



First Light

The Newsletter of the Cape Cod Astronomical Society



December, 2014

Vol. 25 No. 12



Christmas Tree Cluster, NGC 2264

Seasons' Greetings !!

Merry Christmas !!

Happy Hanukkah !!

Happy Holidays !!

Special "Holiday" Note: Members of CCAS and the staff of The Schmidt have worked for many years now developing ways our knowledge and facilities can be effectively integrated with science programs ongoing at D-Y High School. In October and November of this year, student participation at the Dome reached new highs. We celebrate with a special report beginning on page 5. Kudos to both students and our amateur astronomers!

Next Monthly Meeting: Thursday, December 4th at 7:30pm: Professor Jorge I. Zuluaga, currently Fulbright Visitor Scholar at the Harvard-Smithsonian Center for Astrophysics, will present "**What Makes a World Habitable**". Public welcome.

Reminders The CCAS meeting in January is on Thursday, January 8th, rather than New Year's Day. The next "Quarter Moon Saturday" Star Party (after Saturday, November 29th) takes place at the Dome on December 27th at 7:30pm. Public welcome.

In this issue: New Student Member / A good year for the Geminids / Jupiter returns as King / Moons occulting and touching / winter solstice / Student participation at the The Schmidt Observatory reaches new highs / Thinking about travelling beyond the Solar System? Think again!

Bright New Stars:

First Light wishes to welcome student **John Chilinski** of Dennisport to membership in CCAS. John is a high school student at Dennis-Yarmouth Regional High School, and has a special interest in astrophotography. John has already spent time at the Schmidt Observatory taking photos; (please see article on page 5.) John, please introduce yourself at an upcoming meeting and email photos you have taken to info@ccas.ws for possible inclusion in upcoming *First Light* issues. Welcome to CCAS!

We are pleased to note that CCAS has gained *eleven* new members (three of them spouses) since the beginning of September.

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:

Dues:

With the help of our many new members, we now have **41** dues-paid-up members in CCAS. There are still 38 folks eligible to pay who have not yet paid during this cycle. Many thanks, to the “virtuous” 41. We look forward to welcoming the rest of our active members to this elite group asap.

Please bring your check to the December 4th meeting or mail to: CCAS, 34 Ridgewood Rd., Orleans, MA 02653. Thank you.

President:

We have yet to find a member to serve as CCAS President since the end of Mike Hunter’s term. If you know of anyone who might consider serving in this position, please let one of the current officers know.

CAS Meetings:

Many thanks to Professor **Larry Marschall**, retiring Professor Emeritus of Astronomy at Gettysburg College in Pennsylvania for presenting “**Gems of the Ringed Planet: New Views of Saturn and its Moons**” at our CCAS meeting on November 6th.

Professor Marschall gave us a complete tutorial on the

ringed planet and its moons very nicely spiced with current information acquired by the Cassini spacecraft, (which, after ten years, is still sending new data,) and by the little lander Huygens that landed on the moon shortly after Cassini’s arrival. It is remarkable to think that this year marks the 10th anniversary of Cassini’s arrival at Saturn after a seven year journey launched in 1997.

Cassini has opened our eyes to storms on Saturn, weird patterns in its rings, and odd moons. One of these resembles a walnut; another, a sponge; and another features active geysers of ice. Most remarkably, the lander Huygens has given us our first detailed look below the clouds of the mysterious moon Titan, which turns out to resemble our Earth in some surprising and remarkable ways.

Professor Marschall’s talk included many striking images or videos of the planet and its moons and rings.

At our meeting on December 4, Professor Jorge I. Zuluaga, Associate Professor of Astronomy at the Universidad of Antioquia (Colombia) and currently Fulbright Visitor Scholar at the Harvard-Smithsonian Center for Astrophysics, will present “**What Makes a World Habitable**”. Does a world need to be exactly like earth? What challenges might life find on a small exomoon or a planet in a binary star system? Professor Zuluaga will address questions such as these with special focus on his own specialty: the role of magnetic fields in making life possible. (Thanks to new CCAS member Bernardo Duran for recruiting Professor Zuluaga for us.)

