



First Light

The Newsletter of the Cape Cod Astronomical Society



April, 2010

Vol.21 No. 4

- **Next Monthly Meeting:** is Thursday, April 1st at the DY Library. Program notes below. If we are blessed with a clear night, and interest is sufficient, observing from the Schmidt will follow the meeting. Please see the moving banner and the tail of the rocket on our website's home page for upcoming speakers and topics.
- **Star Parties** open to all members and the public will resume on Thursdays in June, 2010. Contact info@ccas.ws or Mike Hunter, Observatory Director, if you wish to set up a special Star Party for your group during the winter, or spring months. MEMBERS, particularly newly joined MEMBERS: we would like to provide you an opportunity to observe. If you would like to schedule an evening at the Schmidt, contact us and we will try to schedule something for you soon.
- **Feature Articles this month:**
 - Kelsie Krafton, Asteroid Hunter
 - Light Pollution Initiative in Harwich
 - Video: Tracking Daily World-wide Air Traffic

Bright New Stars:

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

Thank You! :

Thanks to Charlie Burke, Secretary, for his input to our overview of Paul Cezanne's talk on March 4th and to Jon Greenberg and Tom Leach for contributions to some of our Feature articles. Special thanks to Kelsie Krafton and her supporters for her work on asteroids and for visiting with us at our March 4th meeting. Please see the Feature Article on Kelsie beginning on page 5.

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

If you are a regular contributor, thank you very much!

CCAS Events

Many thanks to Paul Cezanne, our Vice President, for his most informative talk at our March meeting. Paul covered Messier Objects and recommendations on how to conduct a spring Messier Marathon. Messier was born in 1730. His interest was in discovering comets. He found that during his comet searches that he kept viewing objects that at first appeared to be comets, but after further sighting did not move across the sky in the fashion of a comet. To help other astronomers and himself avoid wasting time mistaking these objects for comets, he compiled a list of 109 objects, later expanded to 110: objects which cannot be new comets. **Messier Marathon:** the average duration of darkness in late March at our latitude is 10.5 hours. This leaves an average of 5.8 minutes for each object. Paul provided strategies for preparing for and accomplishing the viewing of the entire list from dusk to dawn. He recommended the use of binoculars as they provide a wide field of view and are easy to use. Paul also recommended good software tools for overviewing Messier objects and planning a marathon. One such tool, the McNish Planner, can be downloaded from reference 6.

Paul had scheduled a Messier Marathon at the Schmidt for the evening of March 13; the event was cancelled because of storms and will possibly be rescheduled for April. At our meeting on March 4, Tom Leach reviewed his recent

efforts to engage the town of Harwich in town-level planning to promote dark skies (Feature Story on page 6.) Tom also encouraged members to participate in a scientific dark sky survey effort called "Globe at Night". This is an initiative that is repeated from time to time; the current effort was scheduled for 3-16 March. The program is designed to determine the quality of the night sky all over the world. Further information is available at www.globeatnight.org/index.html. It is likely that another Globe at Night program will take place in early summer.

As part of his local campaign Tom is creating a video containing illustrations of light pollution on Cape Cod. More on that on page 6.

At our next meeting on April 1, MIT's Dr. Marcia Batusiak will give her talk "The Cosmologist Left Behind". This is an adaptation of the story presented in her latest book, "The Day We Found the Universe". She will talk about the critical work of Vesto Slipher who rebuilt and mastered the delicate Lowell Observatory spectrograph under Edwin Hubble. Hubble usually gets credit for the key discoveries that were made with that spectrograph, but it was Slipher who was first to see the signs that the universe is expanding.

Looking ahead, at our meeting on May 6th, Hugh Blair-Smith will tell us "the rest of the story"; He will continue his review of episodes in his career in building software in support of American space programs. Hugh gave us a spell-binding talk in August, "Chapter 1", on his remarkable career in "machine-language" level software building in support of several historic NASA programs. Hugh is back in May. Not to be missed.

