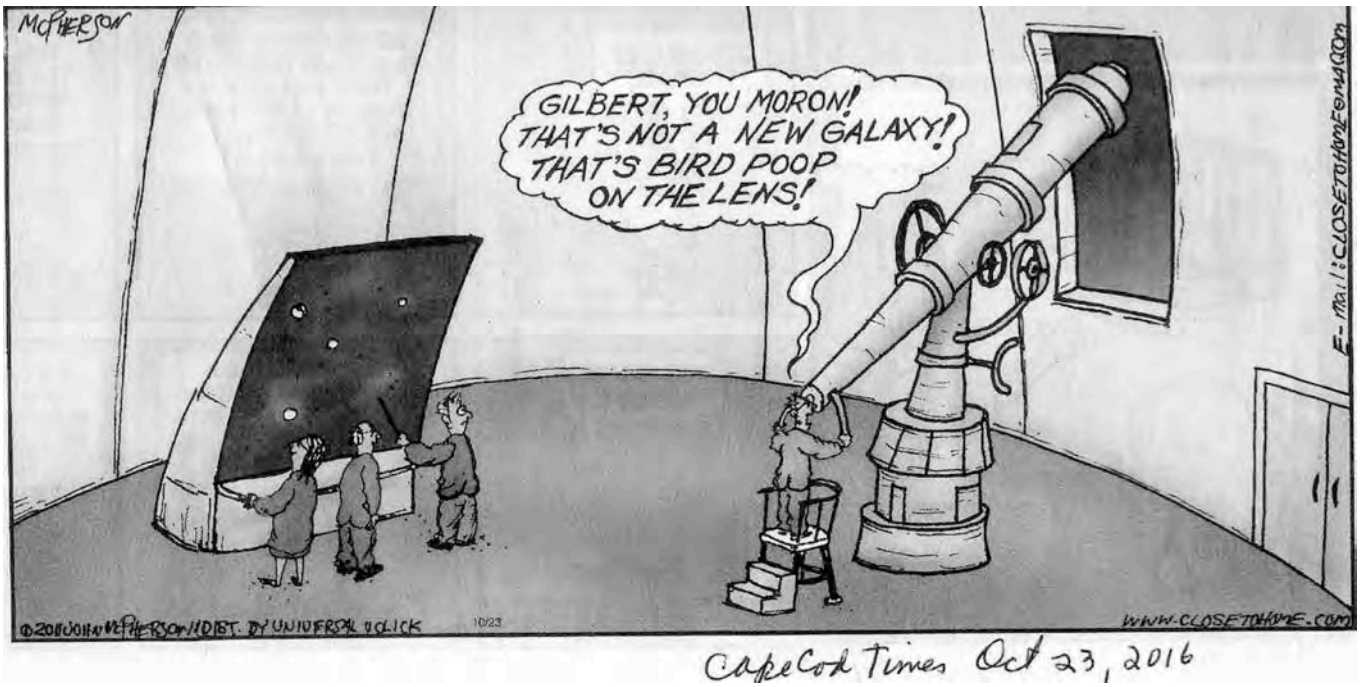
First Light

The Newsletter of the Cape Cod Astronomical Society

November, 2016 **Vol. 27 No. 11**

Poop??!!

Many Students from Jim Mitchell's **Earth and Space** *Class and other Groups Work at The Schmidt Observatory at this time of year. As our Staff are Good Student Mentors and Telescope Maintainers, with luck, this is unlikely to take place with* **OUR** *Students at the dome.*



Good luck to Students and Staff this Season at our Observatory!

Our Next Monthly Meeting is Thursday, October 3rd, at 7:30pm in the D-Y High School library. Dr. Chat Hull, Jansky Fellow of the National Radio Astronomy Observatory, will speak to us on **Star Formation Through Radio Eyes**: what we can learn about the universe with the tools of Radio Astronomy.

Reminder: The Summer Schedule of Every-Thursday Star Parties at The Schmidt Observatory ended in August. **Monthly "Quarter-Moon-Saturday" Star Parties continue on November 4th, 7:30-9:30pm. Public Welcome.**

In this issue: *Three* new Members This Month / Daylight Savings Ends / Saturn Season Ends / "Super Ultra Hyper" Full Moon / Educational Outreach to D-Y Regional High School Students-Fall m2016 / 12" Meade LX200GPS Telescope for Sale

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Bright New Stars:

We have *three* new CCAS members to announce this month!

