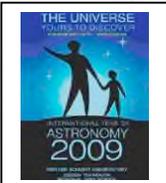




First Light

The Newsletter of the Cape Cod Astronomical Society



August, 2009 **Vol.20 No. 8**

- **MEMBER DUES, \$30*, due June 30th!**
All members, please be reminded that the 2009-2010 dues are due end of June. We cannot maintain growth, outreach, and excellence in programs without this input from members. If you have not yet paid, please bring your check to our next meeting and give to Peter Kurtz. If you last paid dues in late 2008 or early 2009, please consider renewal now to get in sync with the June-July cycle. Thank you. * Dues for Students after High School: \$15; dues for Summer Season only: \$15
- **OPEN POSITION:** All members, please consider volunteering for our the open position of Secretary. If you are willing, even on an interim basis, please contact a member of the Executive Board.
- **Next Monthly Meeting:** is Thursday, August 6th at the DY Library. Program notes below.
- **Public Star Parties:** every Wednesday, at 8:30pm at the Schmidt. Star parties will be held every Wednesday night from June 3 through August 26th, weather permitting. Check the main page of our website after 6pm to find out about cancellations when the weather looks poor.

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 star 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).

PLEASE CONSIDER SUBMITTING AN ARTICLE FOR PUBLICATION IN FIRST LIGHT.

CCAS Events

Thanks to Hugh Blair-Smith for a most informative and entertaining presentation on July 9. Hugh reviewed his remarkable career in “machine language” level software building in support of several historic NASA programs. The center point of his career and his presentation was programming for the inertial guidance system for the Apollo spacecraft which landed the world’s first man on the moon. Good timing for this subject for us given that our astronaut Neil Armstrong first set foot on the moon 40 years ago on July 20 (see page 5 and reference 4.) Hugh provided us a nice mix of stories covering machine-level programming challenges in terms we all could follow. He spiced his presentation with philosophical observations of his own and of colleagues, including astronaut Harrison, “Jack”

Schmidt, “Dr. Rock,” LEM pilot and geologist, on the worth of the Apollo venture and the clear uplift it brought to America’s view of itself in the world of the 60’s and 70’s. Hugh has also worked on software for guidance systems for the recently launched Lunar Reconnaissance Orbiter (LRO). He concluded his presentation with a “small screen” showing of a movie simulating the path of the LRO from launch to stable orbit around the moon enabling



Hugh Blair-Smith, Onno Hommes, and Tom Leach. Onno was visiting and has done software work on a project revisiting the Apollo Guidance Systems called “Virtual AGS” See reference 5 for more information.

the most complete mapping yet of that body. A copy of Hugh's movie is available either from him or your editor. More on the LRO on page 6. We hope Hugh will visit us again in the future to tell us more of his adventures programming for NASA and supporting organizations.

Peter Kurtz and Gary Derman have scanned the posters, programs, slides, and news clips gathered into the binder Bill Boyd prepared for archiving which reprises the talk he gave us in April: "Birth of an Observatory": the story of the conception and building of the Werner Schmidt Observatory. Anyone wishing a personal copy of the CD telling this story, please contact Peter for a loaner CD which you can copy.

Minutes of the July 9th CCAS Business Meeting are available online: click on the "Minutes" button at www.ccas.ws or go to (<http://www.ccas.ws/minutes/ccasminutes070909.html>).

Highlights: Mike Hunter presented the slate of nominees for club officers. The following were elected into office by voice vote: President: Tom Leach, VP: Paul Cezanne, Secretary: Peter Kurtz; Member of the Board of the CC Astronomical Foundation: Mike Hunter. The new Leadership Team decided subsequently that the position of Treasurer cannot remain unfilled and that Peter Kurtz would take on that role as we continue to look for someone to step up to fill the unfilled role of Secretary. If need be, the membership can ratify this decision at our upcoming meeting. Members, please consider volunteering for the open Secretary position if not for the year then at least for a few months.

Many thanks to Tom Leach, our Program Chairman, and those persons who have agreed to speak, for the following outstanding speakers' program for the upcoming months:

On August 6th, our own Betsy Young will give a presentation on astronomer Maria Mitchell's journey from comet hunter on Nantucket to first Director of the Observatory at Vassar College. In 1847, Maria, aged 29, discovered a comet from the rooftop of her home in Nantucket. She was an abolitionist, a suffragette, and cofounder of the American Association for the Advancement of Women.

