The weekend of July 31 through August 1 was the annual Stellafane convention in Springfield, Vermont, I have been going to this event for about the last 10 years.

Stellafane is mostly attended by amateur telescope makers. Many of them bring out their new homemade scopes to show off and enter contests for the best design, craftsmanship or innovative new ideas. There were a lot of large telescopes on Breezy Hill such as a 12-inch refractor and an approximate 36-inch reflector. Some telescopes, while not very big, did have interesting design features: A four-inch folded refractor reminded me of R2D2 and an eight-inch reflector that compressed down into a small box worked like a Veg-O-Matic. It was good enough that if you looked at the double-double star in Lyra (Epsilon Lyrae) with it you could say it even "slices and dices."

I should also mention the amateur gravity wave detector with its box full of thin wires and weights. Look for new discoveries in the Weekly World News.... While some ideas and designs may seem far-fetched, it is good to see amateurs attempting to try the same experiments that even "professionals" with large amounts of government grant money try to do. Sometimes the results are the same.

When I arrived in Vermont on Thursday, the skies were very clear — so clear that while standing near a street light I looked up and saw the Milky Way. It rained all day Friday but cleared up for the Saturday convention. During the day, a swap meet and talks were held. After the evening talk the sky stayed clear and people lined up to look through the big scopes. The lines were too long for me so I found a "small" 17-inch Dobsonian to view through. The recent volcanic eruptions did not seem to affect these skies as I could see the Andromeda galaxy, many Sagittarius area wisps and M13 naked eye. Small binoculars brought out a lot of clusters, planetary nebulas and galaxies. Although it was well before the peak time for the Perseids, I still saw about one meteor every five minutes.

Several thousand people attend Stellafane, including such notables as Dennis di Cicco, Richard Berry, Walter Scott Huston and Al Nagler. It is a real treat to be in their company and know we all have the same interest in common.

Next year, the Stellafane convention will be held on the weekend of August 12, 1993.
The WASP
Volume 24, Number 9 — September 1992

Published by:
Warren Astronomical Society, Inc.
P.O. Box 1505
Warren, Michigan 48090-1505

1991 OFFICERS
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Librarian: Don Mick 779-2784

The Warren Astronomical Society, Inc. is a local, non-profit organization of amateur astronomers. The Society holds meetings on the first and third Thursdays of each month, starting at 7:30 p.m.

General meeting on first Thursdays:
Cranbrook Institute of Science
500 Lone Pine Road
Bloomfield Hills, Michigan

Business meeting on third Thursdays:
Macomb Community College
South Campus, Building B, Room 209
14500 Twelve Mile Road
Warren Michigan

MEMBERSHIP AND DUES
Membership in the Society is open to all. Annual dues are:
Student $12.00
College $17.00
Individual $25.00
Additional Family members $ 5.00 per person
Senior Citizen $17.00

Among the many benefits of membership are:
• Discount magazine subscriptions:
  Astronomy $16.00 (12 monthly issues)
  Sky and Telescope $18.00 (12 monthly issues)
• Free copy of each WASP newsletter.
• Free use of Stargate Observatory.
• Special interest subgroups. (See subgroup chairpersons.)
• Call list - don't miss unexpected events.
• Free membership in Astronomical League.
• Free copy of Reflector (Astronomical League newsletter).
• Free use of W.A.S. library. (See Librarian.)
• Rental telescopes. (See Observatory Chairperson.)

Send membership applications and dues to:
Ed Cressman 643-1837
30540 Pierce Road
Southfield, Michigan 48076

WARREN ASTRONOMICAL SOCIETY PAPER
The WASP is the official monthly publication of the Society. Each new issue of the WASP is made available at the Macomb meeting on the third Thursday. Non-members will be charged $1.00 for each new issue. Back issues, when available, are free. Requests by other clubs to receive the WASP and other correspondence should be addressed to the editor.

Articles for inclusion in the WASP are strongly encouraged and should be submitted to the editor on or before the first Thursday of each month. For further information on contribution, see the "Instructions for Authors" box on page 4 of Volume 23, Number 5.

