due to a few comets taking a long time to be found. The median number of hours for a visual find is 220. Also between 1975 and 1995, 40 of the 67 comets found visually were found in the morning sky, with 27 found in the evening sky. The morning sky comets averaged magnitude 8.8 and were 23 degrees above the horizon at discovery. The evening finds averaged magnitude 9.3 and 27 degrees high. The average elongation for morning comets was 59 degrees with a median of 49 degrees. The average evening sky elongation was 62 degrees with a median of 63 degrees.

These are the main reasons why comets miss being discovered:
1) Magnitude: The comet must be bright enough to be seen in your telescope. If it is too faint, the weakness may be in one of these three areas: a) your eyes, b) your skies, and/or c) your telescope.
2) Position: The comet must be in the part of the sky that you are searching.
3) Time: The comet must be seen by you before it is seen by others.

WHAT TO DO IF YOU THINK YOU HAVE FOUND A NEW COMET
1) Is it a known object such as a galaxy, nebula or small cluster? Check all star maps and catalogues. Check to see if it moves against the background stars within one hour.
2) Is it a small group of a few stars, not recognized as a cluster? Use high power and try to resolve it.
3) Is it a ghost image? Wiggle or rotate the telescope. Change eyepieces.
4) Is it a known comet? Check tables of known comets.
5) For photographic finds, is it a photographic defect? Re-photograph it, visually observe it, check for motion.

If you think that you have found a new comet, check for motion and record all these things: Position in RA and Dec (2000 coords), magnitude, shape, direction and speed of motion, coma size. Try to get someone to confirm it (you can contact me at 916-346-8963), or send this information, along with your name and address, to: Central Bureau for Astronomical Telegrams Smithsonian Astrophysical Observatory 60 Garden Ave. Cambridge, MA 02138. IAUSUBS@cfa.harvard.edu or Phone 617-495-7244/7440/7444. ✪

STATISTICALLY SPEAKING

Location(Dearborn, MI): 42°22'00" N, 83°17'00" W, 180 meters elevation
Local Time = Universal Time - 4.00 hours (Eeastern Daylight 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	Sunrise	SS	Sunset

Calendar Report for August 1995

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
		SR: 6:25	SR: 6:26	SR: 6:27	SR: 6:28	SR: 6:29
		SS: 20:53	SS: 20:52	SS: 20:51	SS: 20:50	SS: 20:48
		MR: 11:38	MR: 12:44	MR: 13:50	MR: 14:58	MR: 16:04
		MS: 23:16	MS: 23:50	MS: None	MS: 0:29	MS: 1:12
6	7	8	9	10	11	12
SR: 6:30	SR: 6:31	SR: 6:32	SR: 6:33	SR: 6:35	SR: 6:36	SR: 6:37
SS: 20:47	SS: 20:46	SS: 20:44	SS: 20:43	SS: 20:42	SS: 20:40	SS: 20:39
MR: 17:08	MR: 18:06	MR: 18:58	MR: 19:44	MR: 20:24	MR: 21:00	MR: 21:33
MS: 2:03	MS: 3:02	MS: 4:07	MS: 5:17	MS: 6:29	MS: 7:40	MS: 8:50
13	14	15	16	17	18	19
SR: 6:38	SR: 6:39	SR: 6:40	SR: 6:41	SR: 6:42	SR: 6:43	SR: 6:44
SS: 20:38	SS: 20:36	SS: 20:35	SS: 20:33	SS: 20:32	SS: 20:30	SS: 20:29
MR: 22:04	MR: 22:36	MR: 23:08	MR: 23:43	MR: None	MR: 0:20	MR: 1:00
MS: 9:58	MS: 11:03	MS: 12:05	MS: 13:06	MS: 14:04	MS: 14:59	MS: 15:51
20	21	22	23	24	25	26
SR: 6:45	SR: 6:46	SR: 6:47	SR: 6:48	SR: 6:49	SR: 6:50	SR: 6:51
SS: 20:27	SS: 20:26	SS: 20:24	SS: 20:23	SS: 20:21	SS: 20:19	SS: 20:18
MR: 1:45	MR: 2:33	MR: 3:26	MR: 4:22	MR: 5:20	MR: 6:21	MR: 7:22
MS: 16:39	MS: 17:24	MS: 18:04	MS: 18:41	MS: 19:15	MS: 19:47	MS: 20:18
27	28	29	30	31	Lunar Events	
SR: 6:53	SR: 6:54	SR: 6:55	SR: 6:56	SR: 6:57	FQ: 23:17 Aug. 03	
SS: 20:16	SS: 20:14	SS: 20:13	SS: 20:11	SS: 20:09	FM: 14:16 Aug. 10	
MR: 8:26	MR: 9:30	MR: 10:36	MR: 11:43	MR: 12:50	LQ: 23:04 Aug. 17	
MS: 20:49	MS: 21:20	MS: 21:54	MS: 22:31	MS: 23:12	NM: 0:31 Aug. 26	

