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SEE WHAT NASA'S HUBBLE SEES, WITH THE CLICK OF A MOUSE

Each day, NASA's Hubble Space Telescope collects enough information and images to fill five encyclopedias. Now, anyone with access to a computer and the World Wide Web can see the most exciting pictures captured by the world's first space-based optical telescope.

A new Web site, "Hubble Space Telescope: New Views of the Universe," highlights the unique contributions to astronomy by this tireless observatory. The exhibition was developed by the Space Telescope Science Institute (STScI), Baltimore, MD, in collaboration with the Smithsonian Institution.

The new Internet portal seeks to simulate the experience of visiting the Smithsonian exhibition, which is now touring the country. Support for developing this exhibition was provided by NASA and the Lockheed-Martin corporation.

Since its launch in 1990, the orbiting Hubble Space Telescope has provided unprecedented views of the Universe. Using spectacular Hubble images, the exhibition and its companion Web site take visitors on a fascinating exploration of Martian weather, colliding galaxies, the tumultuous life cycles of stars, very distant celestial objects, and even a comet colliding with Jupiter.

The Web site shares many of the physical exhibition's features - such as videos, a roadmap of how long the light from different objects in space takes to reach us here on Earth and virtual reality activities - which gives users a true hands-on experience of the orbiting observer.

"Hubble Space Telescope: New Views of the Universe" is a special feature of HubbleSite, Hubble's official online home and the Web's most comprehensive source of Hubble news, pictures, information and educational resources. Both Web sites were developed by STScI, which manages the science program for the Hubble Space Telescope and is operated by the Association of Universities for Research in Astronomy, Inc. for NASA, under contract with NASA's Goddard Space Flight Center, Greenbelt, MD.

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

To experience the new "Hubble Space Telescope: New Views of the Universe," visit: http://hstexhibit.stsci.edu

The Hubble's official online science Web site is located at:
http://hubble.stsci.edu

- Cheryl S. Gundy
Space Telescope Science Institute, Baltimore, MD

The Longmont Astronomical Society, a nonprofit educational organization, was founded in 1987 to enhance public awareness of amateur astronomy. The society's activities include lectures on various astronomical topics and related space sciences at local schools and other organizations, monthly public sky observing sessions, and monthly meetings featuring select speakers. The society serves the Boulder, Estes Park, Longmont, and Loveland, Colorado areas. Regular meetings are held on the third Thursday of every month at 7:00 PM in the Longmont Christian School basement, 550 Coffman St., Longmont. Annual dues are $20. All meetings are open to the public. Visit the LAS web page at http://laps.std.noaa.gov/cgi/las.cgi for timely reminders of upcoming events and maps to monthly star party sites.
MINUTES
of the
LONGMONT ASTRONOMICAL
SOCIETY
MONTHLY MEETING
Thursday, January 18, 2001

There were thirty-one attending folks that signed
the roster this month, including at least one member I know
that didn't, and at least three visitors: Ethan Sondstran (sp?),
Chuck Klasky (sp?), and Kim Cierpik (sp?).

The vice president gave short report about his
progress in arranging the third annual star party at Sterling
State Park, probably to be held the first week of April.

There was some general discussion of meteors,
recapping the presentation given by Matt Morgan at the
banquet.

Don Bunker gave a very interesting slide show
regarding the construction of his cabin on an island in a
remote lake in northern Canada, including many very nice
photographs of the aurora borealis. His talk included many
interesting and humorous anecdotes about the local natives,
wildlife, and other situations unique to this remote location.
Thanks Don! It was very well received!

The Soap Box

A Call For Volunteers

From Andrew Planck:

Platt Middle School in Boulder (where I teach) is
taking a group of kids to the Canyonlands in Utah for a
camping trip May 21-25. I am going along to teach them
astronomy, and I asked them if I could find somebody in the
LAS that would be interested in a nice camping trip to dark
skies, would that be ok. The answer was an enthusiastic Yes!
(They can't pay anything, but they'll provide meals). We'll be
at a basic campsite (no electricity and pit toilets), but RV's
are welcome (no hook-up). I'd like to throw the invitation out
to LAS members to see if somebody would like to come
along. There will be 50-60 kids, which is a little
overwhelming for just one astronomer.

