



First Light

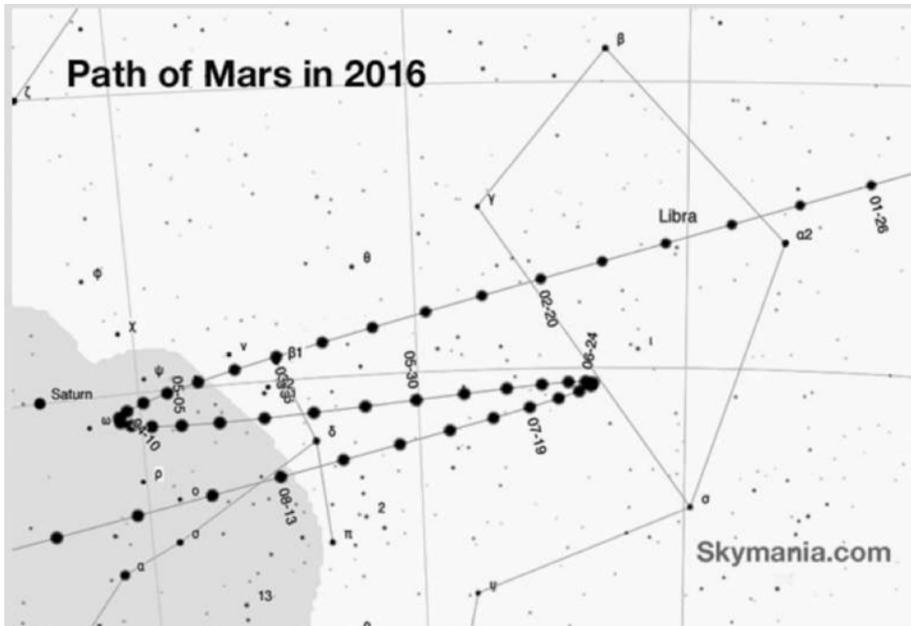
The Newsletter of the Cape Cod Astronomical Society



July, 2016

Vol. 27 No. 7

MARS BACK ON TRACK AFTER JUNE REVERSAL



1/1/16 thru about 4/16/16, Mars is moving east (left on this chart. ⁷)

Appears to turn to west beginning 4/16/16 (see direction change left to right on chart.)

Appears to move west until June 30th** (see direction change right to left); back to moving east then.)

**Schmidt Observatory Staff studied the change in direction at end of retrograde June 30th and days preceding and following that date.

*Normally, from earth, planets appear to move day to day from west to east in the night sky. This chart shows the motion of Mars against the night sky stars from January 2016 (upper right) to August 28th (lowest left). As noted in text above right, after moving to the east until about April 16, it appears to move west beginning April 16 thru June 24 (retrograde motion.) Back to normal moving east after that date. **Please see story beginning on page 4 for more information and a bit about work at the Schmidt on this phenomenon.***

Our Next Monthly Meeting: is Thursday, July 7th, at 7:30pm in the D-Y High School library. **Professor Emeritus Larry Marshall** of Gettysburg College, astronomer, teacher and always an excellent speaker, will speak to us at our July meeting on new information about **Pluto** gleaned from data collected by NASA's New Horizons mission.

Reminder: The Summer Schedule of Every-Thursday Star Parties at The Schmidt Observatory began Thursday, June 23rd at 8:30pm-10:30pm. Thursday Star Parties all summer through August 25th, all open to the public, every Thursday except our meeting night, August 4th.

In this issue: Mars Retrograde Motion / Election of Officers / Dues Cycle Begins / Eight Planets in the Night Sky / Daytime Lunar Occultation of Aldebaran / New Library Telescope Loan Program / big THANK YOU from Girl Scouts / Insight Observatory / WiSE Workshops in Space Exploration

Bright New Stars:

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:

Be sure to attend our July 7th meeting. We will vote to elect CCAS Officers for 2016-2017 and also to fill positions open in the Cape Cod Astronomical Foundation. The new CCAS Dues Cycle also begins at this meeting (more information below.)

CCAS Meetings:

Many thanks to Dr. Anastasia Fialkov, an Institute for Theory and Computation Fellow at the Harvard Smithsonian Center for Astrophysics, for her talk on the “**21-cm line of neutral hydrogen**”, a wavelength of light which can be observed from very early times. Dr Fialkov discussed the properties of these signals and what we can learn from them about the very early stages of the universe.

Upcoming Meetings:

Our next monthly meeting: is Thursday, July 7th, at 7:30pm in the D-Y High School library

Professor Emeritus Larry Marschall of Gettysburg College, astronomer, teacher and always an excellent speaker, will speak to us at our July meeting on new information about **Pluto** gleaned from data collected by NASA’s New Horizons mission.