Planet View Info Report for August 1995

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
Mercury							
8/ 8/1995	7:32	21:23	9h56m26s	14°13'24"	11°25'26"	0.926	1.3218
8/15/1995	8:10	21:21	10h42m50s	9°12'33"	17°01'47"	0.855	1.2679
8/22/1995	8:41	21:14	11h23m06s	4°07'13"	21°27'12"	0.783	1.1959
8/29/1995	9:06	21:03	11h58m13s	-0°44'41"	24°41'44"	0.708	1.1108
Venus							
8/ 8/1995	6:13	20:39	8h56m48s	18°23'05"	3°44'01"	0.998	1.7273
8/15/1995	6:30	20:36	9h31m32s	15°57'36"	2°03'23"	0.999	1.7298
8/22/1995	6:48	20:31	10h05m25s	13°10'26"	1°22'26"	1.000	1.7295
8/29/1995	7:05	20:24	10h38m32s	10°05'38"	2°36'37"	0.999	1.7266
Mars							
8/ 8/1995	11:20	22:54	12h39m23s	-4°02'49"	55°37'39"	0.923	1.8982
8/15/1995	11:15	22:36	12h55m21s	-5°49'47"	53°16'21"	0.927	1.9370
8/22/1995	11:10	22:18	13h11m42s	-7°36'29"	50°58'14"	0.931	1.9737
8/29/1995	11:06	22:01	13h28m27s	-9°22'16"	48°43'05"	0.935	2.0083
Jupiter							
8/ 8/1995	15:58	1:26	16h14m53s	-20°38'19"	110°30'27"	0.992	4.8724
8/15/1995	15:31	0:59	16h15m40s	-20°41'46"	103°59'05"	0.991	4.9745
8/22/1995	15:05	0:33	16h17m03s	-20°46'41"	97°35'16"	0.991	5.0796
8/29/1995	14:40	0:07	16h19m02s	-20°52'57"	91°18'36"	0.991	5.1864
Saturn							
8/ 8/1995	22:18	9:52	23h39m48s	-4°38'36"	141°26'04"	0.999	8.8321
8/15/1995	21:50	9:23	23h38m25s	-4°49'02"	148°30'56"	0.999	8.7654
8/22/1995	21:22	8:53	23h36m50s	-5°00'35"	155°39'35"	1.000	8.7108
8/29/1995	20:53	8:23	23h35m04s	-5°12'58"	162°50'51"	1.000	8.6697
Uranus							
8/ 8/1995	19:44	5:08	20h00m07s	-21°09'14"	162°47'55"	1.000	18.7549
8/15/1995	19:16	4:40	19h59m03s	-21°12'15"	155°49'59"	1.000	18.7984
8/22/1995	18:48	4:11	19h58m03s	-21°14'59"	148°51'56"	1.000	18.8552
8/29/1995	18:19	3:42	19h57m09s	-21°17'25"	141°53'58"	1.000	18.9243
Neptune							
8/ 8/1995	19:24	4:51	19h41m26s	-20°50'05"	158°34'28"	1.000	29.2222
8/15/1995	18:56	4:23	19h40m44s	-20°51'55"	151°41'47"	1.000	29.2727
8/22/1995	18:28	3:55	19h40m05s	-20°53'37"	144°48'44"	1.000	29.3358
8/29/1995	18:00	3:26	19h39m31s	-20°55'09"	137°55'21"	1.000	29.4107

Planet/Moon Apsides/Conjunction/Opposition Report for August 1995

8/ 8/1995	Moon @ Perigee	Hour = 10	Distance from Earth: 362868 km
8/10/1995	Venus @ Perihelion		Distance from Sun: 0.72 AU
8/20/1995	Venus @ Superior Conjunction		Hour=20
8/20/1995	Moon @ Apogee	Hour = 8	Distance from Earth: 404771 km