On September 3rd, former CCAS president Gary Derman will talk about Einstein's telescope and its use in the search for the Dark Matter and Dark Energy that occupy 95% of the universe. Discarded as not practical by Einstein when he first suggested it, the phenomenon has already been used to find new planets and to see objects too distant for even the Hubble telescope alone. Amateurs and professionals alike will use it for the new astronomy of the 21st century.

On October 1st, Robert Brookhart will speak on aspects of missile tower development during the space race in the 1960's. John Kennedy said "We choose to go to the moon

not because it is easy but because it is hard". As a structural steel detailer he worked in California on plans and drawings which led to the Apollo moon shot tower(s) at Cape Canaveral. His plans included requisite escape plans for astronaut safety. His work in steel design also got him involved in the Atlas missile silo program.

Executive Corner

The new Executive Board has been exchanging ideas by email and phone on a continuous basis and will soon formally convene by conference call. Anyone wishing to offer an item for the agenda, please contact Tom, Paul, or Peter.

From the Dome

The box score for our Wednesday summer star parties as of press time is clouds 6, "clear skies" 3. A stricter definition of clear skies would make it 7 to 2. On a more positive note, our 7/15 party had 19 guests and 9 members in attendance. Gregory McCauliff reports another excellent session took place on 7/22. "Two in a row!" Some special viewing through our 8" Dob was arranged for a visitor to support her deliberations on kinds/apertures to consider when buying a starter telescope.

The 16" scope is behaving well: GoTo's are putting targets in the middle of the field of view at 450 power. It's hard to ask for more than that. Work on the 18" tracking and GoTo systems is progressing, slowly. As always, the views through both scopes are great, especially since the acquisition of the TeleVue eyepieces.

Mark Wednesday nights on your calendar. Bring friends; bring family. Come out to The Schmidt. (Only stay home if the "red box" noting weather cancellation shows up on our website main page after 6pm.)

Mike Hunter, Director

Reminders:

Your editor has prepared a flyer on our summer star parties which can be posted anywhere. If you do not yet have your own copy for reproduction and distribution, please let us know at info@ccas.ws and we will send you a copy.

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.

Foundation News...

FL received this important update from Werner Schmidt on the Foundation Plan for CCD Imaging continuing from the article he submitted last month:

Our plans for imaging are proceeding at a fast pace. We have placed an order with Astronometrics, our usual supplier, for the Losmandy G-11 equatorial mount, complete with the Gemini Go-To components. The order was placed on 7/14/09, delivery within two to three weeks, at a cost of \$3725. We also ordered the Optimal clutch levers as we think they will be helpful. This mount weighs 71 lbs. and has a load capacity of 60 lbs.; it is made in the U.S. but the software comes from Germany.

We got an estimate of about \$400 for a 4'x4' concrete pad on which to set the mount and tripod and will go ahead with this job when we know exactly where on the northeast side of the observatory we want to place it. The location is critical as we want to minimize the light pollution from the security lights on top of the school buildings. We do have the capability to shut off the lights at the nearby maintenance buildings on a night to night basis.

Initial plans are to position the 4" refractor, the #102 Televue that used to be located piggyback on the 16" Meade scope in the dome, on the new mount. While we have other scopes that could be candidates for this use, a 6" Richey Chretien (now only about \$800.00) would give us the ultimate definition for imaging.

This project will be handled by Bill McDonough, one of the most experienced and knowledgeable astronomers in our society.

There seems to be a general agreement that a separation of imaging from the normal viewing is best for us given the space limitations in our dome. To do good imaging is a challenge, but I believe we are on the right track.

For those of you who might want to study this aspect of astronomy in depth, we have added the excellent book by Wodaski, "The New CCD Astronomy," to our library in the observatory.

Werner Schmidt

Reminder:

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

August Observing:

There is a lot going on in the sky this August. Please *do* make a point to try to go out and enjoy as much of it as you can! Our Wednesday Star Parties provide a prime opportunity

Before we get into our usual look at sky phenomena which generate "right now" dramatics for August, there is a special event which begins this month that will take more than two years to unfold. This event will be of interest to anyone who has the patience to watch a slow change in the sky take place over multiple months. An article by Glenn Chaple in the August issue of Astronomy Magazine (p 15) invites observers to begin regular observation of the very slowly **eclipsing variable star ϵ -Aurigae**. Eclipsing variable stars, like the well known Algol which runs through its bright/dim cycle every three *days*, ϵ -Aurigae completes one cycle from magnitude 3.8 to magnitude 3.0 and back over two *years* and then waits 25 years until the next dimming cycle! The most interesting times in this cycle are changes in apparent brightness as eclipse begins and ends, a process that takes about two years. In an earlier cycle in the mid 1980's, the dimming process took place over about six months, the star(s) stayed dim for nearly a year, and brightening took place over another six months. The next dimming cycle after the one that starts this August won't occur until 2036... so for sure, don't miss this one! Will this event mirror the 80's event?

