STAR STUFF

The Ford Amateur Astronomy Club Newsletter

October

Volume 3 Number 10 October 1994

STAR STUFF STUFF

HUBBLE UNCOVERS A HIDDEN QUASAR IN A NEARBY GALAXY

Astronomers using NASA's Hubble Space Telescope have found a new quasar -- not billions of light years away like its known cousins, but a mere 600 million light years, the equivalent of Earth's cosmic backyard.

"I was stunned when we realized we had a quasar; it was a total surprise," said Dr. Anne Kinney of the Space Telescope Science Institute, Baltimore, Md. Until this discovery all known quasars existed in the early universe. "So it is unusual to find one in our own epoch," Dr. Kinney said.

The discovery in galaxy Cygnus A will give astronomers their first opportunity for detailed study of a quasar, an object which looks like a pinpoint of light (as does a star) to a ground-based telescope. A quasar, though, emits hundreds of times more energy than an entire galaxy with more than 100 billion stars.

There is evidence that the quasars -- short for "quasi- stellar radio sources" -- found in the remote galaxies are powered by supermassive black holes that devour dust, gas and stars from the host galaxies, producing enormous amounts of energy in the process. Beyond that, little is known about them, which makes this discovery so important. Dr. Kinney emphasized that this unexpected result implies that all radio galaxies might harbor quasars that are hidden from view. The observations were made by Robert Antonucci and Todd Hurt of the University of California at Santa Barbara, and Kinney. Their results appear in the September 22 issue of Nature.

Though Cygnus A is categorized as an elliptical galaxy, it has an unusual peanut shape due to a dark band of dust encircling the enigmatic nucleus. The Hubble astronomers could only peek into the core by taking advantage of a natural "periscope effect." Dust outside of the nucleus acts like a mirror to reflect the shorter wavelengths, or blue component, of the light toward Earth.

The astronomers used the ultraviolet sensitivity of the Faint Object Spectrograph to look for the spectral signature of extremely hot, supermassive stars hidden in the nucleus. Such stars are theorized as one possible explanation for Cygnus A's powerful optical emissions.

Instead, the resulting ultraviolet spectrum was so unusual that astronomers puzzled over the data for three months before reaching their startling conclusion. After much analysis, they realized it was in part composed of the typical spectrum of a quasar. Such a spectrum possesses broad emission lines that indicate that gas in the nucleus is swirling at high speeds. "One caveat is that the broad emission line could possibly be many narrow emission lines blended together," Kinney said. "We will double check that possibility with more observations." HST's ultraviolet sensitivity allowed this spectrum to be distinguished more easily from the galaxy's starlight.

Kinney emphasized that it is probably more than coincidence to find a quasar embedded in the nearest extremely powerful radio galaxy to Earth. These results suggest that quasars might be common to radio galaxies and might explain their powerful radio emissions, she added. Though this provides an unexpected opportunity for close-up study of the mysterious "engine" behind a quasar, these results add further mystery as to the true nature of the powerhouse.

Previous ground-based radio observations show that there is an elongated object in Cygnus A's core. This is inconsistent with black hole models that predict a compact point source of radiation. Supermassive black holes are a leading candidate for explaining a quasar's prodigious outpouring of energy. The astronomers plan to use the Hubble Space Telescope to study the spectrum of other radio galaxies and look for fingerprints of other quasars.

The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency (ESA).

☆

ASTEROID MOON DISCOVERED BY GALILEO SPACECRAFT IS NAMED submitted by Greg Burnett

The International Astronomical Union (IAU) has approved the name Dactyl for the tiny moon discovered this year in orbit around the asteroid Ida by NASA's Galileo mission.

The IAU also approved names for surface features on another asteroid, Gaspra, which became the first asteroid ever visited by a spacecraft when Galileo flew by it on Oct. 29, 1991.

Dactyl is the first natural satellite of an asteroid ever discovered and photographed. The tiny moon, about one mile (1.5 kilometers) across, appeared in images obtained by the Galileo spacecraft during its flyby of the asteroid on Aug. 28, 1993.

Dactyl was discovered in data analyzed in March 1994 by members of Galileo's imaging and infrared science teams. The project recommended the name to the IAU, which is responsible by international agreement for the formal naming of Solar System bodies. The name is derived from the Dactyli, a group of mythological beings who lived on Mount Ida, where the infant Zeus was hidden -- and raised, in some accounts -- by the nymph Ida and protected by the Dactyli. Other mythological accounts say that the Dactyli were Ida's children by Zeus.

Three regions on Gaspra were named for scientists associated with the asteroid. Neujmin Regio was named for G. Neujmin, the Ukrainian astronomer who discovered the asteroid in 1916. Yeates Regio honors the late Dr. Clayne M. Yeates, who was Galileo Science Manager and Science and Mission Design Manager until his death in 1991. Dunne Regio was named in honor of the late Dr. James A. Dunne, who served as Galileo Science and Mission Design Manager until late 1992.

"Clayne Yeates and Jim Dunne both contributed immensely to the Galileo project and to the Gaspra encounter in particular," said Galileo Project Manager William J. O'Neil at NASA's Jet Propulsion Laboratory (JPL), Pasadena, Calif.

The surfaces of Gaspra and Ida are covered with impact craters like those on Earth's Moon. Gaspra was named by Neujmin for a resort on the Crimean peninsula. Consequently, many of the asteroid's craters have been named for resorts and spas worldwide.

The Galileo spacecraft is on its way to Jupiter, where it will send a probe into the atmosphere on Dec. 7, 1995, and then go into orbit for a two-year scientific tour of the planet, its satellites and its magnetosphere. JPL manages the Galileo project for NASA's Office of Space Science, Washington, D.C.

☆

PRESIDENT'S CORNER

"What practical significance does this have for the 'man on the street'?" This rhetorical (?!) question is often posed (usually by someone associated with the media) when the topic under discussion is something outside the mainstream of our daily lives, like the superconducting super-collider, the space program, or astronomy. Of course, those closely associated with the subject activity are rightfully irritated by the inquirer's superficiality and lack of vision. But, how would we, as amateur astronomers, answer this question. Would we slough it off with, "Well, it's just a hobby...." as if that means it doesn't have to have any significance? Perhaps for each of us the significance takes a slightly different form, but have you thought about how you would explain your love of the night sky and the special feeling you get from exploring the universe, to someone else? Someone not "tuned in" to amateur astronomy? Food for thought.
Hope to see you soon!

Greg Burnett

STAR STUFF

Monthly Publication of the
Ford Amateur Astronomy Club
Star Stuff Newsletter
P. O. Box 7527
Dearborn, Michigan 48121-7527

1994 CLUB OFFICERS

President:	Greg Burnett	24-81941
Vice President:	Brian Gossiaux	39-03935
Secretary:	John St. Peter	535-2755
Treasurer:	Al Czajkowski	84-57886

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 building 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. Observing at this location is usually held on any clear weekend and holiday evenings or as specified in the observing hotline phone message.

OBSERVING HOTLINE NUMBER (313) 390-5456

On Friday and Saturday nights, or nights before holidays, you can call the hotline numbers 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 if 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 Recreational Area, and discounts at selected local area astronomical equipment retailers.