Thanks again to our program chairman, Tom Leach, who continues to put together great programs for our monthly meetings well into 2010. If you'd like to look ahead, go to our website and look at the gray box just below the base of the rocket. There you will see what has become our "Speaker's Bureau": profiles on speakers and topics from now through November 4th.

Members, **PLEASE** participate in the effort to recruit speakers to present programs in astronomy and related sciences at our meetings. Please send any ideas or contact information to Tom Leach, our President and Program Chairman. For sure he will follow up.

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

Astronomy Nights at Bank Street Bogs

Join Harwich Harbormaster and CCAS President Tom Leach for a telescopic look at the night sky on any of the following evenings at the Bank Street Bog; CLOUDY WEATHER CANCELS: Thursday, April 15, 9pm; Tuesday, April 20, 9pm; Thursday, April 22, 9pm; Thursday, May 13, 9:30pm; Tuesday, May 18, 9:30pm; Thursday, May 20, 9:30pm. Bring your own binoculars. Directions: From Harwich Center go south on Bank Street. Park in the Harbormaster Parking Lot on the left at 203 Bank St. Free.

The minutes of our March meeting are available on our website; click on the "Minutes" button at www.ccas.ws or go to <http://www.ccas.ws/minutes/ccasminutes030410.pdf>

Executive Corner

The Executive Board exchanges ideas by email and phone on a continuous basis and now and then formally convenes by conference call. Anyone wishing to offer an item to the agenda, please contact Tom, Paul, Peter or Charlie.

All Members please be sure your dues are current!

Please make your payment either by bringing to a meeting or mailing directly to CCAS at PO Box 297 Harwich Port MA 02646. Thank you. .

Foundation News...

... when items are submitted...

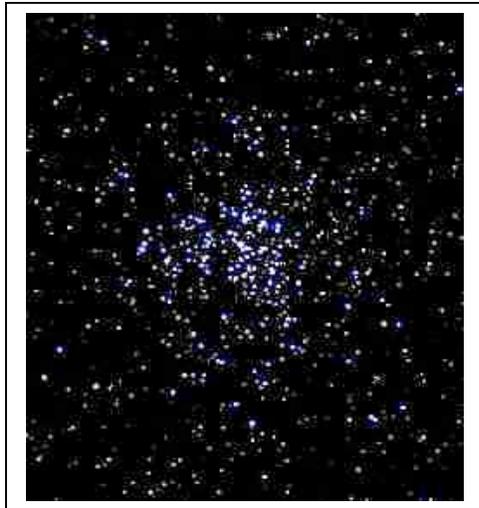
From the Dome

Members of the Observatory Staff continue to cross-train on alignment and operation of our three computerized telescopes. Our goal is to have several staff members familiar with each 'scope sufficient to guarantee redundant knowledgeable operators for all summer star party sessions.

Bernie Young and Mike Hunter have upgraded the mounting of the spotter scope on the 18" Obsession.

Peter Kurtz, Bernie Young, Mike Hunter and Gail Smith hosted a Star Party for Adam Cutler, a teacher at DY, and eight DY students on a beautifully clear night on March 17. Highlights included (in the 18" Obsession operating in "Push To" mode): spectacular views of a low 2-day old crescent moon; Mars; Saturn with at least four of its moons; and The Great Orion Nebula; and (in the 16" in the Dome): Mizar and Alcor; the beautiful triple star σ -Orionis; the M37 open cluster in Auriga and a splitting of the 4.5" wide double star Castor in Gemini. We also found mag 6 asteroid Vesta below ϵ -Leonis with the 16". A good "laser pointer" survey of the overhead constellations was highlighted by a

spectacular short “fly up and die” appearance of the mag -3 **International Space Station**.



Open Cluster 37 in Auriga

Quasar 2c273 was observed with the 16 inch Meade telescope at a gathering of several of the Observatory Staff earlier in the month. Mike Hunter likes to point out that the photons hitting your eye from this distant quasar have been traveling for only 2.5 billion years. So that is indeed a look back in time!