ϵ -Aurigae is easy to find, clockwise in the ring from Capella. There are many stars of static magnitude from 3.0 to 3.8 in the neighborhood that can be used as comparators when making observations. So, beginning this month, take a look at ϵ -Aurigae, note its magnitude by finding a comparator of equal static magnitude, and make similar observations at least every two weeks over the next six months. As the dimming begins to become apparent in your records, you will begin to "see", in your mind's eye the cause of the dimming phenomenon. As with Algol, but on a much much slower time scale, the dimmer of the double star begins to move in front of its brighter partner. Auriga will not be an evening constellation for us until about October 15th after which it will be convenient in the evening sky until mid June, well after the dimming process ends. In order to get good pre-dimming and dimming start magnitude data for August and September, try to take at least two observations each month before dawn in the period 4am thru 6am depending on the time of sunrise.

People living near the Canal should seriously consider driving inland 40 miles or so to see what should be a spectacular **half moon occultation of Antares** at about 6pm EDT on August 27. For people on Cape, the event will be more of a "very close" pass than an occultation. More on that later in this issue (page 5.)

Although separated reasonably from the sun at month's

beginning, **Mercury** sets later and later than the sun through August until it reaches an eastern elongation of 27° on August 27th when it sets 49 minutes after the sun. During the month it moves closer and closer to **Saturn**. Saturn is moving toward the sun to become a morning planet after about the beginning of October. Mercury and Saturn are separated by only 3° on August 18.

Jupiter continues to star in August rising about 30 minutes after sunset at month's beginning and, conveniently, earlier and earlier as the month progresses. This season it is very very large and bright (magnitude -3.)

Take a look through a good telescope early and later in the month after Jupiter is reasonably above the horizon to see if you can spot the debris from what is thought to have been a **comet impact** on July 20th (Please see story on page 6.)

The dance of the **Galilean moons** of Jupiter provides an interesting opportunity to observe, make sketches, and compare observations with predictions from hour to hour and night to night during August and September. Check out the informative locator charts in the August issue of S&T Magazine for the positions and antics of the moons at various times each day (p. 47.) Timings for occultations and eclipses of Jupiter's moons on each other for June thru August are noted in the July issue, pp. 51 and 52. Finally, finally, predictions of movement of Jupiter's moons and their shadows behind the big planet or its own shadow or across its face are also available.

See details in the preceding references for the following highlight events:

- Shadows on Jupiter: On August 3, the shadows of Io and Europa should be visible on the surface of Jupiter from 6:51pm EDT until 8:51pm EDT. Sunset is at 7:50pm EDT while Jupiter rises in the east.
- Shadows on Jupiter: On August 26th, the shadows of Europa and Ganymede should be visible on the surface of Jupiter from 10:20pm EDT until 1:26am EDT. Note how much slower Ganymede moves.
- Moons "covering" one another: On August 11, the shadow of Ganymede will eclipse Europa from 9:46pm EDT ending at 10:01 EDT.

All of these happenings can easily be seen *through CCAS scopes at our Wednesday night star parties.*

As in July, **Jupiter** dances very near **Neptune** (magnitude 7.8) in Aquarius for most of August. You will never find a better pointer for the dim blue planet. Neptune continues its retrograde motion this month while Jupiter moves (for us) slowly in the normal direction. While not as close as in July, the two are separated by only 2° on August 1 and only 5° at month's end. So, as in July, if you are looking at Jupiter and its moons in a good telescope this month [*always available at our Wednesday night star parties*], try to see the nearby

blue planet.

If you don't mind waiting until **Uranus** is well off the horizon to look (rises at about 11pm at month's beginning but earlier at month's end,) Uranus, magnitude about 6, is a good target below Pegasus.

If you have a really good Go To telescope at **Pluto** rises well before sunset and is available but most challenging at magnitude 14 all night long.