NEWSLETTER STAFF

Editor:	Brian Gossiaux	39-03935
Contributing Editors:	Patti Smith Greg Burnett	Doug Bock

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 any other Astronomy Clubs wishing to participate in a newsletter exchange.

NASA NAMES SCIENCE TEAM FOR ASTEROID RENDEZVOUS MISSION

NASA has selected the science team for the first spacecraft designed to rendezvous with an asteroid.

The Near Earth Asteroid Rendezvous (NEAR) mission promises to answer fundamental questions about the nature of near-Earth objects such as asteroids and comets. These objects are believed to consist of debris from the earliest days of planetary formation 4.5 billion years ago, so better knowledge of them should provide clues about the origin and evolution of the Solar System.

Scheduled for launch in February 1996 aboard a Delta 2 rocket, the NEAR spacecraft should arrive in orbit around asteroid 433 Eros in early January 1999. It will then survey the rocky body for a minimum of one year, at altitudes as close as 15 miles (24 kilometers). Eros is one of the largest and best-observed asteroids whose orbits cross Earth's path. These asteroids are closely related to the more numerous "Main Belt" asteroids that orbit the Sun in a vast doughnut-shaped ring between Mars and Jupiter.

The goal of the NEAR project is to carry out a mission with high scientific return and wide participation at relatively modest cost. It will seek the first comprehensive measurements of an asteroid's mass, structure, geology, mineral composition, and gravity and magnetic fields. Science data and related products will be archived in near real-time in NASA's Planetary Data System (PDS), with access for the general science community, the public and educators via the Internet.

The NEAR Science Payload consists of six instruments: a multispectral imager system; a near-infrared spectrograph; an X-ray/gamma-ray spectrometer; a magnetometer; a laser altimeter; and the spacecraft's radio, which is also used for gravity measurements.
The members of the NEAR science team are:

Multispectral Imager/Near-Infrared Spectrograph
Joseph Veverka, Cornell University (Team Leader), Ithaca, N.Y. James F. Bell III, NASA Ames Research Center, Mountain View, Calif. Clark R. Chapman, Planetary Science Institute, Tucson, Ariz. Michael C. Malin, Malin Space Science Systems, Inc., San Diego, Calif. Lucy-Ann A. McFadden, University of Maryland, College Park, Md. Mark S. Robinson, U.S. Geological Survey, Flagstaff, Ariz. Peter C. Thomas, Cornell University

X-ray/Gamma-Ray Spectrometer
Jacob I. Trombka, NASA Goddard Space Flight Center (Team Leader), Greenbelt
William V. Boynton, University of Arizona, Tucson
Johannes Bruckner, Max Planck Institut fur Chemie, Mainz, Germany70 Steven W. Squyres, Cornell University

Magnetometer
Mario H. Acuna, Goddard Space Flight Center (Team Leader) Christopher T. Russell, University of California, Los Angeles
Light Imaging Detector and Ranger (LIDAR)
Maria T. Zuber, Goddard Space Flight Center (Team Leader)

Radio Science
Donald K. Yeomans, NASA Jet Propulsion Laboratory (Team Leader), Pasadena Jean-Pierre Barriot, Centre National D'Etudes Spatiales, Toulouse, France Alexander S. Konopoliv, Jet Propulsion Laboratory

The NEAR Project Science Group will be co-chaired by Dr. Jurgen Rahe, the NASA Headquarters Program Scientist, and Dr. Andrew F. Cheng, NEAR Project Scientist at the Johns Hopkins University Applied Physics Laboratory (APL) in Laurel, Md. APL will build and operate NEAR, making it the first NASA planetary mission to be conducted by a non-NASA space center.

The facility-class Instrument Scientists at APL will be the main interface between the science team leaders and project engineers.
The Instrument Scientists are:

Scott L. Murchie (Multispectral Imager/Near-Infrared Spectrograph) Ralph L. McNutt (X-ray/Gamma-Ray Spectrometer)
Larry J. Zanetti (Magnetometer) - Andrew F. Cheng (LIDAR)

The NEAR project began in late 1993. NEAR will be the first launch in NASA's Discovery program, an initiative based on small planetary science missions with short development cycles and stringent cost caps. It requires missions to proceed from development to flight in less than three years, with total spacecraft and instrument development costs limited to no more than $150 million (in FY 1992 dollars) and an acceptance of a greater level of technical risk than on typical NASA missions. The Solar System Exploration Division of the Office of Space Science at NASA Headquarters has program management responsibility for the NEAR mission.

★

DISCOVERY GAUGES SIZE AND AGE OF THE UNIVERSE
submitted by Greg Burnett

With the discovery of Cepheid variable stars in the distant Virgo Cluster of galaxies, astronomers using the Canada-France-Hawaii Telescope have settled a long-standing debate as to the distance scale of the universe, a debate which has been raging for decades. The results establish that the Virgo Cluster is at a distance of 50 million Light Years from Earth and that remote objects in the universe are at as little as half the distance previously believed. Virtually all astronomers agree that the Cepheids represent the key to ending the controversy over the distance of remote objects. A variety of other methods have yielded estimated distances to individual galaxies which vary by as much as a factor of two. The Cepheid results strongly favor the closer distances and appear to have settled the controversy. The work is described in the September 29 issue of Nature and is the result of an international effort by Dr. Michael J. Pierce of Indiana University (Bloomington, IN; and formerly of Kitt Peak National Observatory, Tucson, AZ); Dr. Douglas L. Welch of McMaster University (Hamilton, Ontario); Dr. Robert D. McClure, Dr. Sidney van den Bergh, and Dr. Peter B. Stetson of the National Research Council, Herzberg Institute of Astrophysics, Dominion Astrophysical Observatory (Victoria, British Columbia); and Dr. Rene Racine of the Universite de Montreal (Montreal, Quebec). This is the first time that these stars have been found at a sufficiently large distance to establish directly the size of the universe.

The discovery is important because the Virgo Cluster is the nearest large concentration of the many different types of galaxies we see throughout the rest of the universe. "For some time astronomers have compared the properties of galaxies in the Virgo Cluster with those found in even more distant clusters of galaxies in order to determine how much further away these clusters are than Virgo", explained Dr. Pierce. "Since we all agree on whether a particular cluster may be, say, three or five times the distance of Virgo the debate has been focused upon the distance to the Virgo Cluster itself. We find the distance of the Virgo cluster to be 50 million Light Years with an uncertainty of only about 8%. Now that we have established the distance to Virgo accurately, the distance to any other cluster and size of the universe follows. We can now establish other properties of the universe, such as its rate of expansion, and place limits on its age."

The newly revised distance to the Virgo Cluster implies that the universe is currently expanding at a rate of 27 kilometers per second for each million Light Years in distance. The current rate of expansion, also called the Hubble Constant, is a key parameter in defining the evolution of the universe over time. One of the more curious results of these measurements is an apparent paradox in the age of the universe. "The age of the universe ends up being between 7 and 11 billion years, depending on the details of the model for its expansion. The best age estimate for the oldest stars is thought to be about 16 billion years, so we have a problem", explains Dr. Pierce. "Either we are missing something in our understanding of the evolution and age of the oldest stars, or we are missing something in our understanding of how the universe has been evolving since the Big Bang. It's going to be very interesting in the next few years while we struggle to unravel this mystery."