Plans are being finalized for members Warren Mumford, Mike Hunter, and/or new member Jim Lynch to speak at our meeting on **January 8th** or in February. Further details, next month.

Please note: the January meeting will not be on the “first Thursday”, New Year’s Day, for obvious reasons. The date for January is January 8th!!!

Reminder:

Mike Hunter (or his delegate) “hosts” a Dutch-treat dinner gathering for members and friends 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, this December 4th. 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 (stop light).

Effort continues to find a speaker and topic for our meetings for March and thereafter.

Members, PLEASE participate in the effort to recruit good speakers to present programs in astronomy and related sciences at our meetings. Please send any ideas or contact information to Charlie, Gus, or Peter or to info@ccas.ws. For sure we will follow up.

Please let us know if you have any leads...

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

Minutes:

The minutes of our November meeting are on our website; click on the "Minutes" button at www.ccas.ws or go to <http://www.ccas.ws/minutes/ccasminutes110614.pdf>

From the Dome:

Once-a-month "Quarter Moon Saturday" Star Parties continue this month. Each event begins at 7:30pm. These gatherings are usually held on the Saturday closest to the date of the First Quarter Moon. All events are open to the public. Here is the schedule:

Schedule for Monthly Quarter Moon Saturday Star Parties for 2014-2015:

<u>1st QTR Moon Date</u>	<u>Star Party Saturday</u>
28 Dec 14	27 Dec 14
26 Jan 15	24 Jan 15
25 Feb 15	21 Feb 15
27 Mar 15	28 Mar 15
25 Apr 15	25 Apr 15
25 May 15	23 May 15
24 Jun 15	20 Jun 15

As always, "Private" group or individual observing sessions at the Werner Schmidt Observatory may be scheduled by contacting Observatory Director Joel Burnett at Joelburnett@comcast.net or sending an email to info@ccas.ws

Our Society exists to promote observing! Help us promote this objective by asking for time at the Dome! CCAS has both 8" and 14" Dobsonian telescopes for loan to members. If you wish to borrow one of these scopes, contact info@ccas.ws

Student Participation at The Schmidt reached new highs late in October and continuing into early November. Please see the reports beginning on page 5.

December Observing:

Please see resources in December's *Astronomy Magazine*, pp 36-43, and *Sky and Telescope*, pp 43-58, and Reference 5 for good guides to the sky. See p 41 in *Astronomy*, and p 52 in the *S&T* and also reference 6 for positions of the moons of Jupiter for December. Details for the red spot of Jupiter and special phenomena of its moons for December can also be found on pp 52-53 of the *S&T*.

Here are observing highlights for December at Cape Cod:

- Without question, if the sky is clear, the **Geminid meteor shower** promises to be one of the most spectacular events of the year. The Geminids peak on the night of December 13-14, promising possibly 120 meteors/hour a bit after midnight. But don't wait till midnight! One of the reasons this year could be so good is that the only half-lit last quarter moon doesn't rise until after 11pm. Even then, the radiant in Gemini is 60° high in the sky, separated well from the moon. *Do* try early before there is any moon. Don't wait until 12/13-14 to look. The Geminid debris field is thick and there should be significant meteor activity all the way from December 4th through the 17th. Thinking meteors? Consider spending some time under the night sky December 21-22 for another opportunity to see meteors. The **Ursid meteors**, seeming to flow from a point in Ursa Major, peak that night. While usually only showing rates of meteors about 10% the rates of the Geminids, this year the Ursids could give an especially good show since a most insignificant new moon will set very early in the evening.
- **Planets:** **Jupiter** season is here; on December 1, the giant planet and its moons rise at 9:41pm for Cape Codders. More on Jupiter and its moons a bit below. **Mars** is still almost stationary this month setting about 7:40pm each evening. Mag 5.6 **Uranus** is a binocular target nice and high early in the month; look early in the evening and early in the month before it gets too low. **Neptune** is getting lower and lower in the early evening sky; look early before it gets too low. **Mercury** and **Venus** take a rest behind the sun this month; try **Saturn**, now a "morning star", low in the east before dawn.
- **Solstice** means, literally, sun stops! The winter solstice takes place this month on December 21st at 6:03pm. At solstice, the sun stops setting earlier and earlier and rising later and later... it "stops"... and begins to rise earlier and earlier and set later and later. In addition, no matter where you are on earth in the northern hemisphere, at solstice the sun stops moving toward the south (of east at rising; of west when setting) and