We welcome **Mia and Darlene Halter** of Bourne to membership in CCAS. Mia is an office manager for the local federal Natural Resources Conservation District offices in Hyannis and Darlene is a healthcare worker at Cape Cod Health in Falmouth. Mia taught Astronomy and Physics in High School some years ago…tried to find an Astronomy Course when at Oregon State University… couldn't, and became a Soil Scientist!
They have an 152mm Maksutov-Newtonian Levy telescope and are looking to upgrade the mount. Welcome, ladies!

We are pleased to welcome **Peter W. Yaremko** of Truro to membership in CCAS. Peter is looking to "re-establish" his involvement in amateur astronomy. He has a Meade ETX90-EC Telescope, an early model which has motorized slewing and tracking but is not "Go To…." A CCAS member is working with Peter to check out need for new battery holders and/or cleaning. Welcome, Peter!

We welcome **Kenneth H. Brink** of Falmouth to membership in CCAS. Ken retired last year as a Senior Scientist at WHOI having spent more than 35 years there. He has an undergraduate degree in Applied Physics, a PhD in Physical Oceanography, and is still active with the Institute. He has a small telescope, which he uses only rarely. His principal interest is the talks at CCAS meetings. Ken's comment on CCAS speakers: "The subjects are very interesting to me and the speakers have been really good." Thank you, Ken. Welcome aboard!

We like to profile new members in our Society in this section of First Light each month. If you are a new member and have not yet been so recognized, or might have new information for us (background, astro equipment preferred, interests, etc.) on yourself or someone else, please let us know (email info@ccas.ws).

MEMBERS: PLEASE CONSIDER SUBMITTING AN ITEM OR ARTICLE FOR PUBLICATION IN *FIRST LIGHT*.

CCAS News Items and Current Events:

CCAS Meetings:

Many thanks to Dr. Charles J. Lada from HSCfA for his most informative talk at our October meeting: **The Search for Stellar Origins from Antiquity to the 21st Century**. Dr. Lada reviewed the history of ideas and concepts about the nature of stars and stellar origins from the ancient Greeks to Newton and then to William Herschel who, in the eighteenth century, proposed a surprisingly modern picture of star formation. He discussed the "dark ages" of the nineteenth century and described the advances in physics and astronomy in the early twentieth century that led to the critical discovery of the true nature of the sun and the stars and set the stage for the renaissance in star formation research that began in mid- to late twentieth century and continues unabated today. Please see the minutes for our October meeting (web address below) for more information.

Upcoming Meetings:

Dr. Chat Hull, Jansky Fellow of the National Radio Astronomy Observatory, will speak to us on **Star Formation Through Radio Eyes** at our meeting on November 3rd. Like Dr. Lada, Dr. Hull is currently based at HSCfA in Cambridge. He is from a small town in upper New York State, and was a high school teacher for some years after graduating from UVA before jumping to graduate work in radio astronomy at Berkeley and now postdoc work in Cambridge.

Here is a short abstract for his talk:

How do stars form? How can we use radio waves to probe the origins of stars within their cold, dusty natal clouds? And how do magnetic fields affect the star-formation process? Come and find out how I use ALMA, a millimeter-wave radio telescope in the Atacama Desert in Northern Chile, to find answers to these questions. I will begin by discussing the basics of radio astronomy, radio telescopes, and star formation. I will then talk about the research I've been doing on polarization and magnetic fields in forming stars, both as a graduate student at UC Berkeley and as a Jansky postdoctoral fellow at the Harvard-Smithsonian Center for Astrophysics.

We are pleased to announce that Bernie Young, Research Director at The Schmidt, will speak to us at our meeting on December 1st on **Apparent Retrograde Motion.**
At certain times of year and with certain planets, apparent retrograde motion is an interesting phenomenon we can enjoy observing over many days and share with others. We will discuss how to predict these opportunities from a planetarium or sky simulation app or a planetary ephemeris.
Not all retrograde motion planet trajectories look alike, and factors affecting the type of trajectory will be explained.
For those inclined to do the math, there is an easy way to generate quantitative information on a planet's trajectory.
Some hints will be offered for those who want to document a retrograde trajectory using astrophotography.