"One of the possible interpretations is that the equations developed by Einstein which describe the 'Big Bang' may require modification", explained Dr. van den Bergh. "The modification would be to insert a 'Cosmological Constant' which Einstein had originally considered and then left out of the final form of General Relativity. It is, perhaps, slightly ironic that Einstein once said that introducing the 'Cosmological Constant' had been the greatest blunder of his scientific career since we may have to include it after all."

Cepheids are stars which pulsate in a regular fashion and whose true brightnesses can be accurately determined once their pulsation characteristics are established. Cepheids can be found relatively nearby in our own galaxy, the Milky Way. They have a long history of use in estimating distances and are generally accepted as the most reliable tool used by astronomers for this purpose. "The true brightness of a Cepheid variable star is directly related to the length of time it takes to go through its pulsation, or brightness cycle", explained Dr. Welch. "If we find a Cepheid in a distant galaxy we can measure its brightness over time. Once we determine its true brightness, from its cyclical variations, we can estimate its distance."

The detection of the Cepheid variables in the Virgo Cluster was made possible due to the excellent images produced by a special instrument called the High Resolution Camera (HRCam) on the Canada-France-Hawaii Telescope on Mauna Kea, Hawaii. The camera was designed and constructed by a team lead by Dr. McClure and Dr. Racine. "This camera produces images which are about three times sharper than most

other ground-based telescopes," Dr. McClure explains. "It accomplishes this by correcting for some of the image distortion due to turbulence in the atmosphere above the telescope. By monitoring the position of the image of a nearby star which has been focused onto a light-sensitive detector, a computer can direct a fast-moving mirror inside HRCam to compensate for the 'shimmering' of the atmosphere. Pictures of galaxies in the Virgo Cluster obtained with conventional cameras just aren't sharp enough to show the Cepheids."

★

JPL, Russian Officials Discuss Mars & Pluto Missions

The third in a series of meetings between representatives from NASA, the Russian Space Agency and Russian Academy of Sciences in preparation for three joint missions occurred at JPL in late August, with each team making significant progress.

The first two meetings, at JPL, and in Hamburg, Germany, helped the teams work out engineering details of the interface between U.S.and Russian parts. With this latest meeting, each of the three missions--Mars Together, Fire (the sun) and Ice (Pluto)--"expanded and solidified the positive relationships that had been already established," according to Dr. Roger Bourke, Mars Together manager.

Under the Mars Together concept, the two nations would collaborate on a series of missions to the Red Planet, beginning in 1998 with two launches, one American and one Russian, with payloads of American and Russian spacecraft and instruments. For Mars Together, this third meeting saw the United States and Russia confirm "the baseline configuration of a Russian autonomous propulsion module, a Russian descent module (containing a balloon and rover) and an American orbiter launched by a Russian Proton rocket," Bourke said.

Instrument exchange was discussed in depth, with the Russians offering 10 possibilities for an instrument on the U.S. orbiter. The Americans discussed possible instruments on the Russian Marsokhod rover and involvement in its operation.

The team will focus on hardware flow of the combined Russian/American vehicle at an October meeting in Moscow. No technical barriers preclude a '98 launch to Mars, Bourke explained, yet he conceded that "Some outstanding issues remain, including the Russian's financial ability to fund this joint mission."

The financial question must be resolved within the next six to nine months, at which time the two sides must commit to an approved mission, he noted. The Fire mission, according to Fire manager Jim Randolph, will team two spacecraft, one built by Russia and one by JPL, both to be launched on a single Russian Proton launch vehicle in September 2001 to study the sun.

"The Russians will build a new generation of lightweight spacecraft, no more than 350 kilograms (770 pounds), which is significantly lighter than previous Soviet spacecraft," Randolph said. The Russians are excited about the fact this will be the first Russian deep space spacecraft, he added.

The proposed mission has the U.S. craft flying "to a 4 solar radii perihelion, and the Russian spacecraft flying to a 10 solar radii perihelion," he explained. U.S. instruments, said Randolph, will be mainly plasma sensors, while the Russians' will be mainly optical instruments.

The Ice mission, according to Pluto Preproject Scientist Dr. Richard Terrile, builds on JPL's existing Pluto Fast Flyby preproject. Under the collaborative U.S.-Russian approach, JPL's twin Pluto spacecraft would be launched in 2001 on a Proton launch vehicle and would carry two small Russian-built atmospheric probes, called drop Zonds. He noted that this approach has the advantages of "clean interfaces that are easily defined and easy to work with." Science objectives and goals were also determined at this third meeting; payloads of both spacecraft are still being discussed. All three reports will be delivered to the Joint Working Group on Solar System Exploration in Moscow on Oct. 7, in preparation for meetings between Vice President Al Gore and Russian Prime Minister Viktor Chernomyrdin to be held in December.

★

HUBBLE OBSERVATIONS SHED NEW LIGHT ON JUPITER COLLISION

Was it a comet or an asteroid?
Scientists are debating that question as they continue to pore over Hubble Space Telescope imaging and spectroscopic data gleaned in the wake of the spectacular July bombardment of Jupiter by comet P/Shoemaker-Levy 9. Their initial findings, combined with results from other space-borne and ground-based telescopes, shed new light on Jupiter's atmospheric winds, its immense magnetic field, the mysterious dark debris from the impacts, and the composition of the doomed comet itself. These early results are being presented at a press conference today at NASA Headquarters, Washington D.C., by astronomers John Clarke, University of Michigan, Ann Arbor; Heidi Hammel, Massachusetts Institute of Technology, Cambridge; and Harold Weaver and Melissa McGrath, Space Telescope Science Institute, Baltimore.

THE LAST DAYS OF THE COMET
Before the comet impact, there was a great deal of speculation and prediction about whether the 21 nuclei would survive before reaching Jupiter, or were so fragile that gravitational forces would pull them apart into thousands of smaller fragments. Hubble helped solve this question by watching the nuclei until about 10 hours before impact. HST's high resolution images show that the nuclei, the largest of which were probably a few kilometers across, did not break up catastrophically before plunging into Jupiter's atmosphere. This reinforces the notion that the atmospheric explosions were produced by solid, massive impacting bodies. HST's resolution also showed that the nuclei were releasing dust all along the path toward Jupiter, as would be expected from a comet. This was evident in the persistence of spherical clouds of dust surrounding each nucleus throughout most of the comet's journey. About a week before impact, these dust clouds were stretched out along the path of the comet's motion by Jupiter's increasingly strong gravity.

WAS P/SHOEMAKER-LEVY 9 A COMET OR AN ASTEROID?
At present, observations seem to slightly favor a cometary origin, though an asteroidal origin cannot yet be ruled out. The answer isn't easy because comets and asteroids have so much in common: they are small bodies; they are primordial, having formed 4.6 billion years ago along with the planets and their satellites; either type of object can be expected to be found in Jupiter's vicinity. The key difference is that comets are largely icy while the asteroids are virtually devoid of ice because they formed too close to the Sun. The attached table summarizes the observational results that shed light on this question.