begins moving north day to day. It reaches its new target as far north as it can get at *summer* solstice and the cycle repeats.

- Jupiter season brings not only the big planet but the antics of the Galilean moons; in particular, check out these two phenomena during December:

On December 5-6, the moon **Callisto will occult** (run in front of) **Europa** about 3' west of Jupiter. This event should be easy to see in a small telescope or large binoculars: the moons will seem to merge just before event starting time at 2am EST. The event lasts 56 minutes. A technical detail for those having brightness-measuring capabilities (Hey Bernie!): the total light from the two moons will decrease by 20% when one passes in front of the other.

Finally, Jupiter's moon **Europa will "touch" little Io** in front of the surface of the planet beginning at 5:15am EST on December 23. One should be able to observe the following phenomena in the after-midnight sky with a good telescope: first the shadow of Io enters on the planet at 1:42am, followed a bit later by the shadow of Europa; then, much harder to see because you are looking at "bright on bright", Io itself moves into the scene followed closely by Europa. Both moons *and* their shadows will be over the surface of the planet beginning at 4:04am. Europa is chasing and will "catch up" with Io. The shadows have passed beyond the moon by the time the difficult-to-see first "touching" of the moons over the planet takes place at 5:15am. The moons are very close for almost 20 minutes but only "in contact" for about 10 minutes. While this should be very difficult to see with amateur equipment, *imagining* the event is almost as much fun and a lot easier!

The references given above provide much more information on these and other moon phenomena.

Minima of Algol^{1,3}, December:

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 *three* evening occurrences of the Minima of Algol at Cape Cod during convenient evening hours in December: Wednesday, Dec. 3rd, at 11:06pm; Thursday, Dec. 18th, at 7:12pm; and Saturday, Dec. 20th, at 6:01pm.

Using binoculars or a small telescope, try to begin viewing two to three hours before the minima to watch the dimming and up to two to three hours after the minima to watch the brightening.

Mooncusser's Almanac and Monthly Alert¹			
DECEMBER 2014			
Object	Dec. 1 (EST)	Dec. 15 (EST)	Dec. 31 (EST)
Sun	R: 06:48 S: 16:11	07:00 16:11	07:07 16:19
Moon	R: 13:17 S: 01:50	00:34 12:12	13:10 02:57
Mercury (near sun)	R: 06:32 S: 15:55	07:27 16:19	08:09 17:15
Venus (near sun)	R: 07:35 S: 16:43	08:01 17:01	08:16 17:34
Mars (early evening)	R: 10:18 S: 19:38	09:57 19:39	09:28 19:41
Jupiter (all nite)	R: 21:41 S: 11:37	20:46 10:42	19:39 09:37
Saturn (predawn)	R: 05:43 S: 15:39	04:56 14:49	04:01 13:51
Uranus (evening)	R: 13:27 S: 02:06	12:32 01:10	11:28 00:07
Neptune (evening)	R: 12:00 S: 22:52	11:06 21:58	10:03 20:57
Pluto (low in evening)	R: 09:05 S: 18:36	08:11 17:43	07:10 16:42

Declination Tables for the Moon² during this month please contact your editor for information or sources.