Reminder:
Gus Romano (or his delegate) "hosts" a Dutch-treat dinner gathering for members and friends on each CCAS meeting night (before the meeting) at the South Yarmouth Hearth & Kettle restaurant at 5:45pm; (the meetings begin at 7:30 at D-Y.) The speaker for each meeting is always invited.

Please join the group to dine and talk about all things interesting, including astronomy! The H&K is at 1196 Rte 28, South Yarmouth, about a half mile west of the Station Avenue/Main Street intersection with Rt. 28 (traffic light).

Jim Lynch, CCAS President, assisted by Mike Hunter, Vice-President, is our present Program Chairman. Please contact Jim or Mike or info@ccas.ws if you have any leads on speakers for January and beyond. We are especially looking for speakers from the CCAS membership.

Members, *PLEASE* participate in the effort to recruit good speakers to present programs in astronomy and related sciences at our meetings.

Please let us know if you have any leads…

or, even better, volunteer to give a talk yourself!

CCAS Dues:

The 2016-2017 dues cycle began on ***July 7th.*** Dues for most folks are $30/year. If you have not yet paid, please do so this month if possible, even if you have been accustomed to making payment at other times of the year.

We need this money to pay our bills, pursue outreach, and support our Observatory! *Annual Dues payment is part of membership!* Please bring your check to the meeting or mail right away to: CCAS, 34 Ridgewood Rd. Orleans MA 02653. Thank you.

The Cape Cod Astronomical Foundation is now participating in the AmazonSmile program (http://www.smile.amazon.com); please go to this Amazon login page and sign up. Going forward, 0.5% of the price of all your Amazon purchases will be donated to the Cape Cod Astronomical Foundation when you are a signed-up participant.

The minutes of the October meeting are on our website; click on the "Minutes" button at www.ccas.ws or click on this link: *http://www.ccas.ws/minutes/ccasminutes100616.pdf*

From the Dome:

Please see the overview, beginning on page 5, of work Bernie Young, Jim Mitchell (DY teacher) , and associates are doing to acquaint DY High students with amateur astronomy at The Schmidt Observatory and involve honors students in "hands-on" astronomy special projects.

This outreach is the heart of the mission of our Society. Members, *do* please study this report, and, if you think you could help in any way, please volunteer.

The "off-season" Schedule of once-per-month "Quarter-Moon-Saturday" Star Parties Continues Saturday, November 5th at 7:30pm at The Schmidt Observatory; Public Welcome.

Want to know what a "Quarter-Moon-Saturday" Star Party is? Our website ("Star Parties and Activities Info" button) describes it this way:

From September thru June, we will have one regularly scheduled Star Party each month on the Saturday closest to the date of First Quarter Moon (about 7 days old); start time: 7:30pm End Time: 9:30pm.

When the moon is near its First Quarter, the terminator (the line dividing light from dark) is favorable for viewing sunlight or shadow on the sides of craters. This time is also good for observing the dark side of the moon occult (cover) stars in the sky beyond it as it moves in its orbit.

The continuing schedule for "Quarter-Moon Saturday Star Parties" follows. *Public always welcome.*

Saturday	November 5th
Saturday	December 10th
Saturday	January 7th
Saturday	February 4th
Saturday	March 4th
Saturday	April 1st
Saturday	May 6th
Saturday	June 3rd

November Observing:

Observing Resources:

Please see resources in the October issue of *Astronomy Magazine*, pp 36-43, and *Sky and Telescope*, pp 41-59 for good guides to the sky.

Highlights in the Night Sky for November:

- **Daylight Savings Time** ends at 2am on Sunday, November 6th. "Fall Back in Fall." Suddenly, on Cape, the sun sets well before 5pm EST.
- If you are a **Saturn** fan and don't like rising early to observe, November is your last chance to view the ringed planet in the evening this year. Don't procrastinate!
- While the moon will be just past full when the **Leonid Meteor Shower** peaks on November 17th, because the earth moves through the comet debris field for many days, the shower really "lasts" from November 6th through 30th . So, look anytime… there will be more "stray" shooting stars this month than in most months.
- Finally, you will likely soon see in the media much hype about the "**Super Ultra Hyper" Full Moon** expected this month. Take a look at a most informative and entertaining story about this phenomenon written by Bob Berman in the November issue of *Astronomy*, p8. Berman separates the bunk ("this full moon will be *twice* as big as usual when it rises") from a list of true and interesting facts. Here's some of them to share with your friends and neighbors:

Moon Phases, November, 2016

First QTR, Monday, November 7th, at 2:51pm EST
Full Moon, Monday, November 14th, at 8:52am
Because of perigee and Alignment, HIGH TIDES 11/15!
Moon is also at perigee 221,524 miles 11/14, 6:21am EST
Last QTR, Monday, November 21, at 3:33am EST
New Moon, Tuesday, November 29th, at 7:18am EST

- The full moon on November 14th (see our Moon Phases table) will appear to be larger than usual. Perigee occurs on the same day as the moon achieves full illumination; and the moon this month will be closer to earth (221,524 miles) than it has been since 1948! But it will not be *twice* as big!
  Actually it will be 7% larger in observed angular diameter than average. The next time the moon will appear this large will be November 25, 2034!
- This especially close perigee happens when the earth and moon *and sun* are all lined up (true at full moon and new moon) AND when the earth is close to the sun in its orbit (in November we are close to perihelion which takes place in January.)
- Yes, the full moon looks larger when it is rising. But that is an illusion. Measure its width with a ruler at rise, measure again when near zenith, and you will see it **isn't** *twice as big* at all.
- Now, this particular near and full ('Super") moon *will* cause extreme tides. Bob Berman makes the point that the highest high tides take place the day *after* such a moon. So, if you are a student of tides, visit a local dock at high tide at any location on Cape Cod on November 15th; if the dock is stationary (i.e., not floating) it likely will be under water.

Minima of Algol[1,3], November:

Algol, a variable double star in Perseus, shines normally at mag 2.1 but once every 2.87 days dims to mag 3.4. The dimming is caused by the dimmer of two self-orbiting stars eclipsing the brighter as viewed from earth.

There are *four* convenient evening occurrence of the Minima of Algol this month: Saturday, November 5th, (CCAS Star Party Night!) at 11:31pm EDT, Tuesday, November 8th, at 7:19 pm EST, Friday, November 11th, at 4:08pm EST (brightening only after sunset), and Monday, November 28th, at 9:02pm EST. November 5th is a CCAS Star Party night! The events on November 8th and November 28th are timed particularly nicely for Prime Time viewing of both the dimming and the brightening.

Using binoculars or a small telescope, try to begin viewing two to three hours before the minima to watch the dimming (record magnitudes now and then by comparing Algol with neighboring constant magnitude stars) and up to two to three hours after the minima to watch the brightening.

Mooncusser's Almanac and Monthly Alert[1]
NOVEMBER 2016

Object	NOV 1 (EDT))	NOV 15 (EST)	NOV 30 (EST)
Sun	R 07:13 S: 17:34	06:30 16:20	06:48 16:11
Moon	R: 08:55 S: 19:01	17:40 07:49	07:39 17:23
Mercury (in the sun)	R: 07:31 S: 17:42	07:32 16:47	08:24 17:10
Venus (evening)	R: 10:31 S: 19:28	09:54 18:42	10:06 19:08
Mars (evening)	R: 13:07 S: 22:17	11:44 21:15	11:16 21:15
Jupiter (predawn)	R: 04:47 S: 16:29	03:05 14:40	02:20 13:47
Saturn (early eve)	R: 10:04 S: 19:31	08:16 17:41	07:25 16:49
Uranus (most of nite)	R: 16:44 S: 05:48	14:48 03:50	13:47 02:49
Neptune (most of nite)	R 15:08 S 02:11	13:12 00:15	12:13 23:16
Pluto (early eve)	R: 12:18 S: 21:42	10:23 19:48	09:26 18:51

NEW COPIES OF THE BROCHURE INTRODUCING CCAS AND ITS ACTIVITIES ARE AVAILABLE; INQUIRE AT info@ccas.ws IF YOU WISH COPIES FOR DISTRIBUTION NOTICE:

Educational Outreach to Dennis-Yarmouth Regional HS Students – Fall 2016:

By Peter Kurtz

This report reviews plans and progress extracted from recent emails sent back and forth between Jim Mitchell, Teacher of the Earth and Space Course (and others) at D-Y and Bernie Young, Research Director at The Schmidt and principal liason with D-Y. Other Schmidt Staff members are also contributing.