Mooncusser's Almanac and Monthly Alert¹

By Peter Kurtz

AUGUST, 2009

||

Object	Aug 01 (EDT)	Aug 15 (EDT)	Aug 31 (EDT)
Sun	R 05:35 S: 19:58	05:49 19:40	06:06 19:15
Moon	R: 17:21 S: 01:53	00:33 16:03	17:17 02:40
Mercury (evening)	R: 07:09 S: 20:53	08:05 20:38	08:24 19:57
Venus (predawn)	R: 02:34 S: 17:29	02:51 17:43	03:20 17:48
Mars (predawn)	R: 01:21 S: 16:19	01:01 16:09	00:41 15:52
Jupiter (evening)	R: 20:33 S: 06:53	19:33 05:49	18:25 04:35
Saturn (evening)	R:08:57 S: 21:47	08:10 20:55	07:17 19:57
Uranus (evening)	R: 21:50 S: 09:41	20:54 08:44	19:49 07:38
Neptune (evening)	R: 20:35 S: 07:04	19:38 06:07	18:34 05:02
Pluto (evening)	R: 17:04 S: 03:00	16:09 02:04	15:05 01:00

Moon Phases, August, 2009

First QTR Tuesday, July 28th at 4:00pm EDT

Full Moon Wednesday, August 5th at 8:55pm EDT

Last QTR Thursday, August 13th at 2:55pm EDT

New Moon Thursday, August 20st at 6:02am EDT

First QTR Thursday, August 27th at 7:42am EDT

One of the biggest meteor showers of the year, **the Perseids** peak on August 12th at a time of waning half moon. The moon doesn't rise on the 12th until about 10:30pm so there could be good meteor viewing until that

time. In addition, since peak date is only the date for *maximum* meteor counts, you can expect to see lower rates of shooting stars from the Perseid radiant for several days following the 12th when you will have the benefit of the diminishing moon rising later and later each night.

Declination Tables for the Moon² or Dates and Times for the Minima of Algol^{1,3} during this month please contact your editor and the information or sources will be provided.

Anyone having an interest in monthly **Libration and**

News and Stories of Current Interest:

40th Anniversary of America’s Landing on the Moon

It is more than appropriate that Hugh Blair-Smith reviewed his work on software programming for the Apollo Guidance System at our meeting on July 9th. July 20th was the twentieth anniversary of Neil Armstrong’s “One Small Step for a Man; One Giant Leap for Mankind”. Any of us who was old enough to talk on July 20th 1969 remembers exactly where he was sitting when he viewed, with Walter Cronkite, the scratchy live black and white TV pictures of that first step on to the moon. Anyone interested in revisiting that feeling, please visit the NASA site at reference 4 and links therein. You can review and revisit the many key steps in the entire Apollo program and replay that First Step on your computer screen.

Half Moon Occults Antares on August 7th viewed anywhere west of the Cape Cod Canal

If you live far enough west or are willing to drive there, the half moon will occult the bright star Antares at 8pm on August 27. People having a portable telescope and living near the Canal should seriously consider driving inland 40 miles or so to see this event. Since the moon passing near or over the star occurs at/near Cape Cod nearly an hour before sunset (at Dennis-Yarmouth High School, 7:17pm, EST,) a telescope will be required to see it since the half moon covers or passes nearest to the star on the Cape at about 6:11pm. So this is not the optimum occultation for on-Cape folks. Anyone on Cape Cod, however, CAN observe the “near-miss” after sunset and imagine what the moon occulting a bright star might look like naked-eye or with a telescope. With this “near miss” for Cape Codders as a primer, visit the iota (International Occultation Timing Association) website referenced below often to see what occultations are coming up and especially which ones might take place after dark where you live. The iota site gives listings of coming occultations, maps like the one below, and specific data for reference cities and towns or each occultation.

Here are three “clips” simulating the moon moving over or very near Antares. Whether you will see an occultation or just the near miss depends on where you are when observing. The leftmost panel, from iota,⁶ shows locations (inside cross hatching)

<p>Portion of iota Occultation Map</p>	<p>5:12pm EDT</p>	<p>6:12pm EDT</p>	<p>7:12pm EDT</p>
<p>Please note: the sizes of the moon and star here are simulations not likely accurate. On Cape Cod, the moon will likely leave some space between itself and Antares as it moves by. Let us know what you see and where you were at 6:12pm EDT or later in the evening.</p>			

where the occultation should be observable. Tables in the reference predict that the star will disappear at 6:11:27, EDT in New Bedford, MA, the nearest city to Cape Cod in the table where an occultation rather than a graze can be seen. At that time, in New Bedford, the sun will be in the west at altitude 13° and the moon will be a bit east of south at 27° altitude, high enough to see with our 16” scope on Cape.