Send articles to the editor:
Douglas E. Goudie 680-0434
2420 Alexander
Troy, Michigan 48083-2405

Disclaimer: The articles presented herein represent the opinions of their authors and are not necessarily the opinions of the Warren Astronomical Society or this editor.

STARGATE OBSERVATORY
The observatory is owned and operated by the Society in conjunction with Rotary International. Located on the grounds of Camp Rotary on 29 Mile Road, 1.8 miles east of Romeo Plank Road, Stargate features a 12.5 inch f/17 club-built Cassegrainian telescope under a steel dome. The observatory is open to all club members in accordance to the "Stargate Observatory Rules:" Those wishing to use the observatory must call the Observatory Chairperson (2nd Vice President) by 7:00 p.m. on the evening of the session.

LIBRARY
The Society maintains a library of astronomy-related books and periodicals at the Macomb County Community College meeting room. See the Librarian for rules or to check out a book.

SUBGROUPS
Special interest subgroups exist for those interested in specialized areas of astronomy. Contact the chairperson of each subgroup for more information on that group.
Computers: Larry Kalinowski 776-9720
Cosmology: Mike O'Dowd 268-7125
Deep Sky: Doug Bock 750-0273
Lunar / Planetary: Alan Rothenberg 624-9339
Solar: Ed Cressman 643-1837
Telescope making: Jim Houser 294-1932

CALL LIST
The Call List is a list of people who wish to be alerted of spectacular and unexpected astronomical events. Anyone who notices such an event calls the next person on the call list. That person in turn calls the next person, etc. A call list member can restrict callings to certain available times. Any Society member is welcome to join the call list.
To join the call list, please notify Marty Kunz at 477-0546.
Mars Observer Fact Sheet

Mission Summary

The Mars Observer spacecraft will be the first U.S. mission launched to Mars since the Viking missions in 1975. It will be launched from NASA's Kennedy Space Center between September 16 and October 13 aboard a Titan III rocket and a Transfer Orbit Stage (TOS). Mars Observer will travel 720 million kilometers (450 million miles) in 11 months to its late summer 1993 insertion into Martian orbit. From its nearly circular polar orbit around the planet, the three-axis stabilized spacecraft will conduct a comprehensive study of the Martian geosphere over a period of one Martian year (687 Earth days), mapping the surface and profiling the atmosphere with a highly complementary set of instruments covering much of the electromagnetic spectrum. Mars Observer will repeatedly map the planet and its atmosphere in 26-day cycles. This global mapping will help scientists understand the geological and climatological history of Mars and the evolution of its interior and surface, and will provide us with a basis for comparing Mars with Earth and Venus. In late 1995, near the end of Mars Observer’s nominal mission, it will begin to serve as a science data relay facility for the landed stations deployed by the Soviet Mars 94 mission.

Mission Objectives

To make observations that will enhance our understanding of the geosciences and climatology of Mars, specifically:

• Determining the global elemental and mineralogical character of the surface material
• Defining globally the topography and the gravitational field
• Establishing the nature of the magnetic field
• Determining the time and space distribution, abundance, sources, and sinks of volatile material and dust over a seasonal cycle
• Exploring the structure and aspects of the circulation of the atmosphere.

Major Mission Characteristics

Launch Date: September 16, 1992
Launch Vehicle: Titan III and a Transfer Orbit Stage (TOS)
Interplanetary Cruise: 11 months
Mars Arrival: August 1993
Mapping Orbit: 93 inclination, nearly circular
Orbit Altitude: 389 kilometers (mean)
Mapping Orbit Period: 117-minute/orbit with a 7-day repeat cycle
Mapping Period: December 1993 through October 1995

Science Complement

Gamma Ray Spectrometer (GRS)
Uses a high-spectral-resolution boom-mounted detector to measure gamma rays that emerge from the upper 90 centimeters of Mars surface. Spatial resolution of 320 kilometers.