Planning continues for the summer star parties which will begin in June.

New eyepieces will be purchased for the telescopes at the Dome to make possible (with what we have now) the availability of a reticle (for alignment work), one good quality wide field and also a good quality high magnification eyepiece for each of the 18” and 16” scopes. The Society and Foundation will collaborate on these purchases.

Spring is a wonderful time for observing!!!!

As always, “Private” group or individual observing sessions at the Werner Schmidt Observatory may be scheduled by contacting observatory Director Mike Hunter at mamhunter@yahoo.com or sending an email to info@ccas.ws

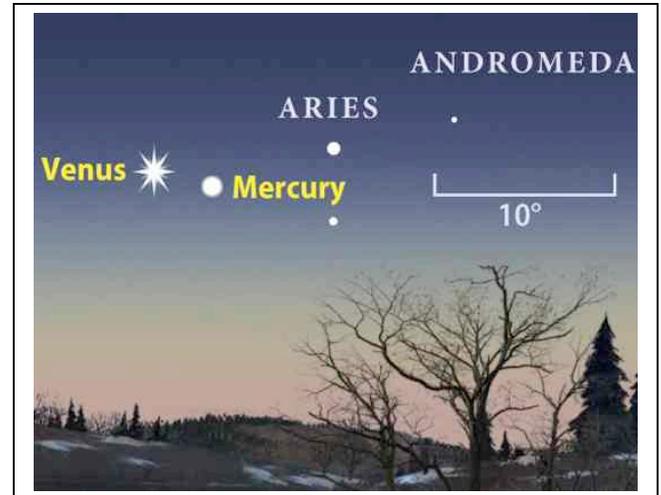
**Our Society exists to promote observing!
Promote this objective by asking for time at the Dome!**

CCAS has both 8” and 14” Dobsonian telescopes for loan to members. Currently, Tom Leach is using the 14” for outreach in Harwich. If you wish to borrow one of these ‘scopes, contact info@ccas.ws

April Observing:

PLANETS:

- **Venus** and **Mercury** travel within 4° of each other the first ten days of April so Venus serves as a nice pointer during that time. The first half of April offers the best
-



Venus points to Mercury April 8;⁷
Mercury maximum separation from sun this date

views of Mercury in 2010; the planet is *at least* 10° separated from the sun 4/1 through 4/15. Don’t miss it in the early evening sky. See how soon after sunset you can find it using Venus as a pointer even with a fairly bright sky. The little planet is 8” in diameter, 38% lit on April 8th.

- **Venus** blazes at -3.9 this month. From now until September it gets closer and closer to earth and becomes more and more crescent-shaped as it catches up on earth in its inside-track orbit. As it becomes more and more partly lit it actually grows in apparent brightness as distance to earth diminishes.
- **Mars** continues to diminish in April but this month offers one spectacular show as it does so. Mars passes within 2° of the Beehive open cluster (M44) for four days in April: 4/15-4/18. It is traveling east from the Gemini twins while in Cancer. Use a wide-field telescope or binoculars having a true field of 2° or more if possible for the best view.
- **Saturn** continues to rule the sky all night during April. Half the fun is watching its moons move; the smaller ones move noticeably over an hour or two. Reference 8 steers you to magazine and online portraits of the moons any date or time in April and beyond.

Mooncusser's Almanac and Monthly Alert¹
By Peter Kurtz
APRIL, 2010

racetrack. *Now is the time to study Vesta.*

GENERAL OBSERVING RECOMMENDATIONS:

Now and then *Astronomy* editors create nice lists of general observing targets good for a given season. This month, video and text reports are both available for good spring targets for small telescopes (by Michael Bakich)¹⁰ and for large telescopes (by David Eicher).¹¹

Highlight targets include: (small telescopes):

Mizar, M81 & M82 galaxies in U Maj., the Owl Nebula (M97), spiral galaxy M101, the Whirlpool (M51), the Sombrero (M104),

and (large telescopes):

Mike Hunter's favorite quasar (3C273), the Great Globular Cluster of Hercules (M13), galaxies NGC4319 and NGC 3190, the Blackeye Galaxy (M64) and the planetary nebula NGC3242.