WHAT IS THAT DARK STUFF MADE OF?
The HST Faint Object Spectrograph (FOS) detected many gaseous absorptions associated with the impact sites and followed their evolution over the next month. Most surprising were the strong signatures from sulfur-bearing compounds like diatomic sulfur (S2), carbon disulfide (CS2), and hydrogen sulfide (H2S). Ammonia (NH3) absorption also was detected. The S2 absorptions seemed to fade on timescales of a few days, while the NH3 absorptions at first got stronger with time, and finally started fading after about one month. During observations near the limb of Jupiter, the FOS detected emissions from silicon, magnesium and iron that could only have originated from the impacting bodies, since Jupiter itself normally does not have detectable amounts of these elements.

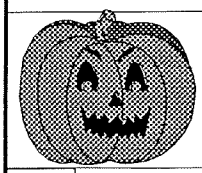
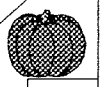
SWEPT ACROSS JUPITER
Observations made with HST's Wide Field Planetary Camera-2, a week and a month after impact, have been used to make global maps of Jupiter for tracking changes in the dark debris caught up in the high-speed winds at Jupiter's cloudtops. This debris is a natural tracer of wind patterns and allows astronomers a better understanding of the physics of the Jovian atmosphere. The high speed easterly and westerly jets have turned the dark "blobs" originally at the impact sites into striking "curly-cue" features. Although individual impact sites were still visible a month later despite the shearing, the fading of Jupiter's scars has been substantial and it now appears that Jupiter will not suffer any permanent changes from the explosions.

Hubble's ultraviolet observations show the motion of very fine impact debris particles now suspended high in Jupiter's atmosphere. The debris eventually will diffuse down to lower altitudes. This provides the first information ever obtained about Jupiter's high altitude wind patterns. Hubble gives astronomers a "three dimensional" perspective showing the wind patterns at high altitudes and how they differ from those at the visible cloudtop level. At lower altitudes, the impact debris follows east-west winds driven by sunlight and Jupiter's own internal heat. By contrast, winds in the high Jovian stratosphere move primarily from the poles toward the equator because they are driven mainly by auroral heating from high energy particles.

PIERCING JUPITER'S MAGNETIC FIELD
About four days before impact, at a distance of 2.3 million miles from Jupiter, nucleus "G" of comet P/Shoemaker-Levy 9 apparently penetrated Jupiter's powerful magnetic field, the magnetosphere. (Jupiter's magnetosphere is so vast, if visible from Earth, it would be about the size of the full Moon.) Hubble's Faint Object Spectrograph (FOS) recorded dramatic changes at the magnetosphere crossing that provided a rare opportunity to gather more clues on the comet's true composition. During a two minute period on July 14, HST detected strong emissions from ionized magnesium (Mg II), an important component of both comet dust and asteroids. However if the nuclei were ice-laden -- as expected of a comet nucleus -- astronomers expected to detect the hydroxyl radical (OH). Hubble did not see OH, casting some doubt on the cometary nature of comet P/Shoemaker-Levy 9. Eighteen minutes after comet P/Shoemaker- Levy 9 displayed the flare-up in Mg II emissions, there was also a dramatic change in the light reflected from the dust particles in the comet

(continued on page 8)

October 1994

SUN	MON	TUE	WED	THUR	FRI	SAT
						1
2	3	4 NEW MOON	5	6 Moon at perigee	7 Venus 7° S. of Moon Jupiter 0.7° N. of Moon	8
9	10	11 FIRST QUARTER MOON	12	13	14	15 Saturn 7° S. of Moon
16	17	18	19 FULL MOON	20	21 Orionid meteors Moon at apogee Mercury inferior conjunction	22 Orionid meteors
23 30	24  31	25	26	27 The Ford Amateur Astronomy Club meeting. LAST QUARTER MOON	28	29 

NEXT MONTH **The Ford Amateur Astronomy Club general meeting is December 8th!**

MEETING ANNOUNCEMENT -- October 27, 1994

The Ford Amateur Astronomy Club holds regular general meetings on the fourth Thursday of each month, except in November and December when that schedule collides with holidays. Our next meeting will be Thursday, October 27, at 5:00 p.m.

The program for the meeting has not yet been determined.

The Ford Amateur Astronomy Club 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 p.m. 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 I will post direction signs only between the lower northeast and lower east doors and the meeting room.
Hope to see you at the meeting!

Greg Burnett

OUR GANG

Submitted to the LINKAGE EDITOR newsletter of the Ford Credit Systems Office.....

So What's Up?

Observations and ruminations of an astronomical nature provided by the Ford Amateur Astronomy Club.

Harvest Moon

"Shine on, shine on harvest moon, up in the sky...." We've all seen the beautiful orange orb of the "harvest moon" looming over the eastern horizon on those crisp fall evenings. Traditionally, the harvest moon provided some additional light for farmers bringing in the fall harvest. Formally, the harvest moon is the full moon that occurs closest to the autumnal equinox, which marks the end of summer (usually September 23rd).

On average, the Moon rises about fifty minutes later each night (called the "retardation") as it moves from west to east in its orbit around the Earth. The path of this motion corresponds closely to the "ecliptic," the circle on the sky defined by the plane of the Earth's orbit around the Sun. In the Fall, the ecliptic intersects the eastern horizon at a low angle, so even though the moon moves along it by the same amount each night, the time of moonrise is retarded less than average. The result is greater than average moonlight for several evenings before and after the harvest moon. This year's harvest moon occurs on September 19.

The following full moon, in October (usually), is called the "hunter's moon" and behaves in a similar manner, traditionally providing extra light for the fall hunting season. This year it's October 19.

Greg Burnett

☆

From Doug's Declination

NCO Remote Observing Commentary
October 4, 1994
By Doug Bock

Hello again fellow observers. This last month was filled with many clear nights for observing. The Island Star Party was a great success. I had 3 telescopes setup and had people there all night. I think Greg estimated about 400 people showed up for the evening festivities. I brought out the 12.5 inch f/6 scope from my observatory on a dobson mount, an 8 inch f/7 Newtonian, and a C-8 SC. The C-8 was setup on Saturn for most of the night and all people had to do was go over and look into the eyepiece. The two newtonians were used to look at deep-sky objects such as M13, M27, M57. The crowd seem to enjoy all the sights.

Since the controller for the 12 inch is not working now, I resurrected the Dobson mount I built for it about 8 years ago. It works just fine. Now I can take it anywhere that my truck can go.