Mars Observer Science Camera (MOC)
Produces a daily wide-angle (low-resolution) image of the entire planet, and narrow-angle (high-resolution) images of objects as small as three meters across.

Thermal Emission Spectrometer (TES)
Uses a Michelson interferometer to map thermal emission spectra in the range of 6.25 to 50 m. Surface spatial resolution is approximately 3.2 kilometers.

Pressure Modulator Infrared Radiometer (PMIRR)
Measures atmospheric profile from the limb of Mars, with a vertical resolution of 4.8 kilometers. Can determine cloud type (H2O or CO2).

Mars Observer Laser Altimeter (MOLA)
Samples topography profile 10 times per second with a vertical precision of 2.1 meters. Laser footprint 160 meters in diameter.

Radio Science (RS)
Uses occultation of Mars to measure changes in spacecraft radio signal caused by planets gravity and atmosphere.

Magnetometer and Electron Reflectometer (MAG/ER)
Boom-mounted magnetometers and reflectometer will establish the nature of the planet is magnetic field, map the crustal residual field, and characterize the solar wind / Mars plasma interaction.

Mars Balloon Relay (MBR)
A radio system that will relay scientific telemetry from balloons or landers deployed at Mars by the Soviet Mars 94 mission.

Hawthorn Hollow Lecture List

The desire to have club members present astronomy programs to the scouts at Hawthorn Hollow has risen to the point where we have been asked to be there on a monthly basis. To ease the lecture load, club members have been divided into two groups. These groups will alternate their scout responsibilities monthly as detailed below.

Group 1

Jeff Bondono
Steve Hughes
Riyad Matti
Frank McCullough
Mike O’Dowd

Group 2

Ed Cressman
Bob Halsall
Scott Jorgensen
Marty Kunz
Nancy Rowe

Schedule

<table>
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<tr>
<th>Group 1</th>
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<tr>
<td>Jeff Bondono</td>
<td>Ed Cressman</td>
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<td>Mike O’Dowd</td>
<td>Nancy Rowe</td>
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September 12, 1992 9:00 p.m. Group 1
October 3, 1992 8:30 p.m. Group 2
NASA's Hubble Space Telescope Uncovers a Starburst Galaxy
By Paula Cleggett-Haleim NASA Headquarters, Washington, D.C.; Jim Elliott, Goddard Space Flight Center, Greenbelt, Maryland and Ray Villard, Space Telescope Science Institute, Baltimore, Maryland

June 2, 1992 — NASA's Hubble Space Telescope (HST) has revealed a new class of object in the universe — a group of gigantic star clusters produced by the collision of galaxies. Images of the core of the peculiar galaxy Arp 220 show that stars are produced at a furious rate from the dust and gas supplied by the interaction of two galaxies.

The discovery was made by Dr. Edward Shaya and graduate student Dan Dowling, University of Maryland, College Park, and the Wide Field/Planetary Camera Team.

Astronomers have never before seen a "starburst galaxy" in such detail. The core of Arp 220 promises to be a unique laboratory for studying supernovas (the self-detonation of massive stars) because they should explode frequently in gigantic young clusters.

Over time, the core of this galaxy should resemble a string of firecrackers popping off. This will provide astronomers an unprecedented opportunity to study the late evolution of massive stars, as well as possibly improve techniques for measuring distances to galaxies, which use supernovae as "standard candle" distance indicators.

In the 1980s NASA's Infrared Astronomy Satellite observatory showed that Arp 220 is the brightest of a dozen or so "ultraluminous infra-red galaxies," which release 95 percent of their light in the infrared region of the spectrum.

Ground-based telescopic images show a dust lane down the center of Arp 220 which makes the galaxy appear double lobed. Astronomers suspected that Arp 220's dark lane hid a massive black hole which provided the energy for heating intervening dust which re-radiates in infrared light. These new observations show that much of the energy is provided by giant star clusters. These star clusters will drive gas into the accretion disk around the black hole.

Astronomers doubted that an incredibly swift burst of star formation could explain all of Arp 220's luminosity. It now seems that the dust is heated both by the nucleus and the giant star clusters.