SPECIAL EVENTS

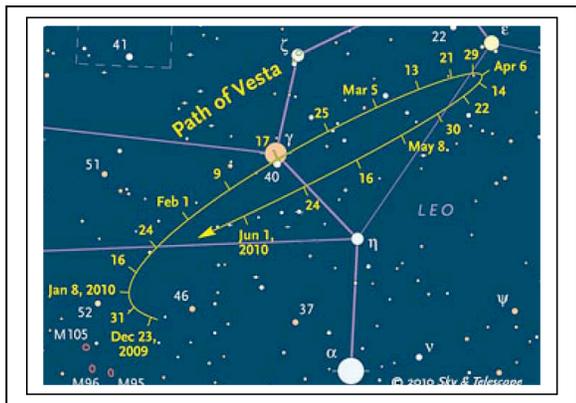
- The **Lyrid** meteor shower runs from April 16 through 25th so keep your eyes to the sky; earth will pass through the debris causing this shower for several days. The peak will show toward the east at dawn on April 22 after the waxing half moon has set. The radiant passes overhead as the moon sets; 15 to 25 meteors per hour may occur.

Once again, all of us have access to excellent summaries of interesting sky objects to be seen in the upcoming month in the print editions of both [Astronomy Magazine](#) and [Sky & Telescope](#). The websites for both magazines also offer a wealth of information on "what's in the sky this month".^{4,5} Both outfits also offer weekly or monthly email newsletters to help you keep abreast of what's happening. Look also on the CCAS website for other good observing guides.

Object	Apr 1 (DST)	Apr 15 (DST)	Apr 30 (DST)
Sun	R 06:23 S: 19:05	06:00 19:21	05:38 19:37
Moon	R: 22:18 S: 07:40	06:17 20:48	22:10 07:03
Mercury (dusk, sun)	R: 06:56 S: 20:34	06:28 20:53	05:28 19:19
Venus (evening)	R: 07:12 S: 20:43	07:00 21:18	06:56 21:54
Mars (evening)	R: 12:54 S: 03:54	12:21 03:08	11:52 02:23
Jupiter (predawn)	R: 05:33 S: 16:58	04:45 16:19	03:53 15:36
Saturn (all nite)	R: 17:54 S: 06:17	16:54 05:19	15:51 04:18
Uranus (dawn)	R: 05:54 S: 17:49	05:01 16:58	04:03 16:03
Neptune (predawn)	R: 04:43 S: 15:18	03:49 14:25	02:50 13:27
Pluto (midnite)	R: 01:27 S: 11:19	00:31 10:23	23:32 09:24

ASTEROIDS:

- Magnitude 6 **Vesta** continues its cycle in Leo all this month and well into June. It is static as it reverses its



Path of Vesta: January thru June 2010⁹
"easy to see small movements in sky nite to nite"

course on April 7th as shown in the chart. Watch it almost immobile for several days centered on the 7th and then watch it speed up again in later days as it takes off back to the southeast. By next month, Vesta will have faded by about 50% as earth increases its lead on the faster inside lane of the solar system

Moon Phases, March, 2010

Last QTR	Tuesday, April 6 th at 5:37 DST
New Moon	Wednesday, April 14 th at 8:29am DST
First QTR	Wednesday, April 21 st at 2:20pm DST
Full Moon	Wednesday, April 28 th at 8:18am DST

Feature Articles:

Kelsie Krafton, Asteroid Hunter

by Peter Kurtz

A story was written by Robert Gold in the February 25th issue of the Cape Cod Times¹² reporting on the exploits of a Sturgis High School student named Kelsie Krafton. The story reports that this local student has, remarkably, identified two new asteroids! Cape Cod Astronomical Society has discovered it has an accomplished asteroid hunter right in its own back yard. Well, one thing led quickly to another. Tom Leach invited Kelsie and her teacher and mentor, Randy Carspecken, to our meeting on March 4. Happily for us, Kelsie and Carspecken could and did attend and Kelsie gave us a most professional and informative short presentation on her work searching for asteroids.