Thanks,
- Andrew Planck

ATTA's

A big atta-boy to Dennis Billings, who bought and
donated to the society library a copy of The Handbook of
Colorado Meteorites, autographed by none other than it's
author, Matthew Morgan.

Thanks Dennis!

And a big atta-girl to Nancy Muth, who donated two
very large bags of aluminum cans to the telescope fund.

Thank you Nancy!

Credit Where Credit is Due
(an Editorial Comment)

Those of you who enjoyed being incensed by the article
on the web about the fate of the CORRECT Robert Burnham that
really wrote Burnham's Celestial Handbook, will love the one-and-
one-third page side-bar article in the March issue of Sky &
Telescope Magazine about H. Page Bailey, who was the guy (in
1930) that actually came up with the mount design that was
eventually used on the 200 inch Hale telescope. He never received
the recognition he deserved, apparently. Bummer. Ticked me off
real good.

Porter and Anderson visited one of his yoke mounts in
1931, at the time that a fork mount was being considered for the
200 inch; Porter's split ring design having been rejected in 1929.

The main article is about a beautiful trailer-mounted 20
inch f/8 Newt built by Allan Guthmiller of RTMC fame, using one
of the original cast-iron yokes made by Bailey, and unearthed from
under a pile of scrap metal behind a machine shop.

But on the bright side, you just never know what an
enterprising scrounger will come up with!
- Jim Sapp

LAS ANNOUNCEMENTS

The LAS has a
NEW MAILING ADDRESS:
Longmont Astronomical Society
P.O. Box 806
Longmont, Colorado
80502-0806

If you are of a mind to recycle, and would like to make a
small contribution to the LAS telescope making fund,
bring your recycled aluminum cans to the
regular meeting each month for collection. Proceeds from
this activity will help fund a telescope for a local
school or other worthy recipient.

If you have not paid
you LAS annual dues for 2001,
this is your LAST ISSUE of the
Journal!
This page is left blank because YOUR unwritten article was to go here!

Year 2000 Totals:

- Proposed Articles: 6
- Received Articles: 0
- Proposed Monthly Columns: 2
- Received Monthly Columns: 0

There were a couple of articles received and published, but they were not sent by the folks that promised them!

- Your Whining Editor
Rep. Andrew Romanoff's (D-Denver) dark sky bill, HB01-1160, passed its first committee hearing unanimously and now advances to the floor of the Colorado House.

**Date Set for 3rd(?) Annual Sterling Star Party**

The 2001 Sterling Star Party is set for the evenings of April 20 and 21 at the North Sterling State Park, just outside Sterling, Colorado. Bob Loomis of the Colorado State Parks Department said the showers, toilets, and other facilities will be open, and camping fees will be waived for astronomers, though it will be necessary to purchase day passes at $4/day if you don't have a current Colorado state parks pass.

According to Gary Garzone, vice president of the Longmont Astronomical Society, "It's a real deal if you ask me. New modern, clean restrooms with hot showers makes it almost civilized. And there are big camp sites with lots of room at the top of a hill above the lake for total sky views in all directions."

"I looked at the calendar and it is 2 days before the new moon, plus there will be the Lyrid meteor shower Saturday night."

"This place is almost as dark as Fox park and better than Pawnee. The North Eastern College and it's students plus local folks will be there, as they will advertise in the local newspaper and radio. I am hoping to make this the best early season annual star party event happening for us on the front range. It sounds like a great weekend, so let's hope for great clear dark skies."

**Clips from NASA News**

**Comet Collisions: Only the Strong Survived?**

Recurring collisions between comets during the solar system's formation may have ground smaller comets to bits, leaving only big comets larger than 20 kilometers (12 miles) to survive, according to a new model developed by researchers at NASA's Jet Propulsion Laboratory, Pasadena, Calif., and the Southwest Research Institute, Boulder, Colo.

The finding, by Dr. Paul Weissman of JPL and Dr. Alan Stern of Southwest Research Institute, published in the February 1 issue of the journal Nature, demonstrates that previous models may have significantly overestimated the mass of the Oort cloud -- a region far beyond the planets populated by comets flung outward in the solar system's youth.