The August campout was a bust. We were flooded out of our tent the first night and went home the next day. Maybe next year. This last weekend was the northern trip to the property west of Cadillac. I left home about 3:15 Thursday afternoon, and arrived there about 6:30. Jeff Bondono from the Warren Club was already there. The sun was setting so I put the trailer up quickly. Unfortunately, I had not notice the yellow-jackets in the area when I started and got stung a few times. After that we waited for twilight to end. The Milky Way popped out about 30 minutes before twilight was over and over the next half hour increased contrast in the sky just brought a spectacular view from horizon to horizon. Ah, northern skies. The night was on in earnest now. Jeff had his 14" setup, and was starting through his list he had been setting up earlier in the day. I had my 12.5" on the dob mount. I started with some old favorites, just to get warmed up, and also to see how good they would look in these skies. Impressive, was all I could think of. Hercules beckoned, so I just had to look at M13, with the 13mm Nagler. It filled the field, and I could resolve stars into the core easily. I then checked out m81 and m82 low on the NW horizon. These were easy to see in the finder and excellent in the main scope. Even at 15 degrees off of the horizon. I rambled through several more Messier objects, then turned my scope to some objects that were a little more difficult. Stephans Quintet. I found NGC 7331 which is near there but was unable to see Stephans in my 12. I asked Jeff to put his 14" on it. That did it just fine. We fought with dew for most of the night. I called it quits about 1:00 am, but Jeff stayed up until about 3:30 when some clouds started rolling in.

Friday brought clouds during the day. Glen showed up, and so did Roy. My family also came up on Friday. That night it rained until about dawn the next morning. Glen got soaked in his tent, but Roy did not. The sun broke out about noon and the sky cleared off. The weather forecast said clear and cold around 30 degrees for the night. The afternoon was crystal clear and drier than Thursday. Glen decided to go home, since he didn't get much sleep and everything he owned was wet. Meanwhile, my brother was staying at a cabin about 20 miles north of us and came down to visit during the afternoon. Since it was to be cold that evening, my wife and the kids went back to their cabin for the night. After sunset the sky was even better than Thursday, with lower humidity. Roy is fairly new to the hobby, so we spent time looking at things that he wanted to see. He was overwhelmed with the quality of the sky conditions and how much detail and contrast one could see in each object we looked at. Jeff kept cranking away on galaxies in areas of the sky that were difficult to see in the metro Detroit skies. So he was having a grand time looking at 13 to 15 mag. galaxies. We noticed that there was increased meteor activity. We saw fairly bright meteors all night. Around 1:00 I started looking for a 12.6 mag. planetary nebula that was listed at 8X6 arcseconds in size. This is in the constellation of Lacerta. After about 1 hour we came to the conclusion that the object was nearly stellar, with very little size to it at all. If there was any extension to it, it must be about 15th mag. on the fringe. I had the field of view in about 10-15 minutes but spent the rest of the time deciding which star was the actual object. After checking it out in Jeff's 14 inch at high power, (250-300x) the object I suspected was it, did show a slight size to it compared to the surrounding stars. So the journey was definitely the best part of finding this object. The object itself was overwhelmingly unimpressive.

The skies were excellent all night, as the milky way went on its endless journey across the sky. Thirteen magnitude galaxies were a snap to find. With frosty scopes and chilled bones, we turned in about 5:30 am for a few hours of sleep Sunday morning. We woke to dark blue skies and a warm sun. That afternoon everyone packed it in for the journey home. I was going to stay another night, since it would be clear again Sunday night, but the human condition said go home and sleep Monday away. So I packed it in and left about 3:30 Sunday afternoon. I arrived at home about 7:00 pm and almost set the scope up in the backyard. But I knew that the sky conditions at home would be disappointing after the fresh memory of the previous night were still intact in my mind. It was a great weekend. We will have to do this again soon. Clear skies.

☆

ULYSSES MISSION STATUS

The Ulysses spacecraft, the first probe to fly over the sun's south pole, is providing scientists with valuable new data about the forces at work in this region of space after a 2-billion-kilometer (1.2-billion-mile) journey. Scientists reported preliminary results of Ulysses's travels at a science conference held in mid-September at the European Space and Technology Center in Noordwijk, The Netherlands. The spacecraft reached its most extreme latitude of 80.2 degrees south of the sun's equator at that time, and is now looping back around the sun toward the equator. Ulysses will cross the sun's equator in February 1995 and begin its pass over the north pole of the sun in June 1995.

Ulysses has discovered that the solar wind emanating from the southern pole flows at nearly double the rate -- 800 kilometers per second, or about 2 million miles per hour -- that it does at lower latitudes in the equatorial region. The composition of the solar wind also appears to differ in the polar regions, and the sun's magnetic field seems to be surprisingly uniform. Continued measurements will yield more information about other solar phenomena as well, such as the mysterious 11-year cycles of solar activity which produce sunspots that are visible from Earth and indicate very hot regions in the sun's corona, or outer atmosphere.

All spacecraft operations and science experiments continue to go well. Ground controllers are carrying out routine data-gathering activities and experiment adjustments as needed. Today Ulysses is about 79 degrees south of the sun's equator, traveling at a heliocentric velocity of about 83,000 kilometers per hour (52,500 miles per hour) with respect to the sun.

VOYAGER MISSION STATUS

Both Voyager spacecraft are in good health and collecting ultraviolet data and studying fields, particles and waves in the outer solar system as they search for the heliopause -- the end of the sun's influence in space -- and the associated termination shock.

Voyager 1 is 8.5 billion kilometers (5.3 billion miles) from the sun, traveling at a speed of 17.5 kilometers per second (39,146 miles per hour).

Voyager 2 is 6.6 billion kilometers (4 billion miles) from the sun, traveling art a speed of 16.2 kilometers per second (36,238 miles per hour).

ASTRONOMY WORKSHOP

by Greg Burnett

PROFS=GBURNETT
InterNet
USFMC6SH@IBMMAIL.COM

Submissions to ASTRONOMY WORKSHOP were pretty thin again this month, so I have included another selection from "Purchasing Amateur Telescopes FAQ" by Ronnie B. Kon (ronnie@cisco.com "FAQ" means Frequently Asked Questions). Thanks to Paul Mrozek for originally providing this material to me.

[NOTE: The opinions expressed here are those of the author(s) and, as with many things, are issue upon which reasonable people can disagree. We invite your opinions. -G.B.]

What Company Makes the Best Telescopes?

Hard to say, actually. The two biggest sellers are Celestron and Meade, both of which turn out good quality optics at fairly affordable prices (Celestron's optics have a reputation for being better than Meade's *[You wouldn't know it by looking thru Brian's scope! - G.B.J*). Both do, however, occasionally turn out clunkers, which they will repair for free (as long as you are the original buyer).

Televue has a very good reputation, at a somewhat higher price. Questar has an excellent reputation, at an astronomical price.

Coulter makes inexpensive Dobsonians, with acceptable optics. They offer the most aperture for the money, with several drawbacks. First, they are big. Think long and hard about how you are going to transport it before deciding on the 10 inch or bigger. Second, they are basically deep-sky telescopes. All the Odyssey Dobsonians are short focal-ratio, which means they're picky about alignment errors. They all also have more than a trace of coma near the edge of the field (minor to unimportant nuisance for clusters, nebulae, and galaxies; a more serious one for planets and other small targets). Hence, they're not as suited for high power planetary work as your basic, medium-sized refractor. The telescope is very basic; in particular, no finder scope and the focuser is a bit on the rudimentary side--a simple friction tube you pull in and out of the telescope's side. Third, they, like all Dobsonians, are altazimuth mounts: very stable but unsuited for astrophotography. Also, you usually have to order directly from Coulter and they're back ordered for six months or more on most of their telescopes. You can look for a dealer who could deliver quicker, for a bit more money (like $100). *[NOTE: Most of the above applies also to the new lines of Dobs from Orion and Meade, although I believe these come with helical focusers. Check the pages of ASTRONOMY and SKY & TELESCOPE for additional manufacturers and dealers. -G.B.]*

[FINAL NOTE: Of course, we all know what company REALLY makes the best telescopes!! - G.B.]