Finally, we are pleased to announce that HSCfA Professor **Antony A. Stark** will speak to us at the **August 4th** meeting. Professor Stark will speak on **Cosmology with the South Pole Telescope**. Here is his abstract:

The South Pole Telescope (SPT) is designed for observational cosmology, the detection of faint features in the Cosmic Microwave Background. After many years of preliminary work at the Amundsen-Scott South Pole Station, the South Pole Telescope became operational in 2007, and has been scanning the sky around the Galactic Poles ever since. Discoveries include detection of clusters of galaxies by the Sunyaev-Zel'dovich (SZ) effect, first detection of lensed galaxies in the early Universe, and measurement of features in the Cosmic Microwave Background. We'll discuss how these results contribute to understanding the Big Bang and the formation of structure in the Universe.

This is a new chapter for us at CCAS following on the talk by HSCfA Post-Doc Colin Bischoff way back in August 2013 in

which he introduced us to the work at the South Pole Station searching for B-mode radiation in the CMB. At that time, there was some evidence for B-mode radiation but the data was confounded some by interferences in the signals. We look forward to an update by Professor Stark.

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).

Mike Hunter, CCAS President, is our Program Chairman. Please contact Mike or info@ccas.ws if you have any leads on speakers for September and beyond.

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:

Thanks to 48 CCAS members for “on-time” payment of dues during the 2015-2016 dues cycle. This is about half of members whose names we have retained (some maybe too long) on our rolls as “active” and expected to pay dues; (we also have 20 members *exempt from* dues: spouses, students, and “permanent” or honorary members.)

If you consider yourself an active member and are eligible to pay dues, please do so early in the upcoming cycle.

The 2016-2017 dues cycle begins at our **July 7th** meeting. Please bring your check. Dues for most folks are \$30/year. Please pay your 2016-2017 dues in July or August 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! 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 June meeting are on our website; click on the “Minutes” button at www.ccas.ws or click on this link:

From the Dome:

The Summer Schedule of Every-Thursday** Star Parties at The Schmidt Observatory began Thursday, June 23rd, and ends on August 25th (*public always welcome!*) Starting time: 8:30pm; ending time: 10:30pm.

(**Except on CCAS Meeting Nights which will be July 7th and August 4th.)

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. Contact info@ccas.ws if you wish to borrow one.

Studying Mars Retrograde:

Please see page 4 for more on our front-page story about the retrograde motion of Mars. Observatory Staff and CCAS members have been studying this year's event and we hope they may report some results here in a future issue.

Please see articles beginning on page 5 on:

- a new **Library Telescope Loan Program** at Snow Library in Orleans being supported by CCAS members,
 - a big "**Thank You**" sent to the staff of the Schmidt Observatory by the Girl Scouts who visited in April,
 - a short article on **Insight Observatory**, an organization based in Plymouth and its excellent website providing educational and observing resources for astro enthusiasts and students, ...and finally,
 - **WiSE**: announcement of workshops in Exploring the Solar System, the Milky Way, and The Cosmos being held at Tufts University in July.
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July Observing:

Observing Resources:

Please see resources in the July issue of *Astronomy Magazine*, pp 36-43, and *Sky and Telescope*, pp 41-61, and Reference 5 for good guides to the sky. See *AM*, p41, and reference 6 for positions of the moons of Jupiter and Saturn and special phenomena of the moons of Jupiter this month.

There is an *excellent* article on the Kennedy Space Center at Cape Canaveral in the July issue of *Astronomy*, pp 44-50. Your editor has been to KSC, and recommends a visit the first chance you get. You will learn or relearn a lot of history about our extraordinary space exploration programs from 1965 until present, stand on the launch pad from which the Space Shuttles and the Apollo missions flew to the moon, and stand next to real spacecraft including the Shuttle Atlantis, and a complete Saturn rocket. You won't believe how big that rocket is!