"We're introducing a new wrinkle in the process of how the Oort cloud formed," said Weissman. One result of the new finding, he said, is that "the cloud may be 10 times less massive than previously thought."

By studying comets of different sizes, the scientists predicted how the comets would collide with each other, and how the collisions would erode the comet's cores, dirty snowballs of dust and ice. Their model showed that comets with nucleus diameters smaller than 20 kilometers (12 miles) would have been destroyed in the early solar system's demolition derby. Previous Oort cloud formation models neglected the effects of these collisions.

Another apparent implication of this violent collisional environment is that the comets in the Oort cloud could be smaller than previously thought, said the scientists. If comets were so eroded that they would never have left the region of the giant planets, then few of them would have survived to be ejected from the Oort cloud. Taking into account their new findings, Weissman estimates that typical comets in the Oort cloud may be about half as large across as compared with current best estimates.

JPL is a division of the California Institute of Technology in Pasadena.

**Volcanoes and Auroras in Eclipse Movie of Io**

The first movie ever made of Jupiter's moon Io while it is in eclipse shows bright spots of hot lava and changes in auroral glows. These images from NASA's Cassini spacecraft provide evidence that the auroras originate in electrical currents that connect Io and Jupiter along magnetic-field lines.

Other images being released by the Cassini imaging team show auroras on the dark side of Jupiter itself, near both of the planet's poles. Jupiter's south pole aurora had never been imaged from the planet's night side before. The images are available from NASA's Jet Propulsion Laboratory, Pasadena, Calif., at http://www.jpl.nasa.gov/pictures/jupiter and from the Cassini imaging science team at the University of Arizona, Tucson, at http://ciclops.lpl.arizona.edu/.

Cassini made its closest pass to Jupiter on Dec. 30, 2000, gaining a gravitational boost for reaching its main destination, Saturn, in 2004. It will continue to make observations and measurements of the Jupiter system through March 2001. More information about joint studies of Jupiter by Cassini and NASA's Galileo spacecraft, which has been orbiting Jupiter for more than five years, is available at http://www.jpl.nasa.gov/jupiterflyby.

Cassini is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. JPL manages the Cassini and Galileo missions for NASA's Office of Space Science, Washington, D.C. JPL is a division of the California Institute of Technology in Pasadena.

**NEAR Mission Completes Main Task**

NASA's Near Earth Asteroid Rendezvous (NEAR) Shoemaker spacecraft, the first to orbit an asteroid, has met all its scientific goals in its year of orbiting the asteroid Eros, and will now attempt another first: a controlled descent to the surface of the asteroid on Feb. 12.

The chief goal of the controlled descent to the surface is to gather close-up pictures of the boulder-strewn surface of 433 Eros, more than 196 million miles from Earth.

"NEAR Shoemaker has set a high standard for low-cost
planetary exploration," said Dr. Edward Weiler, Associate Administrator for Space Science, NASA Headquarters, Washington, DC. "This mission has provided answers to a range of fundamental science questions, and it has excited the public with its exploration and great images. The team at Johns Hopkins University Applied Physics Laboratory and its many partner institutions are to be congratulated for achieving this historic first in space exploration."

During its 5-year, 2-billion-mile journey, the NEAR Shoemaker mission, which was built and is managed by The Applied Physics Laboratory (APL) in Laurel, MD, provided the most detailed profile yet of a small celestial body. It began a yearlong orbit of Eros on Feb. 14, 2000, and has collected 10 times more data than originally planned.

The data include a detailed shape-model culled from more than 11 million laser pulses; radar and laser data on Eros' weak gravity and solid but cracked interior; X-ray, gamma-ray and infrared readings on its composition and spectral properties; and about 160,000 images covering all of the 21-mile-long asteroid's bouldered, cratered, dusty terrain.

"We have answered the questions we had when the orbit began. We now know that Eros is a solid body of uniform composition, made of material probably older than the Earth," said Dr. Andrew Cheng of APL, Project Scientist for NEAR. "But we also found many other things we didn't expect to see and have questions we didn't know to ask at the start of the mission. Scientists will be looking at these data for years."