Meteor Showers Report August 1995

Date	Meteor Shower	ZHR	RA	DEC	Illum. Frac.	Longitude
8/ 6/1995	iota-Aquarids	8	22h10m	-15°	0.79	134°
8/12/1995	Perseids	75	3h04m	58°	0.94	140°
8/20/1995	alpha-Cygni	5	21h00m	48°	0.26	148°

Twilight Report for August 1995

	Sun		Astronomical		Nautical		Civil	
Date	Rise	Set	Begin	End	Begin	End	Begin	End
8/ 8/1995	6:32	20:44	4:36	22:41	5:18	21:58	5:57	21:20
8/15/1995	6:40	20:35	4:48	22:27	5:28	21:47	6:05	21:10
8/22/1995	6:47	20:24	4:59	22:13	5:37	21:34	6:13	20:58
8/29/1995	6:55	20:13	5:09	21:58	5:46	21:21	6:21	20:46

SKY & TEL. NEWS BULLETIN

from the editors of SKY & TELESCOPE magazine

NEW CLUES TO MOON'S ORIGIN

New evidence strengthens the theory that our Moon was created during a titanic impact of a Mars-size object with the Earth billions of years ago. Using data gathered last year by the Clementine orbiter, planetary scientist Paul Lucey and two colleagues have mapped the amount of iron present in minerals all over the lunar landscape. The percentage varies from practically zero in the highlands to about 14% in the mare basins. But these values are lower than would be expected if the Moon's composition were the same as the Earth's mantle, so it now seems rather unlikely that the Moon could have formed along with the Earth or was somehow torn from its side. Lucey's team also finds that huge areas on the lunar far side have virtually no iron at all but instead consist of an aluminum-rich silicate rock called anorthosite. Pure anorthosite is rare on the Earth, but it's exactly the kind of mineral expected to form a crust if the whole exterior of the Moon were once a deep sea of molten rock. And such a magma ocean almost surely would have been present if the Moon formed after a giant impact on Earth.

BEST-BET BLACK HOLE

A team of Japanese and European astronomers has detected the strongest evidence yet that black holes exist. Telescopes aboard the Advanced Satellite for Cosmology and Astrophysics (ASCA) have observed an X-ray emission feature due to iron in a Seyfert galaxy situated in the constellation Centaurus. The spectral signature indicates that the emission is coming from a rotating accretion disk, and it also shows signs of relativistic effects. Previous cases for black holes in the nuclei of galaxies have relied on Newtonian mechanics to "weigh" the central object, or on theories that describe how subatomic matter should resist gravitational compression. But the new ASCA results demonstrate directly the expected behavior of matter just outside a black hole's event horizon.

SOLAR "RINGS"

The Ulysses spacecraft has detected periodic waves in the energetic particles emanating from the Sun, an important confirmation that the solar interior is "ringing" like a bell. Oscillations at the Sun's surface were discovered about 20 years ago and gave rise to the discipline of helioseismology. The principal vibration mode has a period of about 5 minutes. But according to an article in the journal NATURE, such effects have not been observed before in the solar wind. According to investigator Louis Lanzerotti, the oscillations are most likely transferred into the solar wind by the magnetic fields that originate deep in the Sun's interior.