Highlights in the Night Sky for July:

- Check out the rise and set times for the planets in our "Mooncusser's Almanac" on p 4. With some planning, you can actually see **all** the planets this month.
 - **Mercury** and **Venus** are nicely visible in binoculars low in the west 30 minutes after sunset on the last days of the month.
 - if you are willing to either stay up late or get up early in the morning, you can see **Neptune** and/or **Uranus** with a good telescope.
 - The parade of the "big three": east to west: **Saturn, Mars, and Jupiter** is visible with or without optical aid for a good part of the month; use a telescope if you want to study the motions of the moons of Jupiter and Saturn. Don't dawdle too too late in the month to study Jupiter: it sets as early as 9:51 on July 31.
 - Finally, if you can get to the 16" or 18" 'scopes at the Schmidt, mag 14 **Pluto** should be high enough to find any night in July by 10 or 11pm when it is highest. Pluto transits a bit after midnight at mid month.
 - There will be a **lunar occultation** of (mag 1) very bright star **Aldebaran** early in the morning for Cape Codders on July 29th. For folks living in the Rockies or California, this event should be a naked-eye spectacle, particularly the *reappearance* when the star comes out from behind the moon. At Cape Cod, given how bright the star is, this event *might* be visible in a good telescope, particularly the reappearance event... even though the occulting event, involving the bright edge of the waning gibbous moon covering the star, takes place at 6:18am, about 45 minutes *after* sunrise, ...and the reappearance event, the star peeping out from behind the dark edge of the moon, will take place at 7:05am in broad daylight. Bernie Young, Research Director at The Schmidt, please send Peter an email if you have plans to pursue this opportunity and your email will be forwarded to our various emailing lists. Thank you.
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Mooncusser's Almanac and Monthly Alert¹
JULY 2016

Object	JULY 1 (EDT)	JULY 15 (EDT)	JULY 31 (EDT)
Sun	R: 05:10 S: 20:19	05:20 20:13	05:35 19:59
Moon	R: 03:15 S: 17:18	16:26 02:28	03:48 18:07
Mercury (evening)	R: 04:39 S: 19:55	06:06 20:54	07:31 21:01
Venus (low, eves)	R: 05:41 S: 20:48	06:11 20:53	06:50 20:47
Mars (evening)	R: 16:35 S: 02:03	15:49 01:12	15:10 00:23
Jupiter (low, eves)	R: 10:48 S: 23:39	10:04 22:48	09:15 21:52
Saturn (all night)	R: 17:51 S: 03:25	16:53 02:27	15:47 01:22
Uranus (late nite)	R: 00:54 S: 14:05	00:00 13:11	22:57 12:08
Neptune (late nite)	R: 23:18 S: 10:29	22:23 09:33	21:19 08:28
Pluto (all nite)	R: 20:25 S: 05:53	19:29 04:56	18:24 03:51

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

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 two convenient evening occurrence of the Minima of Algol this month: Saturday, July 2nd, at 7:50pm (view

brightening only) and Friday, July 22nd, at 9:30pm.

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 magnitudes) and up to two to three hours after the minima to watch the brightening.

Moon Phases, July, 2016

New Moon, Monday, July 4th, at 7:01am EDT
First QTR, Monday, July 11th, at 8:52pm, EDT
Full Moon, Tuesday, July 19th, at 6:57pm, EDT
Last QTR, Tuesday, July 26th, at 7:00pm, EDT

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

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

MARS BACK ON TRACK AFTER JUNE REVERSAL

...continuation of Story beginning on page 1...

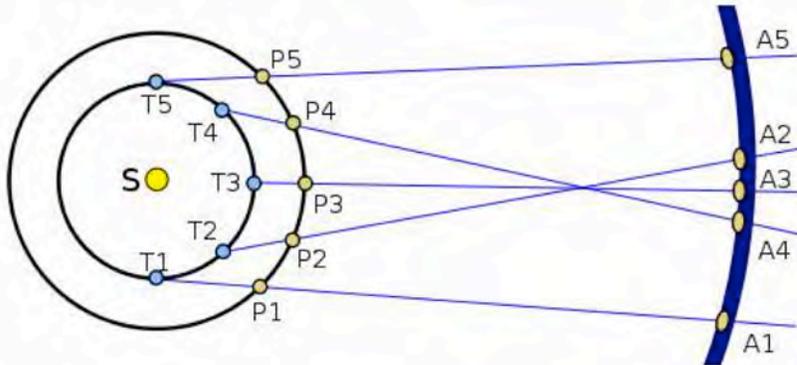
We are featuring this subject this month because, as is shown in the chart on page 1, not only is Mars completing, at the end of June, the apparently retrograde motion it has been in since the beginning of 2016, but there has been a flurry of astrometric and astrophotographic activity by staff and CCAS members at The Schmidt Observatory end of June studying the end of this year's event. Hopefully, one or more participants in this adventure at The Schmidt will send us either reports, or photos from their work, or both, in the coming weeks so we and run a followup story here in the coming month or months. We have already in hand some amazing photos showing the motion change at end of retrograde.