"On the tiny fraction of the surface we've seen at high resolution, we noticed strange processes we haven't seen on the moon or anywhere else," added Dr. Joseph Veverka, NEAR imaging team leader from Cornell University in Ithaca, NY. "For example, some boulders seem to have just disintegrated on the surface. We've also seen that some of the fine surface material moves downhill, filling low areas and creating flat surfaces in craters, even with Eros' low gravity. These are big puzzles and we need to get a better look."

That look should come Feb. 12. The primary goal of the controlled descent is to get the closest images yet of Eros, particularly its "saddle" area, a 6-mile wide depression that has intrigued scientists with its boulder patches, relatively craterless surface and patterns of grooves and ridges. The secondary aim is to practice the maneuvers that would lead to a landing, creating a flight plan for future missions to land on a small body.

"With the spacecraft just about out of fuel and our science objectives met, this is a great way to end a successful mission," said NEAR Mission Director Dr. Robert Farquhar of APL. "It's all bonus science. It's never been tried before and it certainly is a complicated set of maneuvers, but at this point the only real risk is not taking one."

NEAR Shoemaker's 4-hour descent is scheduled to start at 10:31 a.m. EST with a maneuver moving it out of its current orbit 22 miles from the center of Eros. On the way down it will take images that will help determine its exact location and altitude, and set the timing for the final thruster firings. This series of thruster firings are designed to decelerate the spacecraft from about 20 mph to 5 mph.

NEAR Shoemaker will approach the surface on its side, its outward-facing camera pointed down, snapping a photo every minute. The last clear pictures from the telescope camera, taken from approximately 1,650 feet could show surface features as small as four inches across. After that, NEAR mission operators will use the blurring photos, altitude data from NEAR Shoemaker's laser range-finder, Doppler tracking and the eventual loss of signal to learn when the spacecraft touches down, predicted for just after 3 p.m. EST.

"The whole sequence of engine burns has to go right, or it might not be a very soft touchdown," Farquhar said. "The unknown nature of the surface makes it hard to predict what will happen to the spacecraft, especially since it wasn't designed to land. The most we can hope for is a beacon from NEAR Shoemaker that says it's still operating."

Images and information on end-of-mission media activities can be found at: http://near.jhuapl.edu/media/index.html

**Mars Global Surveyor Completes Prime Mission**

NASA's Mars Global Surveyor spacecraft, which has collected more information about the red planet than all previous missions combined, completes its primary science mission today and begins a new era of continued exploration.

"By any conceivable measure the scientific impact of Mars Global Surveyor has been extraordinary. In many ways we now know Mars to be a different planet than when the spacecraft arrived in 1997, and our perspective continues to evolve as the data keep flowing," said Dr. Arden Albee, Global Surveyor project scientist at the California Institute of Technology in Pasadena. "In some aspects, we now have better maps of Mars than we do of Earth."

"During the primary science mission, the spacecraft studied the climate, surface topography and subsurface resources and mapped the entire planet," said Tom Thorpe, Global Surveyor project manager at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "The extended mission will continue to take advantage of these extraordinary mapping capabilities and the data will be used to select future landing sites for several upcoming missions."

Mars Global Surveyor's extended mission has been approved through April 2002.

The robotic orbiter was launched on Nov. 7, 1996, and arrived at Mars on Sept. 12, 1997. The spacecraft began its primary mapping mission in March 1999 and has collected data for a full Martian year, equivalent to about two Earth years. Those comprehensive observations are proving invaluable to understanding the seasonal changes on Mars. Some of the most significant findings of the mission include:

-- Enticing evidence for recent liquid water at the Martian surface.
-- Dramatic evidence for layering of rocks that points to widespread ponding of water or lakes on Mars in its early history.
-- The first good estimate of the amount of water currently trapped in both Martian polar caps combined -- about one and a half times the amount of ice in Greenland.
-- Topographic evidence for a South Pole-to-North Pole slope that controlled the transport of water and sediments, and recognition of the flat Northern Hemisphere that has been proposed as the possible site of an ancient ocean.
-- The surprising detection of highly magnetized crust in the Southern Hemisphere, which indicates rapid cooling of Mars in the beginning of its history that may have contributed to its earlier, warmer climate.
-- The first reliable models of the crustal structure of Mars, including the detection of ancient impact basins and possible channels buried beneath the northern plains.
-- Identification of the mineral hematite, indicating a past surface-hydrothermal environment that may be an analog for the kinds of areas in which early life developed on Earth.
-- Significantly improved understanding of the dynamics of the atmosphere, including the monitoring of cyclonic storms, and the daily and seasonal behavior of carbon dioxide and water ice clouds.
-- Extensive evidence for the role of dust in re-shaping the recent Martian environment in the form of dust devils, dust storms, dunes and sand sheets.

As of 4:33 p.m. PST (7:33 p.m. EST) January 31, 2001, the spacecraft will have made 8,505 orbits of the planet and taken more than 58,000 images, 490 million laser-altimeter shots to measure topography and 97 million spectral measurements.

The Global Surveyor mission is managed by JPL for NASA's Office of Space Science, Washington, D.C. Lockheed Martin Astronautics, Denver, Colo., developed and operates the spacecraft. JPL is a division of the California Institute of Technology.

Additional information on the mission can be found at: http://mars.jpl.nasa.gov/mgs/
Dates, Diameters, and Declinations
Upcoming Oppositions of Mars

by Jim Sapp

In the last couple of decades, as the course of the Earth’s orbit brings us adjacent to the position of the red planet every other year or so, one of my favorite night time pastimes during these seasons has been watching and sketching Mars. I have been drawn to this planet from an early age, having consumed a steady diet of the works of Edgar Rice Burroughs, Robert Heinlein, and Ray Bradbury. The theories of Percival Lowell put forth in his writings near the turn of the 20th century no doubt had a tremendous effect on the works of the later writers, and his theories were perfectly reasonable considering the limited means of observation that were available during his time; mainly the telescope, and little else.

Mars has long been a mysterious planet whose fiery glow, as it waxes and wanes every two years, can entice the imagination; and it seems that the more we learn of it, the more mysterious it becomes. Witness the recently released images obtained by the Mars Global Surveyor showing vast regions covered by what appear to be stratified sedimentary rock, and other evidences of more recent hydrologic activity. Ahhh, how the imagination can soar!

Another aspect which magnetically draws the attention of the telescopic observer Mars-ward is that besides the Earth and it’s moon, Mars is the only planet in the known universe whose solid surface can be observed with modest ground based telescopes. Jupiter and Saturn offer marvelous and changing details, but their true surfaces are forever veiled by their thick colorful atmospheres. The seasonal changes of the Martian surface revealed by the backyard telescope can be directly paralleled with the seasonal changes experienced on our own home planet. No other place in the observable sky has this kinship with our home. The annual growing and receding of the polar caps, the darkening and fading of various surface features, the clouds formed over the Tharsis bulge by up slope winds, morning mists in the lowlands, and tremendous dust storms that shame the mightiest torrents the Sahara ever dared to display. But what sets the hook is that we only get a good look at our sister planet for only three or four months out of every twenty-six!

In the next few months we will again be catching up to Mars in our annual race around the sun. Opposition, or the point at which Mars will lie opposite the sun in our sky - closest approach, if you will - occurs on June 13 this year, when the red planet will present a disk nearly 21 seconds of arc in diameter. The last opposition reached just under 14 seconds - a tremendous difference in the eyepiece! The closest oppositions occur when the Earth is at it’s furthest distance from the sun, aphelion, at the same time that Mars is at it’s closest distance to the sun, perihelion. At it’s very best it can present a disk just over 25 seconds in diameter; but there is more to a great opposition than apparent diameter alone. There is also the matter of declination.

For those of us that are confined to mid-northern latitudes, the best times to observe the red planet are at oppositions that are not only close, but when Mars is north in our sky. When the planet rises high in the sky, we have less of our turbulent air to peer through, there is less atmospheric refraction smearing the colors and softening the edges, and the moments of steady seeing are dramatically multiplied. There are two factors which can influence this matter of declination. The minor factor is Mars’s orbital inclination to the ecliptic, which can add or subtract only just less than two degrees of altitude in our sky. The major factor is the time of year on Earth.