Left over questions.....

Q31. What is meant by an Astrometric night and a Photometric night, are they the same? What are the differences and what type of astronomy are they related to? *(John Paul will be disappointed if SOMEONE doesn't take a stab at this question!)*

Clear skies.

☆

MEETING MINUTES for September 22, 1994

The meeting was called to order at 5:00pm by President Greg Burnett. There were 28 members present.

President's Report: An announcement that the election of club officers is coming in January. Any members interested in running should submit their name and position sought. A list of tasks necessary for the operation of the club was distributed. The Island Lake Star Party was a great success with between 350 and 400 people attending. Thought should be given to more organized lectures and demonstrations for next years party. Information on fundraising for FERA and the club was passed around. ILSP tee shirts can still be printed if desired.

Telescope Making SIG: A sign-up sheet was passed around for those interested in building their own scope. For more information contact Chuck Boren, the SIG leader.

Misc: Barry Craig informed us that at an upcoming DAS meeting they will have a demonstration of the Cookbook CCD camera. All are invited. Information was passed around on Comet p/Machholz 2, 1995 IMO Meteor shower calendar, and the Florida Winter Star Party.

Upcoming Events:
Detroit Astronomical Soc. Software Fair, Southfield Civic Center, 11/18.

Main Presentation: Time, Its measurement and meaning, by Greg Burnett.

☆

From the Treasurer:

I just received an order form from Kalmbach Publishing listing everything we can order from them with the appropriate discounts. Also available are calendars for 1995. If we order between 5 & 10, the price each is $5.48, if we get more than ten they are 4.92 each. Give me a call if you want one. I would like to order them by <date 2 weeks after newsletter mailing>. Call me at 84-57886. Leave a message on my voice mail if I don't answer the phone

Allen J Czajkowski

STATISTICALLY SPEAKING....

Dearborn, MI
Latitude: 42°22'00" N Longitude: 83°17'00" W
Local Time = UT - 4.00 hours(EDT) Elevation: 180 meters

Times are in 24 hour format.
Abbreviations used in reports:

FQ	First Quarter Moon	SR	Sunrise
FM	Full Moon	SS	Sunset
LQ	Last Quarter Moon	MR	Moon Rise
NM	New Moon	MS	Moon Set
UT	Universal Time		

October 1994

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 SR: 7:30 SS: 19:15 MR: 3:25 MS: 17:03
2 SR: 7:31 SS: 19:13 MR: 4:33 MS: 17:35	3 SR: 7:32 SS: 19:11 MR: 5:43 MS: 18:08	4 SR: 7:33 SS: 19:10 MR: 6:55 MS: 18:42 NM: 23:55	5 SR: 7:34 SS: 19:08 MR: 8:09 MS: 19:19	6 SR: 7:36 SS: 19:06 MR: 9:24 MS: 20:00	7 SR: 7:37 SS: 19:05 MR: 10:38 MS: 20:47	8 SR: 7:38 SS: 19:03 MR: 11:48 MS: 21:40
9 SR: 7:39 SS: 19:01 MR: 12:52 MS: 22:38	10 SR: 7:40 SS: 19:00 MR: 13:48 MS: 23:41	11 SR: 7:41 SS: 18:58 MR: 14:36 MS: None FQ: 15:19	12 SR: 7:42 SS: 18:56 MR: 15:17 MS: 0:46	13 SR: 7:44 SS: 18:55 MR: 15:52 MS: 1:51	14 SR: 7:45 SS: 18:53 MR: 16:23 MS: 2:55	15 SR: 7:46 SS: 18:51 MR: 16:52 MS: 3:58
16 SR: 7:47 SS: 18:50 MR: 17:20 MS: 4:59	17 SR: 7:48 SS: 18:48 MR: 17:48 MS: 5:59	18 SR: 7:49 SS: 18:47 MR: 18:16 MS: 6:59 FM: 8:19	19 SR: 7:51 SS: 18:45 MR: 18:46 MS: 7:58	20 SR: 7:52 SS: 18:44 MR: 19:20 MS: 8:56	21 SR: 7:53 SS: 18:42 MR: 19:56 MS: 9:52	22 SR: 7:54 SS: 18:41 MR: 20:37 MS: 10:47
23 SR: 7:55 SS: 18:39 MR: 21:23 MS: 11:38	24 SR: 7:57 SS: 18:38 MR: 22:14 MS: 12:26	25 SR: 7:58 SS: 18:36 MR: 23:09 MS: 13:10	26 SR: 7:59 SS: 18:35 MR: None MS: 13:49 LQ: 12:45	27 SR: 8:00 SS: 18:33 MR: 0:07 MS: 14:25	28 SR: 8:01 SS: 18:32 MR: 1:09 MS: 14:59	29 SR: 8:03 SS: 18:31 MR: 2:13 MS: 15:31
30 SR: 8:04 SS: 18:29 MR: 3:20 MS: 16:03	31 SR: 8:05 SS: 18:28 MR: 4:29 MS: 16:36					

Planet View Info Report for 10/ 1/1994 to 10/31/1994

Mercury

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
10/ 1/1994	9:50	19:56	13h58m52s	-15°32'25"	25°39'57"	0.510	0.91111
10/ 8/1994	9:38	19:34	14h11m24s	-16°56'36"	22°09'28"	0.333	0.79148
10/15/1994	8:55	19:03	14h04m11s	-15°40'30"	13°13'22"	0.113	0.69222
10/22/1994	7:43	18:27	13h37m20s	-11°08'47"	1°59'28"	0.003	0.67247
10/29/1994	6:44	17:58	13h19m13s	-7°02'08"	14°26'53"	0.204	0.77985

Venus

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
10/ 1/1994	11:02	20:11	14h43m44s	-22°15'33"	38°08'50"	0.237	0.40474
10/ 8/1994	10:47	19:46	14h51m52s	-23°27'27"	33°35'19"	0.175	0.36082
10/15/1994	10:22	19:17	14h53m21s	-23°54'16"	27°22'33"	0.112	0.32284
10/22/1994	9:45	18:46	14h47m21s	-23°22'55"	19°20'19"	0.055	0.29331
10/29/1994	8:58	18:14	14h34m58s	-21°45'18"	10°02'57"	0.015	0.27510

Mars

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
10/ 1/1994	1:28	16:22	8h00m49s	21°29'32"	69°40'40"	0.897	1.57680
10/ 8/1994	1:20	16:08	8h17m32s	20°46'51"	72°36'57"	0.895	1.52740
10/15/1994	1:12	15:53	8h33m34s	20°00'43"	75°42'22"	0.893	1.47603
10/22/1994	1:03	15:37	8h48m53s	19°12'10"	78°57'36"	0.892	1.42285
10/29/1994	0:54	15:20	9h03m26s	18°22'20"	82°23'45"	0.891	1.36795