The new Hubble observation seems to confirm a 1988 theory by David Sanders (University of Hawaii), which predicted that starburst activity is triggered in Arp 220 and other ultraluminous infrared galaxies as a result of mergers of two giant spiral galaxies. Additionally, Joshua Barnes, University of Hawaii, and Lars Hernquist, Lick Observatory, University of Southern California, Santa Cruz, have calculated that when two spiral galaxies merge much of the gas and dust lose angular momentum and fall into the center. This high gas density would trigger a very high rate of star formation.

HST reveals for the first time six luminous knots that lie within 2,000 lightyears of the bright nucleus. These clusters are much brighter and ten times larger than any previously known star cluster. The HST observers speculate there may be even more super-clusters embedded deeper in the dust lane.

"We can now interpret previous microwave observations to estimate the clusters' age to be greater than ten million years," says Shaya. "This means that they are no longer in the starburst phase." Frictional forces, however, should draw these clusters toward the center of the galaxy where gravitational tidal forces should tear them apart within 100 million years. This limited age range adds further support for the galaxy collision scenario.

Since the clusters are young they must contain an abundance of massive short-lived stars. Shaya estimates that these should explode as supernovae several times per year.

HST to Resume Normal Operation After Brief Delay
By Paula Cleggett-Haleim, Headquarters, Washington, D.C. and Jim Elliott, Goddard Space Flight Center

July 31, 1992 — While recovering from a benign standby condition, which began late Wednesday night, NASA's Hubble Space Telescope (HST) entered a deeper safe condition on Thursday night. A plan for resuming normal operations will be developed over the next several days.

Currently, the cause of both conditions, or safe modes, are understood and can be fixed promptly. Spacecraft managers, however, are now analyzing all related data before sending HST's new computer commands that would resume science data collection.

The project director, Joe Rothenberg, said, "The system operated exactly as designed."

Safe modes are a capability built into all NASA spacecraft. They are invaluable "safety nets" to protect against spacecraft anomalies caused by on-orbit hardware problems or erroneous commands sent from the ground.

On Wednesday at 11:49 p.m. EDT, HST went into a standby condition, called an "inertial hold mode." This condition was caused by some erroneous data contained in a standard ephemeris uplink. The ephemeris tells where the spacecraft will be at certain time. Such uplinks occur routinely to update stored data contained in the HST flight computer.

Hubble's safety checking system detected the error and entered this hold condition until spacecraft controllers could fix the problem. The recovery process from this type of hold should take about 36 hours.

While recovering from that inertial hold, another problem occurred that caused HST to enter a deeper, "hardware safe mode." Revised software loaded on board Hubble's flight computer in May 1992 contained an error, which caused it to enter this type of safe mode.

Currently, spacecraft controllers are further analyzing and testing spacecraft data to develop an appropriate recovery plan.
Hubble Telescope Resolves Dark "X" Across Spiral Galaxy Center
By Paula Cleggett-Haleim, Headquarters, Washington, D. C.; Jim Elliott, Goddard Space Flight Center, Greenbelt, Maryland and Ray Villard, Space Telescope Science Institute, Baltimore, Maryland

June 8, 1992 — NASA's Hubble Space Telescope has provided astronomers with what may be their first direct view of an immense ring of dust which fuels a massive black hole at the heart of the spiral galaxy M51, located 20 million light-years away.

These observations are being reported by Dr. Holland Ford, Johns Hopkins University and Space Telescope Science Institute, Baltimore, Maryland, and his co-investigators on HST's Faint Object Spectrograph, at the 180th meeting of the American Astronomical Society in Columbus, Ohio.

"Pictures of M51 taken with Hubble's Planetary Camera show a striking, dark "X" silhouetted across the nucleus. The "XU is due to absorption of light by dust and marks the exact position of the nuclear black hole," said Ford. "If these ideas are correct, M51 provides the first direct view of a torus (ring of material) which both fuels a massive black hole and hides the hole from direct view from anyone outside the narrow cone of light emitted from the near-visibility of the black hole."