During the warmer months in our northern hemisphere we bask in the sun’s rays shining down from a sun riding the ecliptic high in the northern sky, though at night when viewing a planet we see the ecliptic riding low in the south, on the other side. Conversely, in the colder months, we see the sun riding the ecliptic low in the southern sky, while at night on the other side we see the planets riding the ecliptic high in the north! Step outside tonight on your frozen lawn and look up at Jupiter and Saturn. They are nearly straight up! Just right for high resolution viewing! In six years or so, when Jupiter is at opposition in the summer months, it will be low in the sky at night. This matter of the position of the ecliptic can add or subtract as much as 46½ degrees of apparent altitude in our sky!

This year, with the opposition occurring in late spring, Mars will be placed at an unfavorable 27 degrees south declination. For us 40-northers, that hurts! That puts Mars at only 23 degrees of altitude above the horizon on opposition night! The Aussies will love it though!

As a point of curiosity, I computed the dates, diameters, and declinations of Martian oppositions for the rest of this century. Surprisingly, the opposition of August 2003 will present the largest apparent diameter (25.1") for the next 100 years! It will also be 11 degrees further north in declination than this year’s opposition. Next runners-up diameter-wise will be 25.0" in 2028 at 14 degrees south, and 25.0" in 2050 at 21 degrees south, though these years are probably moot for most of us. 2035 will give us 24.5 seconds at a decent 8 degrees south declination, and 2018 will tempt us to southern climates with a 24.2 second diameter disk at a miserable 26 degrees south declination. Pack your bags for 2018!

For those of us that are not travel-prone, the best opposition in the realistic future is slated for November, 2005. Mars will smile with a wide 19.9 second grin, shining from a northerly declination of 16 degrees! Sure, 2003 gives us a 5.2 seconds of arc wider disk, but I’ll trade that for 32 more degrees of altitude any day! Next best for us Longmtonians looks to be 22.3 seconds at +5 degrees in 2020.

So what will it be? Baja in 2003 and Tucson in 2005? See ya there!

-Jim
Mad Marathon II

This March 24th will mark the second annual attempt by members of the LAS to locate all 110 of the Messier objects in one night between sunset and sunrise.

In 2000, we held a 'rain date in advance' one week prior to the actual event, which served as a practice run until we got clouded out that night. During the actual event on the evening of March 31-April 1, clouds rolled in around midnight which stopped the action for a couple of hours, but mostly cleared away in time for a frenzy of cloud-dodging action and a mad dash to finish the race by dawn.

As always, all are cordially invited to join the marathoners this year at the Cactus Flats site for a strenuous evening of dark-sky fun. Many of the objects are readily spotted with the naked eye, and a great majority of them can be found using binoculars mounted on a tripod. The remainder can be bagged with a 3-inch refractor from this fairly dark site.

For the benefit of those that have never tried this before (like me last year), I have jotted down some lessons learned by last year's attempt.

First and foremost, be organized and ready for action before sunset. There are three objects that are difficult to acquire during a very brief window between sunset and the time they set. Be sure you can find them easily in a dark sky long before you attempt them in twilight conditions! These are the galaxies M77, M74, and M33. M33 is further north in the sky, and therefore sets more slowly than the other two. But beware of taking too much time searching for M74 or M77 and missing the opportunity to nail M33. They set fast!

If you have your telescope tracking the star near M74 when it first becomes visible, you will have a better chance of catching it during its tiny window of opportunity. Bag M33 with your binoculars while tracking for 74. Don't waste time if it becomes apparent that you've missed one. There are other objects in the southwest plunging toward the horizon that you can't let get away!

Save the Virgo group of galaxies for the last part of your before-midnight leg of the race. It takes lots of time to positively identify the right objects in this cluttered field of galaxies. An equatorial mount with a clock drive will save a lot of aggravation here, when you are constantly dividing your attention between your charts and the eyepiece.

One trick I found to be of supreme benefit was to prepare beforehand a list (in 16-point bold type - easier to see under dim red light) of the objects roughly in order of their setting time, with their respective page numbers in the star chart. I had this on a clipboard, and had the objects in the chart circled with pencil marks. This was a tremendous time saver.