CCAS members, as you read through this, you will clearly see opportunities to help. If you are willing, please let Bernie know now and during the school year!

- Jim Mitchell contacted Bernie in late August expressing an interest in the following programs for this school year"

1) Sun-viewing and WSO orientation at the WSO during school hours with 2 sections of the Earth and Space Class…to start as early as possible in the school year.

2) Honors projects with WSO mentors.

3) Night viewing at WSO 2-3 evenings (star parties and some project data work). Also, perhaps start in early October.

Jim also expressed an interest in our scheduling additional time for mentors to assist students with data analysis and presentation preparations. Jim is looking not only for his students to learn about astronomy, but also for them to grow in their ability to give "informative presentations with sound analysis and conclusions".

- Bernie's response included the following comments on ways our programs with the D-Y students can be expanded over prior years:
    - We are blessed with new volunteers to assist with this year' programs adding support to folks who worked last year, notably Hank and Marilou Richey; our new CCAS President, Jim Lynch, and recently joined member George Silvis, an active member of the American Association of Variable Star Observers, are new volunteers.
    - New Projects: We have concentrated on documenting the apparent retrograde motion of Mars and Saturn this summer. It is convenient but still rewarding to begin observing from the time the planets are in conjunction (and appear to be moving from east to west against the background of the celestial sphere) through their western elongation (when the appear to stop and reverse direction) and for a few day after to complete the illustration. Ten days ago Saturn achieved western elongation, and a few days later Mars went racing by (now in direct motion, i.e. from west to east), shooting the gap between Saturn and the star Antares. The product of such observations is a time lapse superposition of images like the one made by Hank (you can see this photo of the recent retrograde motion of Mars in the August issue of our newsletter, *First Light* available at "Older Newsletters" button on the CCAS website.)
    - I am ready to start documenting the apparent retrograde motion of Neptune which will achieve western elongation around Thanksgiving time. Neptune is a slow mover.
    - Apparent retrograde motion can be illustrated by two people (students) walking in circles of two different diameters while tethered to a fixed point. It can also be computed using the JPL Horizons software to generate orbital positions and doing some simple trig calculations on a spreadsheet.
    - We now have a fairly reliable and spectacular *transient event* other than movement of planets to consider project fodder during times this semester. We are 3 for 3 capturing Iridium flares, bright flashes of light from the solar panels on the Iridium communication satellites. There are usually one or two flares a week at convenient times. The site Heavens-above.com has predictions for Iridium flares and Space Station transits.
    - We have received a set of 5 astronomical filters to help with photometry of stars, particularly variable stars. I'm hoping George (Silvis) will be able to lend his expertise with this. It is a long trek here from Mashnee Island though.
    - Lunar occultations are fun. But more importantly, a call for observations has gone out to prescreen candidate stars in support of the Keppler II satellite project looking for exoplanets. We haven't been very involved in this yet. but I did record an occultation a couple of weeks ago which is unusual enough to motivate me to get a report out. We should progress in this area.
    - I have always held the vision that these projects could be conducted like laboratory experiments, with planning, observation, and reporting. The report should include the predictions, description of equipment used, and analysis as appropriate.

- For my part the celestial navigation project last year was very rewarding but was limited in scope because of limitations in staffing. *That's one more reason for trying to get more people involved.*.

- Bernie and Jim worked on schedules for September and October for members of Jim's Class to visit the WSO for solar viewing and general orientation to the capabilities of the WSO during daytime, and, separately, schedules for honors students to visit to learn about and then begin possible projects. Jim and Bernie worked also to set schedules for night visits of students to the WSO for both general observing of the night sky and possible beginning of work on honors projects.