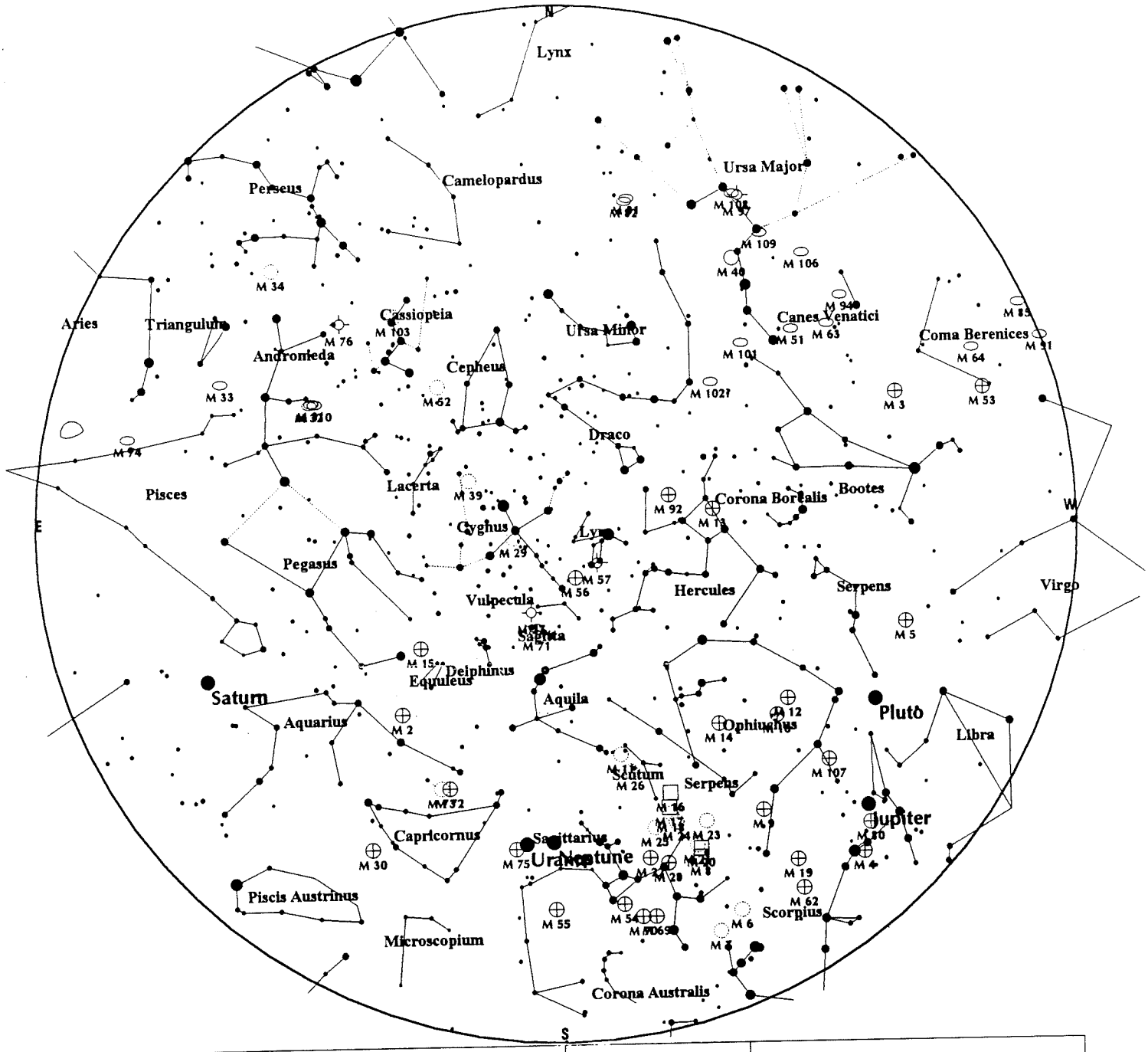
TWO-FACED IAPETUS

Saturn's moon Iapetus has long been considered odd. Even William Herschel realized that the 1,440-kilometer-wide moon is segregated into bright and dark hemispheres, with the dark half facing forward. Why so? According to Bonnie Buratti and Joel Mosher the likely mechanism involves another Saturnian moon, Phoebe. As they explain in the June issue of Icarus, color changes across the moon's bright-dark boundary are gradual, not abrupt as would be more likely from a single event like an eruption or impact. Instead, the researchers say that, over time, material blasted from the very dark surface of Phoebe has migrated inward and slowly accumulated on the leading hemisphere of Iapetus. Buratti and Mosher note that a big geyser, such as those on Io or Triton, could also have spread the material with such a distribution, but there is no evidence for one of these in Voyager images and, besides, it's unlikely that such an enormous fountain would be located smack in the center of the satellite's leading hemisphere.

COMET HALE-BOPP

On the morning of July 23rd, two amateurs discovered a new comet near the globular cluster M70, just south of the Teapot in Sagittarius. Alan Hale in Cloudcroft, NM, and Thomas Bopp near Stanfield, AZ, were both using 16-inch reflectors. They described the comet as a tailless, 11th-magnitude glow moving slowly to the west-northwest. A preliminary orbit, announced three days later, suggests that Comet Hale-Bopp is now well outside Jupiter's orbit, farther than any comet ever discovered by amateurs. The fact that it can be seen so far away suggests it could conceivably become a naked-eye comet should it come close to the Sun a year and a half from now. On the other hand, dynamicist Brian Marsden warns that it could also be an object that will never venture into the inner solar system. Observations within the next two weeks should clarify the issue. Comet Hale-Bopp will probably not brighten much as it crosses the Teapot during August.