After the Virgo group is done, you will have plenty of time to relax, have a midnight snack, and shoot the breeze with your comrades, or even take a nap. Take advantage of it! There is another time-critical race coming before dawn - the Sagittarius region.

After your midnight rest, be a sniper. Pick off targets of opportunity as soon as you can. They can be positively identified above the Eastern horizon. You'll be glad you did in the twilight before dawn, when you feel the unstoppable Earth beneath your feet carrying you relentlessly toward the sunrise.

See Ya in the Dark!
- Jim Sapp

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Secondary Spectrum

Few will argue that low power wide field views of the night sky through short refractors (like binoculars, for instance) is anything less than grand, but have you ever wondered why using medium to high power eyepieces in those inexpensive short-tube refractors results in such a mess of chromatic aberration? It all has to do with secondary spectrum. Read on:

Typical achromatic doublet lenses for visual use are designed such that the red and blue portions of the refracted light come to a common focus. Such a lens is called "C-F corrected"; however there will always be a slightly different focus point for the green portion of the light. The difference in focal length between the green and the red/blue portion is called secondary spectrum. Since it is the yellow/green portion that we focus on, we find a slight red and blue haziness surrounding bright objects which grows more obvious with increasing magnification. This secondary spectrum grows more apparent as we increase the diameter of our lens relative to it's focal length, or shorten the focal length relative to the lens's diameter. Secondary spectrum is considered at an acceptable level if the diameter of the red and blue haze does not exceed three times the green light's Airy disk. For conventional Fraunhofer-type lenses, secondary spectrum amounts to about 1/2000 of the focal length of the lens.

So how short can I make a doublet objective lens, and have it still be "achromatic"? Here is a simple formula: Minimum Focal Ratio equals Objective Diameter (in millimeters) times 0.122. Or: \( R = D \times 0.122 \)

This leads me to build a handy table:

<table>
<thead>
<tr>
<th>Min. F/ratio</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>10mm</td>
</tr>
<tr>
<td>3</td>
<td>25mm (1 inch)</td>
</tr>
<tr>
<td>4.3</td>
<td>35mm</td>
</tr>
<tr>
<td>6.1</td>
<td>50mm (2 inches)</td>
</tr>
<tr>
<td>7.3</td>
<td>60mm</td>
</tr>
<tr>
<td>9.3</td>
<td>76mm (3 inches)</td>
</tr>
<tr>
<td>12.4</td>
<td>102mm (4 inches)</td>
</tr>
<tr>
<td>15.5</td>
<td>127mm (5 inches)</td>
</tr>
<tr>
<td>18.5</td>
<td>152mm (6 inches)</td>
</tr>
<tr>
<td>24.8</td>
<td>203mm (8 inches)</td>
</tr>
<tr>
<td>31</td>
<td>234mm (10 inches)</td>
</tr>
</tbody>
</table>

- And a 12 inch refractor needs to be a whopping 37 feet long! No wonder we don't see many refractors over 6 inches at the star parties!

Modern exotic (expensive) glasses and/or using three or more elements (expensive) in the lens can drastically reduce these numbers, but when shopping for a short-tube, let the buyer beware!

- Jim Sapp

P.S. Refractors still rule!! Hee hee hee...
NOTES FROM THE DARK SIDE

Cactus Flats, 19 January

We bugged out at 11:30 Friday night. The wind came up around 10:30 and blew a steady 15 mph, just got to be too painful on any exposed skin. Steve, Kimon and I were the only ones out, heavy frost shut Kimon down about 10:00.

We did enjoy clear skies though the seeing was not very good, could only push the planets to 275X. Did get a nice look at the GRS as it came around. I spent much time on M42 with different eyepiece combinations. The best was with the binoviewer at 180X, letting the whole cloud drift thru the field of view. I must have done this at least a dozen times.

- David Dunn

HEADS UP!

Things to See This Month Only!