Kelsie, a senior at Sturgis, began looking into astrophysics some two years ago. Her interest in that field led to her participation, with guidance from Mr. Carspecken and program scientists, in The International Astronomical Search Collaboration Program¹³. This program, organized by Dr. Patrick Miller of Hardin-Simmons University in Abilene, Texas, invites students to participate in the identification of new asteroids (and other novel sky objects) by working with special software programs making possible visualization of new bodies pictured in reams of sky images and other data made available by participant institutions. Each year, about 240 schools worldwide, ranging from middle school to college, participate in the search for asteroids and other objects; about 150 asteroids are discovered through the program each year.



Kelsie Krafton, a senior at Sturgis Charter Public School in Hyannis, hopes to add her initials to the names of the two asteroids she has discovered. [Photo: Steve Heaslip, Cape Cod Times]

Students like Kelsie access images and related data online and examine same with utilities in software called *Astrometrica*,¹⁴ “shareware for research grade CCD Astrometry.” The software provides routines having such names as “moving object utility” and “blink utility” for examination of raw image data making possible identification of which blobs of light on images of small sections of night sky might in fact be objects which have not been recognized before. The data Kelsie was examining were provided in this case by a private astronomical observatory in Illinois.

Indeed, on Valentine’s Day, 2010, Kelsie identified two objects in data she was studying as candidate “new discoveries” and submitted her findings to Dr. Miller in Texas. Very quickly, Miller emailed Carspecken with the news that Kelsie had found two new asteroids. Kelsie had discovered two asteroids that are somewhere “between the orbits of Mars and Jupiter,” Miller said; “roughly two to four times farther away from the Sun than Earth is from the Sun.” For now, the asteroids are named “2010 CK141” and “2010 CM141”.

Kelsie's finding ultimately will find its way to the Harvard University-affiliated Minor Planet Center in Cambridge. Within several years, astronomers will confirm and reconfirm the discoveries and profile the properties of the asteroids and their orbits. When those followup studies are complete, Kelsie may be provided with the opportunity to add her own initials to the names of the confirmed asteroids.

Many thanks to Kelsie for visiting with us and providing us a personal glimpse into the good science and excitement of her project and discoveries. CCAS was pleased to present her with a plaque congratulating her on her accomplishment and a token monetary prize. The plaque says, simply, "Cape Cod Astronomical Society. This certificate is awarded to Kelsie Krafton in appreciation for the Discovery of Two Asteroids, 2010 CK 141 and 2010 CM 141, given at the March 4th 2010 meeting of the Society."

It will be some time before we again have an equal opportunity to recognize such promise and accomplishment at one of our meetings.

But.... now... "The Rest of the Story"....

On March 14, Randy Carspecken forwarded to Tom Leach a *new* email dated March 13 from Patrick Miller, Director of the IASC program. Here's what Dr. Miller had to say:

Virtual Impactor Observation

K. Krafton from Sturgis Charter Public School (MA) and Bennett, Franco, & Collins from Mountain View College (TX) made observations of 2010 CS19 which was originally classified as a *potentially hazardous asteroid (PHA)*, an *asteroid that might pass close enough to impact Earth*.

Their observations were among those provided to the Minor Planet Center that allowed the MPC to refine the orbital elements and re-evaluate the threat. *The asteroid is no longer classified as a hazard* and has been removed from the PHA list maintained by the Jet Propulsion Laboratory in Pasadena.

This is an observation that is even more rare and valuable than a discovery of a new Main Belt asteroid.

Congratulations!!