AUGUST'S SKIES

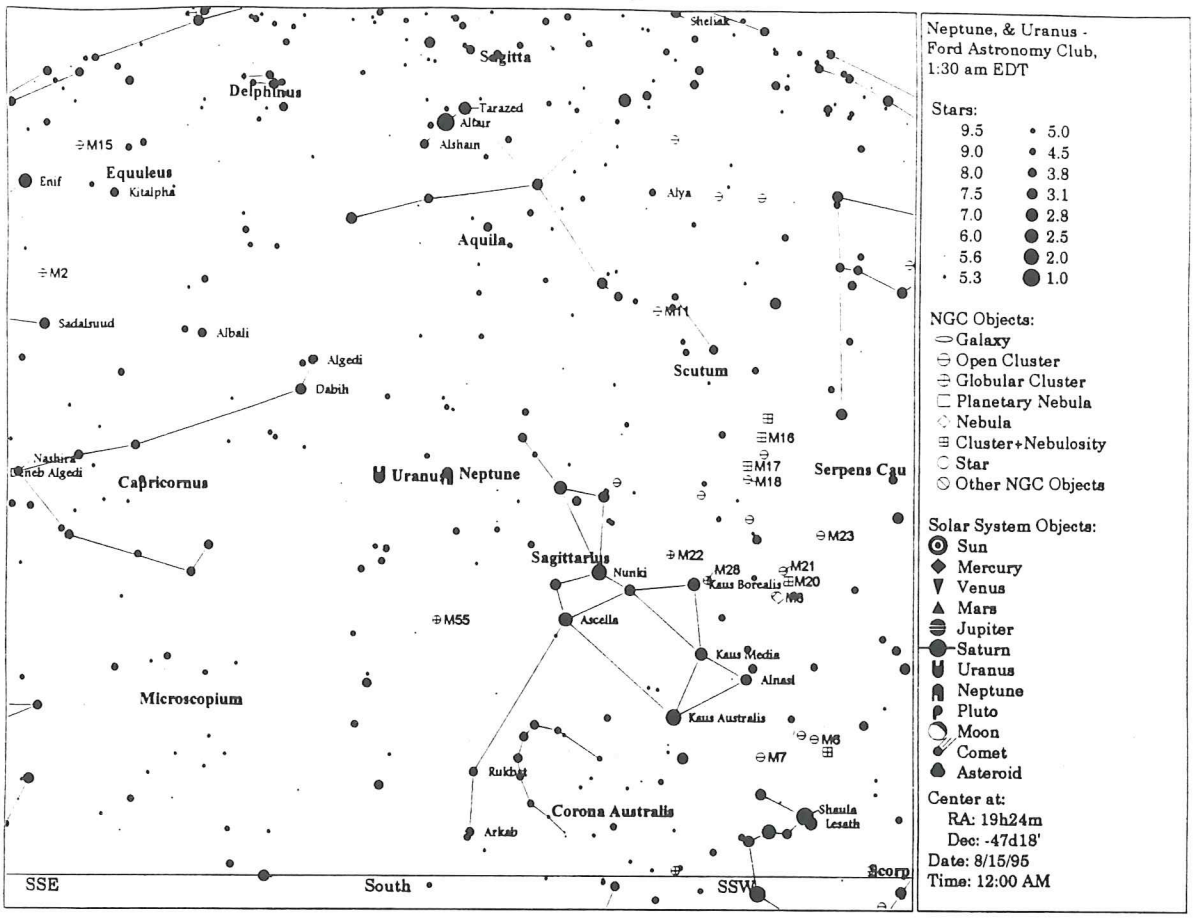


STARS	SOLAR SYSTEM			
● <1 ● 3.5	☿ Mercury	♅ Uranus	⬭ Galaxy	NOTES
● 1.5 ● 4	♀ Venus	♆ Neptune	⊕ Globular Cluster	
● 2 ● 4.5	♂ Mars	♇ Pluto	⋯ Open Cluster	
● 2.5 ● >5	♃ Jupiter	☄ Comet	⌖ Planetary Nebula	
● 3	♄ Saturn	⬡ Asteroid	□ Diffuse Nebula	
			○ Other Object	

Local Time: 23:30:00 15-Aug-1995
Location: 42° 22' 0" N 83° 17' 0" W

UTC: 03:29:59 16-Aug-1995
Centre Az: 180.0° Alt: 90.0° Field: 180.0°

Sidereal Time: 19:33:07
Julian Day: 2449945.6458



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