Jupiter

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
10/ 1/1994	10:40	20:47	14h51m13s	-15°30'43"	37°25'26"	0.997	6.15972
10/ 8/1994	10:20	20:24	14h56m44s	-15°55'43"	31°55'17"	0.998	6.21962
10/15/1994	9:59	20:00	15h02m28s	-16°20'51"	26°26'19"	0.998	6.27044
10/22/1994	9:40	19:37	15h08m22s	-16°45'53"	20°58'08"	0.999	6.31178
10/29/1994	9:20	19:14	15h14m25s	-17°10'39"	15°30'10"	0.999	6.34329

Saturn

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
10/ 1/1994	18:05	4:53	22h36m32s	-10°53'57"	148°59'39"	0.999	8.86560
10/ 8/1994	17:37	4:23	22h35m03s	-11°02'08"	141°43'28"	0.999	8.93132
10/15/1994	17:08	3:54	22h33m49s	-11°08'45"	134°29'18"	0.999	9.00863
10/22/1994	16:40	3:25	22h32m51s	-11°13'40"	127°17'48"	0.998	9.09615
10/29/1994	16:12	2:57	22h32m10s	-11°16'46"	120°09'07"	0.998	9.19250

Uranus

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
10/ 1/1994	15:52	1:08	19h37m07s	-22°05'09"	104°48'00"	0.999	19.39856
10/ 8/1994	15:25	0:41	19h37m10s	-22°04'52"	97°55'05"	0.999	19.51670
10/15/1994	14:58	0:13	19h37m24s	-22°04'11"	91°03'07"	0.999	19.63678
10/22/1994	14:30	23:43	19h37m49s	-22°03'04"	84°12'09"	0.999	19.75707
10/29/1994	14:03	23:16	19h38m25s	-22°01'34"	77°21'55"	0.999	19.87596

Neptune

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
10/ 1/1994	15:40	1:03	19h28m39s	-21°16'40"	102°59'09"	1.000	29.93448
10/ 8/1994	15:13	0:36	19h28m41s	-21°16'49"	96°05'47"	1.000	30.05262
10/15/1994	14:45	0:08	19h28m50s	-21°16'42"	89°12'31"	1.000	30.17226
10/22/1994	14:18	23:37	19h29m06s	-21°16'21"	82°19'23"	1.000	30.29165
10/29/1994	13:51	23:10	19h29m28s	-21°15'45"	75°26'08"	1.000	30.40916

Pluto

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
10/ 1/1994	11:00	22:19	15h47m54s	-6°09'54"	49°55'41"	1.000	30.43453
10/ 8/1994	10:34	21:52	15h48m41s	-6°15'17"	43°35'08"	1.000	30.51671
10/15/1994	10:07	21:25	15h49m31s	-6°20'37"	37°19'37"	1.000	30.58876
10/22/1994	9:41	20:58	15h50m26s	-6°25'49"	31°12'33"	1.000	30.64972
10/29/1994	9:15	20:31	15h51m24s	-6°30'50"	25°20'25"	1.000	30.69880

Planet Apsides Report for 1994

Mercury
10/29/1994 Perihelion Distance from Sun: 0.31 AU

Planet Conjunction/Opposition Report for 10/ 1/1994 to 10/31/1994

Mercury

Date	Hour	Event
10/21/1994	1	Inferior Conjunction

Moon Apsides Report for 10/ 1/1994 to 10/31/1994

Date	Hour	Apsis	Distance (km)	Diameter
10/ 6/1994	10	Perigee	360234	0.5529°
10/21/1994	22	Apogee	406111	0.4904°

Meteor Showers Report for 10/ 1/1994 to 10/31/1994

Date	Meteor Shower	ZHR	RA	DEC	Illum.	Frac.	Longitude
10/12/1994	Piscids	??	1h44m	14°	0.61		200°
10/22/1994	Orionids	25	6h24m	15°	0.90		209°

Twilight Report for 10/ 1/1994 to 10/31/1994

Date	Sun		Astronomical		Nautical		Civil	
	Rise	Set	Begin	End	Begin	End	Begin	End
10/ 1/1994	7:30	19:15	5:52	20:53	6:25	20:20	6:58	19:47
10/ 8/1994	7:38	19:03	6:00	20:40	6:33	20:08	7:05	19:35
10/15/1994	7:46	18:51	6:08	20:29	6:41	19:57	7:13	19:24
10/22/1994	7:54	18:41	6:16	20:19	6:48	19:46	7:21	19:14
10/29/1994	8:03	18:31	6:24	20:10	6:56	19:37	7:29	19:04

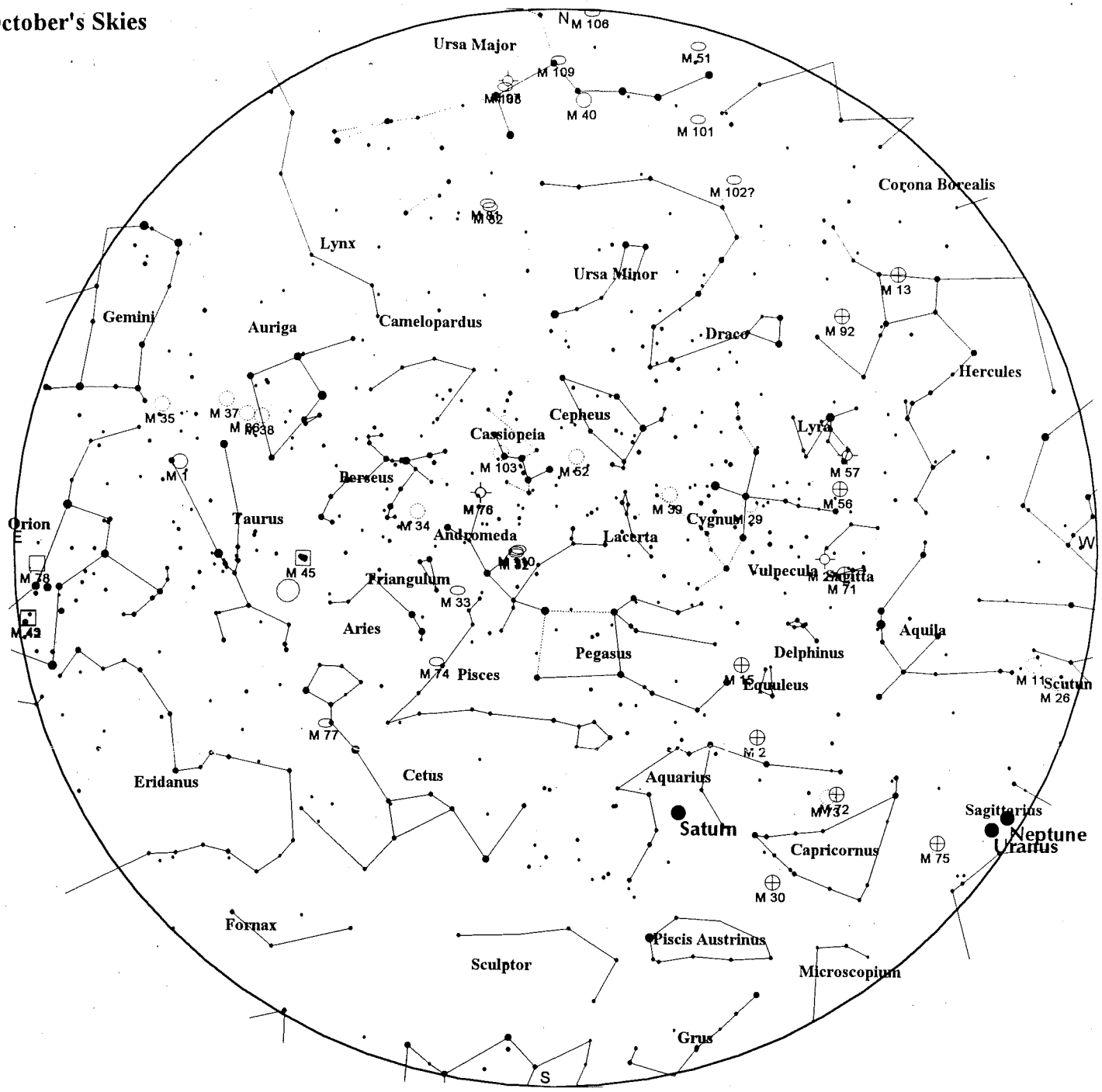
NEW AURORAL ACTIVITY (Continued from page 4)