Moon Phases, December, 2014
Full Moon, Saturday, December 6th, at 7:27am EST
Last QTR Sunday, December 14th, at 7:51am EST
New Moon Sunday, December 22nd, at 8:36pm EST
First QTR Sunday, December 28th, at 1:31am EST
"Quarter Moon Saturday" Star Party: December 27th

Science Students of D-Y High School Visit Dome Day and Night; Honors Students Begin Projects

By Peter Kurtz

Last month we reported on the visit of 28 students to The Schmidt Observatory in the daytime to view the sun. Here is a report on more visits that took place late in October and one day in early November. Special projects have been started up for ten of Jim Mitchell's Honors students working with more than five members of the staff of The Schmidt. Energy and enthusiasm are clearly evident; a lot is being given; a lot is being learned.

Thanks to Jim Mitchell, teacher of D-Y's Earth and Space classes, for copying us on emails reporting on these events.

Students from Jim Mitchell's Earth and Space classes visited The Schmidt for evening viewing of the night sky on October 27 and 28, and for solar study sessions at the Dome on October 29th and again on November 3rd. Five teams of two honors students each began projects as follows:

Project 1 [solar] Nicole Gallagher and Adrienne Tardif are counting sunspots using a professionally accepted technique (and formula) that permits them to compare results with those of the larger scientific community. Project coordinator: CCAS member Warren Mumford.

Project 2 [solar] Nicholas Castelone and Edward Veara are identifying and plotting various surface features (prominences, filaments, sunspots...) over time to determine the rate of solar rotation at various solar latitudes; (the rotation speed at the sun's equator is faster than at other latitudes). Project coordinator: Schmidt Research Director Bernie Young.

Project 3 [night sky] Michael Ricker and Hunter Faught are determining if certain stars are actually multiple star systems (most common are binary stars, 2 stars orbiting each other), using special computer software that measures changes in the light intensity from a star as the moon passes in front of it ("lunar occultations of stars"). If successful, the work and conclusions from this study will be added to a scientific online database containing information on binary systems determined by occultation light curves. Project coordinators: Schmidt Director Joel Burnett and Bernie Young.

Project 4 [night sky] [New CCAS member] John Chilinsky and Melissa Richardson are learning astronomy imaging techniques. John is learning astrophotography utilizing his own cameras attached to Schmidt Observatory telescopes. Melissa is learning astrovideography. Project coordinators: former CCAS President Mike Hunter, Bernie Young, and CCAS member Hank Ricci.

Project 5 [night sky] Briana Flores and Rebecca Crosby are visually estimating variations in brightness over time of known variable stars using a professionally accepted technique. If successful, conclusions from their work will be published on an online "Citizen Science" database containing results from all over the world. Project coordinators: Jim Mitchell, Joel Burnett, and Bernie Young

Jim also sent us a less formal report that provides a feel for experiences he and his students had during the various visits:

The two evenings at WSO and two daytime sessions with my Earth and Space students went extremely well. All five projects are off and running smoothly. Monday evening we had nine students and three guests, and it was the best ever night viewing experience I've had in several years (weather and just plain fun was exceptional!) The variable star project began with much success, special thanks to Joel (and emailed resources from Peter).

Tuesday evening the sky was hazy with seven students. Several students began learning astrophotography (special thanks to Mike Hunter and Hank) and several students began learning program analysis of an occultation of a star by the moon recorded earlier by Bernie (special thanks to Joel and Bernie).

About noon on Monday, four students observed and recorded sunspots and other surface features; sufficient to begin solar projects. They returned on Wednesday: projects became better defined: two students worked with Warren Mumford studying sunspots (Wolf number, etc) and two students with Bernie recorded various features to determine solar rotation rates at various latitudes. Principal Ken Jenks paid a visit and took some photos. Special thanks to Warren, for his fresh contributions, thorough preparations, and expertise.