- Progress:
  - Two groups experienced solar viewing on September 15.
  - Jim's list of honors students is growing as word gets around; he counts 21 honors students at mid September.
  - Honors Students visited the WSO during school hours on Monday, October 3rd to look at a menu of possible projects. The centerpiece for this visit was looking at individual project possibilities in a Power Point presentation Bernie had prepared.
  - Jim worked with his students to select projects subsequent to the 10/3 presentation at the Dome. During October, Jim and Bernie worked on refining dates and times students could begin visiting the WSO either during school hours or at night to work on their selected projects. Jim prepared a Word dDocument summarizing the projects that will be active as we go forward. Here's a summary:

- List of Astronomy Projects available for Honors Students (DY Earth and Space Class, 2016-2017):

01 NOON SIGHT
Purpose: Experience the 18th century discovery that longitude can be determined from the time of solar noon (determines the earth's rotation) and the date (determines the position of earth in its orbit). This is an essential skill for navigators, explorers, and map makers
Result: Latitude and Longitude of your location.

02 Transit
Purpose: Experience the 18th century discovery that longitude can be determined from the meridian transit of a known star (determines the earth's rotation) and the date (determines the position of earth in its orbit). This is an essential skill for navigators and explorers.
Result: Latitude and Longitude of your location.

03 SUNSPOTS-CLASSIFICATION
Purpose: Continue the 407year record of solar activity and interpret what the appearance of a sunspot indicates about the phase of its development and decay. Experience the recording of sunspots on paper so as to appreciate the variability of sunspot number reports.
Result: your sunspot number for the day and classification of each sunspot group

04 SUN ROTATION
Purpose: Demonstrate that the sun is not a rigid body but rotates at different rates depending on latitude. Compare your telescopic observations of the sun with satellite images.
Result: the rotation period of the sun at specific latitudes.

05 LUNAR OCCULTATION
Purpose: Contribute to the database of multiple stars that are too close to observe directly from earth because of atmospheric disturbance. With sufficient data from several observers, over time we can determine separation and orbital phase of component stars. Answer a "call for observations" in support of the NASA Kepler II program to identify exoplanets.
Result: Video record of stars disappearing behind the dark edge of the moon, and extracting a curve of light intensity as the stars disappear.

06 SPECTROSCOPY
Purpose: Identify elements in stellar atmospheres, temperature, radial velocity, etc., from the spectrum of a star.
Result: Images of stars and their spectra; possible identification of elements.

07 ASTROPHOTOGRAPHY
Purpose: Acquire skills in capturing and enhancing images of celestial objects.
Result: Photographs and videos of objects of interest to the student or needed for other student projects.

08 VARIABLE STARS
Purpose: To measure the magnitude and time of minimum of a short-period eclipsing binary star.
Result: Curve of light intensity around the time of minimum, time at which minimum occurred

09 RETROGRADE MOTION
Purpose: Record the position of a planet during the time of its apparent retrograde motion cycle.
Result: Individual images of Neptune and generation of a Composite image showing the Westerly Elongation of Neptune occurring around November 20, 2016.

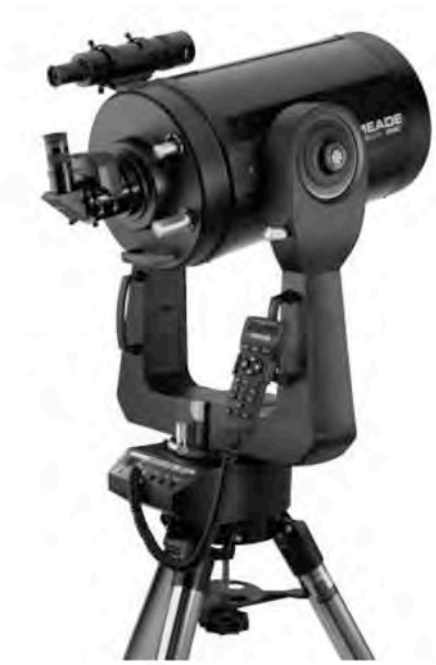
10 SIDS (not performed in 2016)

11 CROSS-STAFF <DO NOT AIM THE CROSS STAFF AT THE SUN OR LOOK AT THE SUN. PERMANENT EYE DAMAGE WILL RESULT.>
Purpose: Recreate an activity commonly performed by ancient surveyors, mariners and astronomers
Result: A star chart of the area you survey

12 LIMITING MAGNITUDE
Purpose: Determine how faint a star can be observed with the 16inch telescope at the Werner Schmidt observatory. Experience the effect of polarizing and photographic filters on the ability to see stars.
Result: Data on magnitude, altitude, and angular distance from the sun of a range of stars, planets, and their moons.