This is the month to watch Venus! Only once every eight years do we get a show as good as this. Watch in early March as Venus begins it’s dramatic plunge into the sunset, it’s increasing acceleration growing more apparent every evening. By mid month, very sharp-sighted folks may be able to see Venus’s thin crescent with the naked eye - the rest of us need binoculars. By the 25th or so, Venus will be both a morning and an evening object; visible both after sunset, and before sunrise for a few days.

As Venus overtakes us in our orbit, we are rapidly approaching Mars! By month’s end it will have swollen to 10 seconds of arc in diameter and the first traces of surface features will become visible to telescopic observers with sharp optics under steady skies. Last opposition Mars only increased to about 14 seconds in diameter, but this time around it will grow to almost 21 seconds (by June 13); very nearly as good as it gets! See the article Diameters, Dates, and Declinations elsewhere in this issue for when the best will be (soon!).

Drive east of the mountains for the evening of March 2 to watch the 1st quarter Moon occult many of the stars in open cluster NGC1647 at around 7p.m. At about 8p.m. the same evening, the Moon will also occult the 11th magnitude asteroid 16 Psyche. The following afternoon you might also glimpse a 3rd magnitude star in Taurus suddenly reappear from behind the Moon’s sunlit side at the stroke of 5 p.m.

The week of the 24th brings the opportunity to join the ranks of the ragged (tired) in this year’s 2nd Annual LAS Mighty Messier Marathon to held at Cactus Flats - your opportunity to attempt to capture all 110 Messier objects in a single evening (and see the thin crescent Venus in the evening and morning skies).

Watch the Moon glide through the northern part of the Hyades cluster on the evening of the 29th. Too bad it misses so many of the stars, huh?

Meteors in March are the Virgind streams. These consist of several intertwined radiants that can produce zenithal hourly rates of 20 per hour or so. These can also be abundant fireball producers. HEADS UP!

EQUIPMENT AND BOOKS TO LEND

Don’t forget about the LAS equipment that is available for members to borrow, including a 10 inch reflector, solar scope, and many books and videos.

Contact your Equipment Manager, Leigh Pierson at 303 772-4689, or leighp13@bouldernews.infini.net to use this free service!

Jupiter’s Great Red Spot Transit Times for March, 2001

(Assuming Jovian system II longitude = 76 degrees)

Only events with Jupiter above the horizon and the sun below the horizon are listed. Times shown are MST (Longmont Standard Time). Add or subtract 10h 55m for other events not listed.

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Contributors to this month’s Journal:

David Dunn: observing report; Gary Garzone: Sterling Party info; Jim Sapp: Marathon article, Mars article, equipment corner, monthly solar system stuff; Brian Simpson: monthly star chart

Special thanks to MCDATA Corporation for the use of their copier.

Sorry if I missed anyone!
## Jovian Satellite Predictions
### for March, 2001

Only events with Jupiter above the horizon and the sun below the horizon are listed. Times listed are MST (Longmont Standard Time).

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### Key:
- Cal = Callisto
- dis = disappearance
- ecl = eclipse
- egr = egress
- Eur = Europa
- Gan = Ganymede
- ing = ingress
- Io = Io
- occ = occultation
- rea = reappearance
- sha = shadow
- tra = transit

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### L.A.S. CLASSIFIED ADS

**This is a service provided free of charge by the LAS for the members and associates of the society.**

Send ad submissions to the LAS Editor, 1209 Yale Lane, Longmont, Co. 80503, or e-mailed to jsstars@worldnet.att.net

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1-1/4", long eye-relief, reasonably priced eyepieces from 8 to 18mm focal length. Call Les Shaw at (303)499-0946

Older Meade Research Grade eyepieces, especially 20mm Erfle, and any orthoscopics. Call Jim at (303)776-5098

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**ASTRONOMY PUBLICATIONS**


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**Graze Observer's Handbook** by Harold Povenmire, Second Edition, signed by author. All magazines are $1 each; book is $20. Contact Dave at: street@juno.com

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**ADVERTIZING SPACE - price: FREE!**

**FREE TO GOOD HOME**

I have totally switched to CCD imaging but have many hundreds of dollars worth of scientific film. It has been frozen for years and in some cases decades. I will give it to anyone that is still doing serious astronomical photography.

Gry
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