Commonly called the Whirlpool Galaxy, M51 is one of the nearest and brightest galaxies, having an angular diameter 1/3 the width of the full Moon. The galaxy is spectacular because it is tilted nearly face-on to Earth, allowing for an unobstructed view of its the bright core. M51 is especially noteworthy because its well-defined spiral arms are unusually bright, and the end of one of the spiral arms projects across a small, dusty and distorted satellite galaxy.

Previous observations made with both radio and optical telescopes have revealed energetic activity in the core of the galaxy. Hot ionized gas in the center of M51 is moving at speeds of up to two million miles per hour. Ground-based observations also show a pair of radio and corresponding optical "bubbles" that form a double-lobed structure across the nucleus.

The new HST images now offer the best glimpse yet of the near-visibility of the "powerhouse" driving these fireworks. The pictures reveal an hour-glass structure formed by two bright beacons of light that are so energetic they cause interstellar gas caught in their beams to glow through ionization. This double cone "searchlight" is bisected by the widest bar of the dark "X." "This suggests that the dark band in the "X," which is perpendicular to the ionization cone, may be a rotating torus (or ring) of cold gas and dust seen edge-on," said Ford.

The second bar of the "X" is both interesting and puzzling. The dust in this linear feature could be a second disk seen edge on, or possibly rotating gas and dust in M51 interacting with the jets and ionization cones. "The safest interpretation is that the slash is a caution sign, showing that we do not yet fully understand what is happening in the center of M51," said Ford.

The edge-on torus, estimated to be 100 light-years across, hides the black hole and its disk of infalling hot gas. This accretion disk buried deep inside the torus is presumably the source of the ionizing radiation. The dusty ring confines the radiation from the accretion disk so that it can escape only through the "donut hole" of the torus as a pair of oppositely directed cones of light.

The ring also determines the axis of a jet of material being accelerated away from the black hole. Like a top tipped on its side, the dust ring is tilted so that it is perpendicular to the plane of M51. The high-speed jet thus lies in the galaxy's plane and plows into the gas and dust in M51 disk. The jet inflates a bubble of hot gas on either side of the black hole. This is analogous to a fire hose directed against a large pile of sand. The fire hose inflates a cavity of water and sand which expands and advances into the sand pile.

The resulting optical and radio emission from this "blowtorch" in M51 is several times brighter than the radio emission in the center of our own Milky Way Galaxy. This means that the M51 black hole is more energetic than the million-solar-mass black hole suspected to lie at the center of the Milky Way Galaxy.

The power produced by the M51 black hole is still a hundred times fainter than the nuclei of bright Seyfert galaxies (a class of active galaxy having a brilliant point-like nucleus) which are thought to harbor 100 million-solar-mass black holes. Ford suggests the M51 core may be classified as a "miniature Seyfert nucleus."

A black hole's level of activity is determined not only by its mass, but by the rate at which surrounding material falls into it. The gravitational interaction between M51 and its companion is likely causing gas to fall into the nucleus.

Astronomers will attempt to confirm the existence of the dusty torus and the black hole by using spectroscopy to measure the rotation velocity of the ring. Just as the orbital speed of the planets in Earth's solar system can be used to estimate the mass of the Sun, the black hole's mass can be estimated by the rotation velocity of the torus.

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Picnic and Star Party at the Hawthorn Hollow Observing Site
Saturday, August 22, 1992
4:00 p.m. - 8:00 a.m.
Bring lawn chairs, whatever you will be eating and drinking and games for everyone to play. If you can, please bring a charcoal grill, charcoal and / or a large table for everyone to use. All club members and their guests who wish to attend are welcome provided that you notify either Bob Halsall or Jeff Bondono by August 20. If you don't have a map to Hawthorn Hollow or the Hawthorn Hollow Site Rules, please ask Jeff for them. If the weather looks poor on the day of the star party, call Jeff at 731-4706 to find out if the star party will be held. There will be a recorded message if Jeff is not home.
HST Begins to Provide Accurate Distances to Galaxies
By Paula Cleggelt-Haleim, Headquarters, Washington, D.C.; Jim Elliott, Goddard Space Flight Center, Greenbelt, Maryland and Ray Villard, Space Telescope Science Institute, Baltimore, Maryland

June 29, 1992 — Using NASA’s Hubble Space Telescope (HST), an international team of astronomers has taken a major first step in re-determining the expansion rate of the universe. This rate, known as the Hubble Constant, is one of two critical numbers needed for making a precise determination of the size and age of the universe.