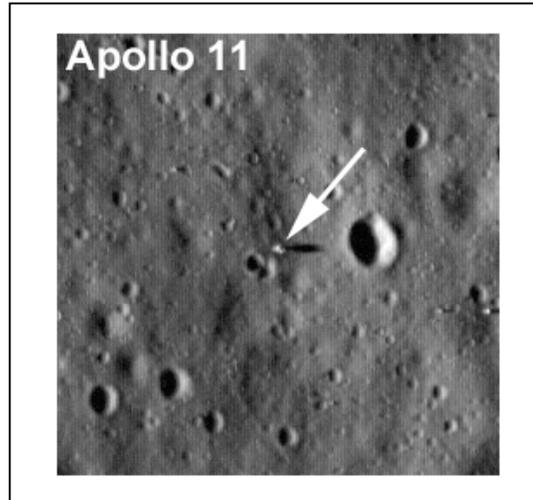
Lunar Reconnaissance Orbiter (LRO) Successfully enters Moon's Orbit

Earlier in this issue we mentioned briefly that Hugh Blair-Smith, our speaker for July 9th, has done programming work in support of the guidance systems for the LRO. Well the LRO was successfully launched on July 18th from Cape Canaveral and successfully inserted into lunar orbit at 6:27 a.m. EDT June 23. The LRO's orbit will permit it to take photographs leading to high-resolution three dimensional maps of the lunar surface and to survey the surface at many spectral wavelengths. Please see more information in reference 7. That's old news as of end July.

What is fantastic *new* news, however, especially near the 40th anniversary of man first setting foot on the moon, is the story reported by NASA online ⁸ on July 17th, that on June 30th, the LRO had returned to earth amazing photographs of five of six of the Apollo landing sites on the moon: landing sites for Apollo 11, 14, 15, 16, 17; a photo of 12 is planned. What is amazing about



Artist's Conception of the LRO



Arrow points to the Apollo 11 LEM, Eagle.
Image width: 282 meters; shadow of
LEM to right of LEM: about 30 meters wide.

the new photos is that they, taken from lunar orbit, show objects smaller than about 10 ft in diameter. See above the photo of the Lunar Explorer Module, Eagle, from which Neil Armstrong and Buzz Aldrin set foot for the first time on the moon 40 years ago (arrow in picture). See the references for many more photos and information about the capabilities of the LRO.

Comet(?) Strikes Jupiter

On July 20, the S&T online AstroAlert email news service reported that one Anthony Wesley, a well known Australian astrophotographer and planetary observer, had taken a photo of a new dark spot on Jupiter very reminiscent of the pictures of atmospheric disruption made available in 1994 after the comet ⁹ Shoemaker-Levy 9 crashed into the big planet. The dark spot is located near Jupiter's System II longitude 210°. It appears 2 hours and 10 minutes later than widely available predictions for the appearance of the great Red Spot. The picture at right was taken by the Hubble telescope and released on July 24. ¹⁰ The event is important enough that NASA scientists interrupted the checkout and calibration of the newly refurbished scope to aim at the new and expanding spot on the planet's surface.

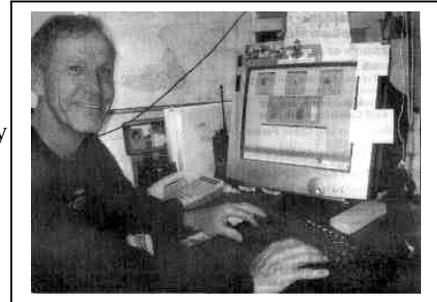


Small Asteroid Predicted to Graze Earth's Atmosphere; It does... and then its Meteorites are Found

The pace at which science is advancing knowledge with new technical tools in our time is truly astounding. Witness the capabilities of the cameras on the LRO reported above. There is an equally interesting story in the August issue of S&T Magazine, p22, describing how, in October of 2008, an asteroid was discovered and tracked as it approached earth, was in fact trapped by earth's gravity, was fragmented and partly burned as a meteor event in the atmosphere, and then, shortly thereafter, pebble-sized meteorite pieces were found on the ground by university students in the Sudan just about where the meteor track suggested they might be found. Read and enjoy the story.