13 ALT-AZ TELESCOPE
Purpose: Understand how one method of aiming an Altitude-Azimuth telescope uses data to develop a mathematical model connecting two coordinate systems. Gain experience in entering data in a telescope controller and using it to observe celestial objects.
Result: Experience in working with Alt-Az telescopes, their advantages, and limitations.

12" Meade LX200GPS For Sale:



Kim Zanco and Bobby Spongberg, Dennis residents, have for sale a new Meade LX200GPS with accessories and a sturdy tripod including eight Meade Super Plossl eyepieces(6.4, 9.7, 12.4,15.0 20.0 26.0, 32.0 and 40.0mm) and various eyepiece filters.

The telescope is essentially brand new and in pristine condition. It was left to Kim and Bobby by Steve Spongberg, Bob's brother, who, unfortunately, died almost directly after buying the 'scope two or three years ago.
An experienced amateur astronomer from Cape Cod Astronomical Society has checked out the telescope for Kim and Bobby and found it has immaculate and sharp optics and is in good "Go To" working order. Kim and Bobby are asking $4000.00 for this telescope. Interested parties please contact Kim at <kzanco@gmail.com> or Bobby, 978-375-0074 (cell).

Cape Cod Astronomical Society

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Secretary	Gus Romano	7819294770
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Mailing Address: A. P. Kurtz, CCAS Treasurer, 34 Ridgewood Rd, Orleans MA 02653

* Mike Hunter will serve until Jim retires from WHOI later this year.

Cape Cod Astronomical Foundation

Chairman Emeritus	Werner Schmidt	5083629301
Chairman	Mike Hunter	5083859846
Vice Chairman	Ed Swiniarski	5088965973
Director of R&D	Bernie Young	5083941960
Secretary	Joel Burnett	5082217380
Treasurer	Gus Romano	7819294770
Observatory Director	Joel Burnett	5082217380
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The **Cape Cod Astronomical Society** meets at 7:30 pm on the first Thursday of every month in the library of the Dennis-Yarmouth Regional High School in Yarmouth, Massachusetts. Meetings are open to the public. Membership dues are $30 for adults, $15 for students in two year colleges and part year residents, and no charge for spouses or for students in K12 schools.

REFERENCES AND NOTES FOR THIS ISSUE:

1) Information for The Mooncussers Almanac and Monthly Observing Alerts was extracted from Sky Events, Astronomy Magazine Online (Astronomy.com), and Stargazing.net's Planet Rise/Transit/Set calculator (http://www.stargazing.net/mas/planet2.htm), *Astronomy Magazine*, *Sky & Telescope Magazine*, *Sky and Telescope Skywatch 2011*, and other sources. The *Observer's Handbook, 2010 and 2011,* published by The Royal Astronomical Society of Canada is also an important reference, particularly for information on lunar libration and declination and the minima of Algol.

2) Information on how Libration and Declination Maxima and Minima can make visible parts of the moon normally hidden was reviewed in the January2007/January2008 *First Light*. Quick recap: Max Long brings to view extra right side; Min Long, extra left side; Max Lat, extra north side; Min Lat, extra south side. Max Dec puts it high in our sky during its transit; Min Dec puts it low.

3) Algol is an eclipsing variable star in Perseus which has its brighter component eclipsed or covered by its companion once every 2.87 earth days. When the dimmer component is not eclipsing the brighter, Algol appears typically about magnitude 2.1; when eclipsed, magnitude 3.3 The minima usually lasts about two hours with two hours on either side to bring it back to mag 2.1. Good comparison stars are γAndromedae to Algol's west, mag 2.1, and εPersei to its east, mag 2.9.

S&T's reliable calculator for Minima of Algol dates and times can be found at:
http://www.skyandtelescope.com/observing/celestial-objects-to-watch/the-minima-of-algol/
[If you are not a registered user yet of *Sky and Telescope* online, going to this website will result in arriving at a screen asking you to become a registered user. No need to be a subscriber to either the print or online editions of the magazine. For future access to the S&T website, you will be prompted to enter your user ID and password.]

5) *S&T*'s interactive Java utility for showing the positions of **Jupiter's main moons** for any date and time:
http://www.skyandtelescope.com/observing/objects/planets/3307071.html

for **Saturn's moons**: http://www.skyandtelescope.com/observing/objects/planets/3308506.html