HST detected unusual auroral activity in Jupiter's northern hemisphere just after the impact of the comet's "K" fragment. This impact completely disrupted the radiation belts which have been stable over the last 20 years of radio observations.

Aurorae, glowing gases that create the northern and southern lights, are common on Jupiter because energetic charged particles needed to excite the gases are always trapped in Jupiter's magnetosphere. However, this new feature seen by Hubble was unusual because it was temporarily as bright or brighter than the normal aurora, short-lived, and outside the area where Jovian aurorae are normally found. Astronomers believe the K impact created an electromagnetic disturbance that traveled along magnetic field lines into the radiation belts. This scattered charged particles, which normally exist in the radiation belts, into Jupiter's upper atmosphere.

X-ray images taken with the ROSAT satellite further bolster the link to the K impact. They reveal unexpectedly bright X-ray emissions that were brightest near the time of the K impact, and then faded.

October's Skies



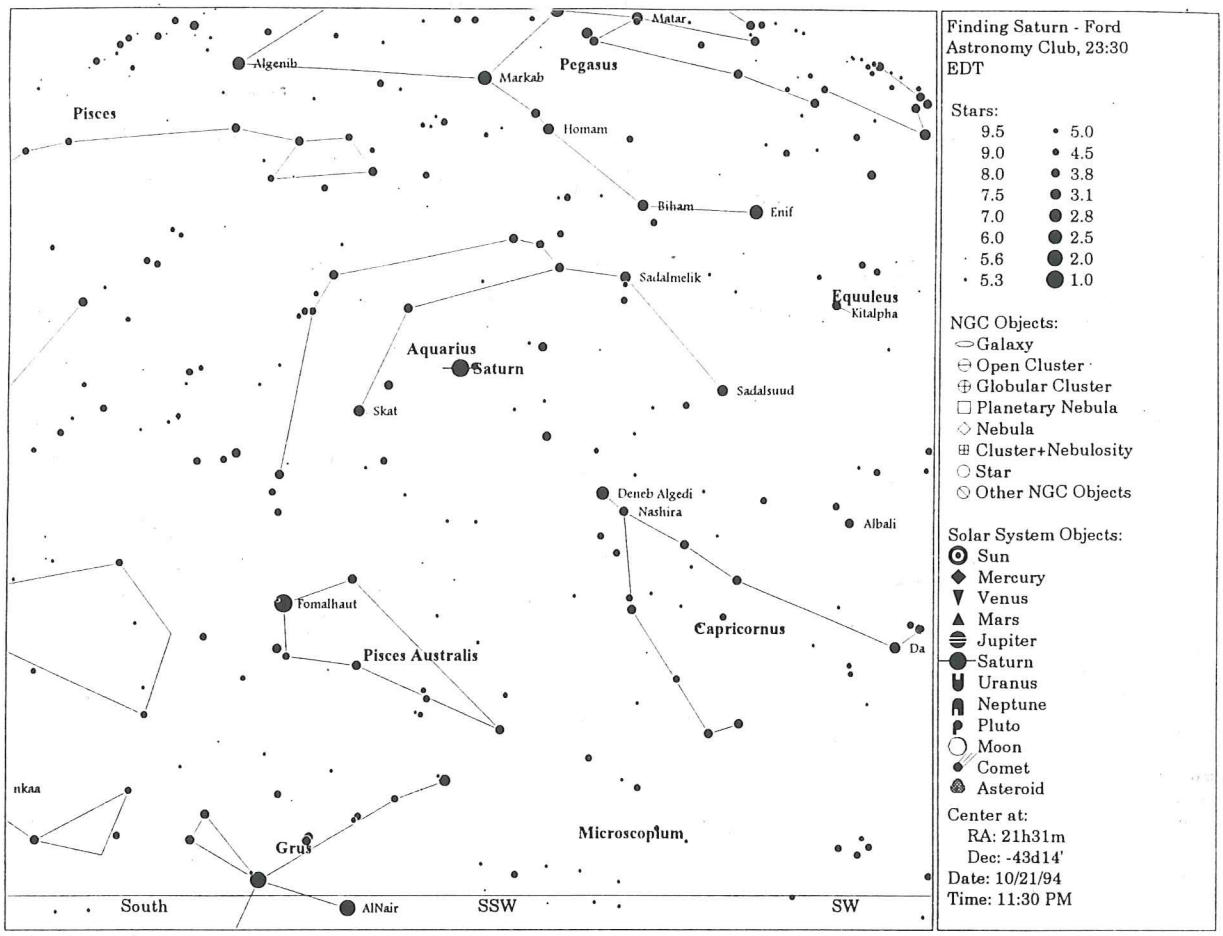
STARS	SOLAR SYSTEM			NOTES
● <1 ● 3.5	☿ Mercury	♅ Uranus	⬭ Galaxy	
● 1.5 ● 4	♀ Venus	♆ Neptune	⊕ Globular Cluster	
● 2 ● 4.5	♂ Mars	♇ Pluto	⁘ Open Cluster	
● 2.5 ● >5	♃ Jupiter	☄ Comet	☼ Planetary Nebula	
● 3	♄ Saturn	⚷ Asteroid	□ Diffuse Nebula	
			○ Other Object	

Local Time: 23:30:00 21-Oct-1994
Location: 42° 22' 0" N 83° 17' 0" W

UTC: 03:29:59 22-Oct-1994
Centre Az: 180.0° Alt: 90.0° Field: 180.0°

Sidereal Time: 23:58:13
Julian Day: 2449647.6458

Finding Saturn



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