Indeed. What will Kelsie accomplish next! Congratulations and thanks to Kelsie, Randy Carspecken and all who created the opportunity for and supported this endeavor; to include for sure Kelsie's Dad who stopped in briefly at the end of our meeting.

Local astronomers Aim to Limit Light Pollution¹⁵

Submitted by Tom Leach; by Jamie Balielt, *CAPE CODDER*
, February 19, 2010

[Tom Leach has initiated discussions with the Town of Harwich officials toward drafting and approving a Town Ordinance promoting future minimization of light pollution]

HARWICH — (2/19/10)

Although the recent talk of the town has been on waterways pollution, another kind of emission is permeating the night sky: Light pollution. As Harwich's population has grown, so have its subdivisions, street networks, stores and shopping plazas. With these changes have come widespread outdoor lights, illuminating everything from intersections to flagpoles to car dealerships and churches.

A handful of interested parties have raised the concern that many of these outdoor lights point skyward and are causing a collective glow, effectively blocking out what used to be an unobstructed view of the stars and planets. These residents are asking the town to draft a bylaw to impose new limits on outdoor lighting. The changes could require downward pointing lights and may reduce the total number of lights in a defined area. An article titled "General By-Law Amendment – Lighting" appears on the draft warrant for the Special Town Meeting on May 4 but it includes no details to date.

Tom Leach, the town harbormaster, is a leading advocate on this issue and proposed the article. Leach is also the town's natural resources director and an amateur astronomer. He's an active member of the Cape Cod Astronomy Society, which is in support of a bylaw.

The planning board holds the regulatory powers to develop a proposal of this kind. Leach made a pitch to the planning board back in June on the subject. As a resident of East Harwich, he indicated that he has witnessed a substantial growth of light pollution in the last three decades. "I moved to East Harwich in 1977, when the intersection of Routes 137 and 39 was four vacant corners. The brightness of that area now is so great you can see it from Harwich Port and my office," he said. "We want businesses to control their lighting and simply aim it downwards to limit its cast," he said. "Quite simply, many of the existing lights with a cap with sides would make a huge difference." Leach said that, given the right equipment to direct existing lighting, property owners could also lower their individual light wattage and save money over time.

[Note: Not all commercial lighting at the intersection of Routes 137 and 39 in East Harwich is bad although much of it is. The exception: Most of the lighting in the Stop and Shop parking lot is exemplary: most fixtures have side and top panels that allow light only to fall where it is needed: downward.]

[Tom has created a preliminary version of a video to demonstrate the problem by showing a collection of photos depicting "problem" lighting or "good lighting". Please take a look at this video¹⁶. Tom requests that *All interested persons send him photos which might be useful in this video story; again, local photo of GOOD light situations and, more importantly, BAD light situations. Please notify Tom directly if you have photos or let us know at info@ccas.ws.* Thank you.]

Video Tracking Daily World-wide Air Traffic

Video found and submitted by Jon Greenberg
Story by Peter Kurtz

Jon Greenberg sent us the url for an absolutely fantastic video which shows airplane flights world-wide over longer than a 24hour cycle. View the video at <http://www.motionbox.com/videos/3096d1b51819efcbbe> It is a 24 hour observation of all of the large aircraft flights in the world, condensed down to under two minutes. From space, we look like a bee hive of activity. The video takes place on a world map with moving yellow dots representing individual flights. Here are some of the amazing things it shows:



[one frame of the 24hour flights video: do folks fly from US to Paris in day or at night?]

- How busy we little bees are when we wake up in the morning ... or wish we were not on an airplane at night!
- If you didn't know yet, try to figure out when most flights travel from the US east coast to Europe, when they arrive in

Europe, and when flights leave from Europe and arrive Stateside. Anyone who has ever taken a red-eye to Europe will enjoy seeing what he looks like to the satellite!