These results are being reported by Drs. F. Duccio Macchetto, Nino Panagia and Abhijit Saha of the Space Telescope Science Institute, Baltimore Maryland; Allan Sandage, of the Carnegie Institute of Washington and Gustav Tammann of the University of Basel, Switzerland, at the international workshop "Science With The Hubble Space Telescope," being held in Sardinia, Italy, June 29 through July 9.

Using HST's Wide Field and Planetary Camera (WF/PC) in the wide field mode, the team found 27 Cepheid variable stars in a faint spiral galaxy. The galaxy, called IC 4182, is located 16 million light-years away in the northern sky constellation Canes Venatici.

Cepheid variable stars rhythmically change in brightness over intervals of days - the prototype is the fourth brightest star in the constellation Cepheus. Early in this century astronomers found a direct link between a Cepheid's pulsation rate and its intrinsic brightness.

Once a star's true brightness is known, its distance is a relatively straight-forward calculation because the intensity of light drops off at a predictable rate. Though Cepheids are rare, they are very reliable "standard candles" for estimating intergalactic distances. Only once before have Cepheids been found in a more distant galaxy (M101, located 23 million light-years away).

"The few Cepheids found in M101 with ground-based telescopes were unusually bright and required an enormous effort over many years," says Macchetto. "Only the Hubble Space Telescope can make these types of observations. Cepheids are too faint and the resolution too poor, as seen from ground based telescopes, to separate the images in such a crowded region of a distant galaxy."

The galaxy IC 4182 was chosen as a target for a Cepheid search because it is the site of a type Ia supernova explosion which occurred in 1937. Type Ia supernovae are thermonuclear explosions that may occur in systems containing a pair of white dwarf stars.

Models predict that all supernovae of this type should reach approximately the same peak brightness - as if all light bulbs manufactured in the world were exactly 60 watts.

Like the Cepheids, Ia supernova can be reliable standard candles, but only if astronomers accurately know their true intrinsic brightness. Type Ia supernovae are more useful than Cepheids because they are much brighter and can be seen at far greater distances. These supernovae are the next "rung" in a "ladder" of techniques for estimating cosmological distances.

The problem is that astronomers have been uncertain about the absolute brightness these supernovae reach at maximum. By accurately determining the distance to IC 4182 using Cepheids, astronomers can calibrate the intrinsic brightness of the 1937 supernova. They essentially now can "link together" two rungs in the cosmological distance ladder.

Since type Ia supernovae can be seen 1,000 times farther than the Cepheids, they can be used to determine large cosmological distances accurately. This measurement is a critical step in refining the true value of the Hubble Constant, first developed by the American astronomer Edwin Hubble in 1929.

Hubble found that the farther a galaxy is, the faster it is receding away from us. This "uniform expansion" effect is strong evidence that the universe began in an event called the Big Bang and has been expanding ever since.

The Hubble Constant is an estimate of the rate at which the universe is expanding and is expressed in kilometers per second per megaparsec (3.26 million light-years). The Hubble Constant is one of two critical numbers needed to determine the intrinsic curvature of space and the fate of the expansion.

The other number needed is the mean density matter in the universe or an independent verification of the age of the universe. Previous estimates for the Hubble Constant vary by a factor of two (50 vs. 100 kilometers per second per megaparsec).

Using the absolute calibration of this single type of supernovae IC 4182, the researchers yield a range for the Hubble Constant of between 30 and 60 km/sec/Mpc, The most probable value is in the middle of this range, yielding a value for the Hubble Constant of 45 km/sec/Mpc, which implies a minimum age for the universe of 15 billion years.