Thanks to all who have helped with this projects approach. It's truly a dream come true for me (and I know for you as well). It's a great opportunity for DY students. Thanks so much. I'll send photos after I've received permission to release them.

Bernie, I'm pleased that WSO will be open Mon evening (Nov 3rd) for general viewing. I still have about eight students who could not come earlier and to pursue night-viewing projects; perhaps Joel will record an occultation on Friday or Bernie will record and occultation on Sunday that might permit analysis. Astrophotography lessons and perhaps variable measurements will continue.

A Cosmic Distance Scale....

Here is a wonderful short article by the Editor of *Astronomy* magazine, David Eicher. Perhaps the folks proposing travel farther and farther into space over the next decades and centuries might gain some valuable perspective (read: save some money) by reading this:

Sometimes we forget that the universe is a staggeringly large place.

Let's pause for a moment to appreciate the physical scale of just our solar system only the Sun, its attendant planets and debris, and our little island of life inside it.

To envision our immediate vicinity a little better in your mind, imagine a scaled solar system with the Sun on one end and **0.4 inch (1 centimeter) representing the distance between our star and Earth**. That is, 1 AU = 1cm. You can actually draw this on paper to help crystallize it in your mind. Tape several sheets of paper together and start drawing.

With the Sun at one end, Earth is 1cm away, with Mercury and Venus at 0.4cm and 0.7cm, respectively.

Outward from Earth, we have **Mars at 1.5cm, the mainbelt asteroids centered around 2.5cm, Jupiter at 5cm, Saturn at 9.5cm, Uranus at 19cm, Neptune at 30cm, and Pluto at 35cm.**

The outer solar system is sparse, consisting of the Kuiper Belt region 30 - 50cm from the Sun, and you can even indicate some of the more interesting objects in that area to keep Pluto company: Haumea at 40cm, Makemake at 45cm, and Eris at 60cm.

Now you can finish by indicating the region of the **scattered material between 50 cm and 100cm from the Sun** . This gives you a complete scale model of the solar system in a region spanning 3 feet (1meter) across.

Now appreciate that on this scale, the *inner* edge of the Oort Cloud is 109 *yards* (100meters , more than an American football field) **farther away than the edge of your diagram**. The *outer* edge of the Oort Cloud, on this scale, is 0.06 *miles* from the edge of your diagram, 1000meters, more than 10 football fields) away.

Note that as astronaut-explorers, we have traveled only as far away as the Moon, on our scale **only about 1 /400th of a cm**, from Earth; that distance is imperceptibly close to Earth's "dot" on our drawing.

Remember all this the next time you hear people talking about flitting around the galaxy in spacecraft.

By David Eicher, Editor, *Astronomy* magazine...

Cape Cod Astronomical Society

President	Position is Open	
Vice President	Charles Burke	5083949128
Secretary	Gus Romano	7819244770
Treasurer	Peter Kurtz	5082550415
Observatory Director	Joel Burnett	5082217380
<i>First Light</i> Editor	Peter Kurtz	5082550415

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

Cape Cod Astronomical Foundation

Chairman	Werner Schmidt	5083629301
Vice Chairman	Michael Hunter	5083859846
Director of R&D	Bernie Young	5083941960
Secretary	Ed Swiniarski	5088965973
Treasurer	Pio Petrocchi	5083621213
Observatory Director	Joel Burnett	5082217380
Observatory Phone Line		5083984765

The **Cape Cod Astronomical Society** meets at 7:30 pm on the first Thursday of every month in the library of the DennisYarmouth 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), 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 January2007January2008 *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.
- 5) Here is the web address for Astronomy Magazine's "The Sky This Month" online for December: <http://www.astronomy.com/magazine/sky-this-month/2014/10/jupiters-evening-return> See also S&T resources online at <http://www.skyandtelescope.com/>
- 6) 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>

**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.**