- Study where the commercial bustle is; and where it isn't.
- NOW do you really believe that international flights take "great circle routes"?
- Stay with the picture. We can learn some things that we know from science to be true but maybe never saw so clearly illustrated in a video before, like the light of day moving from the east to west. Note the day is just ending in Australia when the video starts. Is this a video taken in summer of the northern hemisphere or in summer in the southern hemisphere? Check out where 24hour sunlight and 24hour darkness take place: indeed a clear "picture" of the realities caused by the tilt of the earth's axis. We are taught by science about the earth's tilt and how it causes summer and winter and have had to imagine just what is going on. Now we can see it happen worldwide, not just where we are!

Thanks, Jon, for a most entertaining and instructive find!

Coming Soon:

Next month's issue will be shorter for sure. Your editor goes fishing in North Carolina in April!

If more pressing matters do not intervene, we hope to bring you the following stories promised earlier:

- Most of us know that Mizar, one of the double star system Mizar-Alcor in Ursa Major, is itself a double system. There is also an unrelated field star named Sidus Ludoviciana that lurks nearby. New study has found that *Alcor* is not a single but in fact also has a partner. Next month we will review current study which uses an ancient technique Galileo used to determine that the newcomer is indeed part of the Alcor/Mizar system rather than merely an unrelated far distant star that only "looks" nearby.
- The newly installed Wide Field Camera 3 (WFC3 on Hubble is returning new wider and deeper views almost all the way to the edge of the universe. Next month we will highlight some beautiful images and things newly learned from same.

Citations and References for this issue continued from page 9:

9) <http://www.skyandtelescope.com/observing/home/80433142.html>; Vesta is on a faster track as we move into May: *Astronomy Magazine*, April issue, p. 43.

10) Small Telescopes: <http://www.astronomy.com/asy/default.aspx?c=a&id=7982>

11) Large Telescopes: <http://www.astronomy.com/asy/default.aspx?c=a&id=7983>

12) Cape Cod Times: <http://www.capecodonline.com/apps/pbcs.dll/article?AID=/20100225/NEWS/2250326>

13) ISACP: <http://iasc.hsutx.edu/>

14) Astrometrica: <http://www.astrometrica.at/>

15) <http://www.wickedlocal.com/capecod/environment/x295634751/Local-astronomers-aim-to-limit-light-pollution>

16) <http://www.youtube.com/watch?v=AkwLyD1YKzM>

A PORTION OF THIS PAGE IS INTENTIONALLY LEFT BLANK TO REMIND ALL MEMBERS THAT THERE IS ALWAYS PLENTY OF ROOM IN FIRST LIGHT FOR YOUR CONTRIBUTIONS

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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 K-12 schools.



Reference Information:

- 1) Information for The Mooncussers Almanac and Monthly Observing Alerts was extracted from Sky Events, Astronomy Magazine Online (Astronomy.com), Stargazing.net's Planet Rise/Transit/Set calculator (<http://www.stargazing.net/mas/planet2.htm>), *Astronomy Magazine*, *Sky & Telescope Magazine*, *Sky and Telescope Skywatch 2007*, and other sources. The *Observer's Handbook, 2007 and 2008*, 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 December-January 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 γ -Andromedae to Algol's west, mag 2.1, and ϵ -Persei to its east, mag 2.9.
- 4) <http://www.astronomy.com/asy/default.aspx?c=ss&id=84>; Look also at The Sky This Month (select the month you want) link at the "StarDome" utility of Astronomy Online: <http://www.astronomy.com/asy/stardome/default.aspx>
- 5) <http://www.skyandtelescope.com/observing/ataglance>
- 6) McNish Planner: <http://members.shaw.ca/rilmcnish/darksky/messierplanner.htm>
- 7) *Astronomy Magazine*, April issue, p 36 and online: <http://www.astronomy.com/asy/default.aspx?c=a&id=9422>
- 8) Full charts for Saturn's main moons in April are given on on page 47 of the April issue of *Sky and Telescope* magazine. General utility for locations of Saturn's moons: <http://www.skyandtelescope.com/observing/objects/planets/3308506.html>

[Please see page 8 for the rest of the citations and references for this issue.](#)