The astronomers plan to narrow this range for Hubble Constant by detecting Cepheid variable stars in other galaxies that have had recent type Ia supernovae as well. These observations will be made next year with HST.

When a second generation WF/PC is installed in HST during a Space Shuttle servicing mission in 1993, the astronomers expect to detect Cepheid Variables out to the Virgo cluster of galaxies, estimated to be 60 million light-years away. The ultimate goal is to use HST to refine the scale of the universe to within 10 percent.
Deep-Sky Objects

The term deep-sky object refers to a broad range of relatively dim and diffuse objects in the night sky. Deep-sky objects include all varieties of galaxies, bright and dark gas clouds, globular star clusters and open star clusters - virtually any distant, blurry blob of faint light in the sky. Once regarded as nuisances that impeded the then far more important discovery of new comets, these objects are in fact some of the most distant, beautiful and challenging objects to observe.

To be seen, deep-sky objects require dark skies and high transparency, preferably on a night near a New Moon. Some objects are within the light-grasp of binoculars, but most require a larger aperture — at least six-inches — before significant detail becomes apparent. A useful technique for observing deep-sky objects is averted vision: looking directly at a dark section of sky while observing the object from the side of your eye.

Use these charts to find some deep-sky objects. At right is a detailed chart showing enough stars to 'star-hop' to the objects. Inset is a low-scale chart showing the general region of sky.

Happy viewing

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**September 1992**

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<td><strong>11</strong> - Moon is 1.9° north of Uranus</td>
<td><strong>15</strong> - Moon is 0.9° north of Neptune</td>
<td><strong>23</strong> - Moon is 5° north of Saturn</td>
<td><strong>15</strong> - Moon is at apogee</td>
<td><strong>16</strong> - Ceres is stationary</td>
<td><strong>17</strong> - Jupiter is in conjunction with Sun</td>
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<td><strong>0</strong> - Mercury is in superior conjunction</td>
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<td><strong>20</strong> - Uranus is stationary</td>
<td><strong>23</strong> - Moon is at perigee</td>
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<td><strong>5</strong> - Moon is 0.9° south of Mars</td>
<td><strong>15</strong> - Autumnal equinox</td>
<td><strong>20</strong> - Uranus is stationary</td>
<td><strong>23</strong> - Moon is at perigee</td>
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<td><strong>12</strong> - Neptune is stationary</td>
<td><strong>11</strong> - Moon is 4° south of Venus</td>
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Warren Astronomical Society Calendar 1992

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**Sunday Afternoons**
- **August 28-30**
- **Fish Lake Under the Stars** sponsored by the EMU Astronomy Club, Lapeer, Michigan. Contact: Kevin Dehne, 39576 Ronayton, Novi, MI 48377. Phone: (313) 347-5844

**Thursday**
- **September 3** 7:30 p.m.
  - **General meeting** at Cranbrook Institute of Science. Guest speaker: Doug Murphy from the Abrams Planetarium, Michigan State University (East Lansing) discussing their new planetarium projector.
- **September 11-2** 8:30 p.m.
  - **Open House** at the 24-inch observatory of Michigan State University (East Lansing). For further information contact Kim Dyer.

**Saturday**
- **September 12** 9:00 p.m.
  - **Hawthorn Hollow Girl Scout Astronomy Lecture.** Given by Group I. (See Hawthorn Hollow Lecture List on page 3.) Bring telescopes. Contact Jeff Bondono for details.

**Thursday**
- **September 17** 7:30 p.m.
  - **Business meeting** at Macomb Community College.
- **September 18-19** 8:30 p.m.
  - **Open House** at the 24-inch observatory of Michigan State University (East Lansing). For further information contact Kim Dyer.

**Thursday**
- **September 24** 8:00 p.m.
  - **Computer Group** meeting at Gary Gathen’s house.
- **September 25-26**
  - **Overnight Weekend Campout and Star Party.** Considered site: Port Crescent, Michigan. Watch for further information next month.

October 2-3 (tentative)