CCAS Webmaster Profiled for His Harwich Harbors Webmaster Service

Most of us know Tom Leach as President of CCAS, Program Chairman for our Society and Webmaster for the CCAS website. Now we know that not only is he Harbormaster for the Town of Harwich but also webmaster for <http://www.threeharbors.com>, the website for the Harbormasters office and the Harwich Department of Natural Resources. See the story in the Cape Codder, July 10th issue.



Tom's enterprise and website covers the following areas among others; this from the opening statement on the website homepage:

This website contains interactive menus which provide information in our office. You can also use this site and a credit card to conduct business with the Harbormasters Office. We are also the Harwich Natural Resources Department, promoting shellfish area protection and propagation, estuary & pond water quality monitoring, herring run management and the operation of Allen Harbor, Wychmere Harbor, Herring River, Red River, Round Cove, Pleasant Bay and Saquatucket Municipal Marina. If you are a fisherman, sailor or recreational boater, our on-line weather station contains the most useful Nantucket Sound weather information anywhere.

Do you know what this is?



It costs \$15 and is available online. It is a product of thinkers at the international organization creating and promoting the International Year of Astronomy. The parts can be used for classroom tutorials, available on the web, on how lenses bend light and work together to produce magnified images. It can be assembled in about ten minutes. When assembled, depending on some options, it provides an almost exact model of one of Galileo's earliest telescopes having magnification 18x and an extremely narrow field of view. Assembled slightly differently, it provides a beautifully useful small achromatic refractor scope with crystal clear optics that can be mounted on a camera tripod, shows astro images with a 1.5° field of view at 25x or a 0.75° field of view at 50x using the Barlow and eyepiece you also assemble yourself, and is an outstanding starter scope to show or give to anyone without spending hardly any money. So the claims on the IYA approved website are true: a model of an historic and ancient scope, a good starter scope for almost no money. Your editor has one which he can show you at a meeting sometime or you can find out more and buy one yourself by checking out <https://www.galileoscope.org/gs>

One caution: they are oversubscribed in a big way. Tens of thousands have already been shipped worldwide. I ordered two intending to give one to grandchildren but so far have only received one. If you place an order now, expect at least an 8 weeks wait until delivery.

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.

A Project Idea?

A Photo?

A Piece of Club History?

A Short Profile on Yourself, New or Old Members!?

Cape Cod Astronomical Society

President	Tom Leach	508-237-9291
Vice President	Paul Cezanne	508-487-1456
Secretary	position open	
Treasurer	Peter Kurtz	508-255-0415
Observatory Director	Michael Hunter	508-385-9846
First Light Editor	Peter Kurtz	508-255-0415
		info@CCAS.ws

Mailing Address: PO Box 297 Harwich Port MA 02646

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.

Cape Cod Astronomical Foundation

Chairman	Werner Schmidt	508-362-9301
Vice Chairman	Michael Hunter	508-385-9846
Director R&D	Bill McDonough	508-771-0471
Secretary	Ed Swiniarski	508-896-5973
Treasurer	Pio Petrocchi	508-362-1213
Observatory Director	Michael Hunter	508-385-9846
Observatory		508-398-4765



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) Visit http://www.nasa.gov/mission_pages/apollo/index.html for many aspects of the Apollo program and its history. To revisit the first step on the moon, click on "Past Missions" and then "Apollo" in the left column; then "One Giant Leap" on the right column and then "view video." If you saw that live 40 years ago, you will revisit the feeling you had then.
- 5) Leading url's for further info on virtual AGC and AGS: <http://www.ibiblio.org/apollo/index.html> Also: <http://virtualagc.googlecode.com/> and <http://www.ibiblio.org/apollo/listings/Colossus249/MAIN.html>
- 6) <http://www.lunar-occultations.com/iota/bstar/0827antares.htm>
- 7) From Astronomy Magazine online: <http://www.astronomy.com/asy/default.aspx?c=a&id=8397>
- 8) http://science.nasa.gov/headlines/y2009/17jul_lroc.htm?list719759; See also <http://www.skyandtelescope.com/community/skyblog/newsblog/49772807.html>
- 9) <http://www.skyandtelescope.com/news/home/51237952.html>
- 10) <http://hubblesite.org/newscenter/archive/releases/2009/23/>