Retrograde Motion of Planets: Retrograde motion in a planet motion is a phenomenon in which the planet being observed from earth *appears* to reverse the usual direction in which we see it moving, usually west to east, against the star patterns in the celestial dome. The planet does not reverse in its orbit. It turns out any planet orbiting *outside* the orbit of the earth will demonstrate retrograde motion at one time or another. Mars is the more frequent star of such a

show because its orbit is the closest to earth's orbit and its motion is fun to watch and record because dramatic changes in direction take place over weeks rather than months.

How is it that the direction Mars moves *appears* to reverse from the normal west to east to east to west and then eventually to return to a more conventional west to east track against the background stars?

This excellent schematic from the *Earthsky*⁸ website explains the phenomenon pretty clearly:



A schematic of how apparent retrograde motion takes place when Earth (T) passes an outer planet (P) on its slower outside track as they both orbit the sun (S).

The changing viewing angle from Earth (T) makes the projection of the outside planet (P) against the celestial sphere (A) move “backwards” (A2-A4) as we pass the slower planet on our faster inside track. Both the Earth (T) and the outside planet (P) are orbiting counterclockwise. The default apparent movement of the planet when NOT being passed by earth on its inside track is west to east.

CCAS Member Supporting new Library Telescope Loan Program

You may recall the mention in the June *First Light* of a New Hampshire Astronomical Society program supporting the lending of telescopes from local libraries. Interestingly, a program like that is being started in Orleans!

We were recently contacted by Jarvis and Judy Hunt, informed that they were contributing a starter-level Orion StarBlast 4.5” Reflector telescope to Snow Library in Orleans and asking if CCAS could support startup of a new Library Telescope Program.

Peter Kurtz, Treasurer of CCAS and Editor of *First Light*, participated in a planning meeting with Tavi Prugno, Director of Snow Library, and Jarvis and Judy on June 21, and laid out plans for the first phases of this program.

It was decided the telescope will be loaned out for one- or two-week periods only to individuals 18 years and older who have participated in an orientation program at the library. The first of these once-a-month orientation sessions will take place at 7:00 pm on July 13th. (Please see an image of a flyer announcing this session immediately following our masthead (page 7).)

Peter will cover elementary how-to's, do's and don'ts on the StarBlast, suggestions on learning the 'scope, planning observing sessions, and enjoying first night sky observing experiences at home. He will also suggest good startup targets, generally in order of brightness (moon, planets, brightest stars) and progressing to double stars and the best asterisms and deep fuzzies for a small telescope.

Any member or “Friend” of CCAS having an interest in this program either as a potential borrower or a potential supporter and teacher please contact Peter (info@ccas.ws), let him know your interest, and try to participate in the orientation session on July 13th or later months. Thank you.

Girl Scout Troop 80776 sends CCAS and the Staff of The Schmidt Observatory a big “Thank you.”

We reported last month that our Observatory Staff was pleased to host a contingent of Girl Scouts from Eastham Middle School on April 29th at the Schmidt Observatory. The reward for the Observatory Staff and all of us is a recently received and delightful “Thank You” card created and sent by the girls and their leader, Pamela Anderson.

Please see the *second* page following our masthead page 7 for an image of the card. Thank YOU, Ladies!

Introducing Insight Observatory and its website:

CCAS received an email from Mike Petrasko during June inviting us to let CCAS members and friends know a bit about “Insight Observatory”. Many CCAS members know Mike and other key Insight Observatory members including Harry Hammond, onetime member of CCAS and Editor of *First Light*.

Insight Observatory is an organization of experienced astro enthusiasts who maintain a spectrum of resources valuable to anyone interested in amateur astronomy and observing the night sky. Please go to their website, (<http://www.insightobservatory.com>) to learn more.

Mike describes IO as “an organization that promotes astronomy education for schools and the general public using both remote robotic and backyard telescopes. Check out the tabs at the website, including: Recent Posts, Purpose, About Us, Telescope Network, Dream Telescope, Observing Programs (at an observatory in Kingston, MA), and others.

At his request, Mike is on the “Friends of CCAS” emailing list so has access to all issues of the CCAS newsletter. Now and then, after consulting with the editor of *First Light*, Mike might re-post a *First Light* article on Insight Observatory’s “Recent Posts”.

Workshops in Space Exploration (WiSE), July 11-29 ...at Tufts University:

CCAS received an email from scientist Dr. Bill Waller of Rockport, Maine (<mailto:williamhwaller@gmail.com>) asking us to post a notice on this workshop in our newsletter. Topics include “Exploring the Solar System”, “Exploring the Milky Way”, “Exploring the Cosmos”.

The flyer indicates that the workshops are intended to introduce science educators, students, and enthusiasts to the content, structure, and 13.8 billion-year history of the Cosmos. Danilo Marchesini and researchers from Tufts, Harvard, MIT, etc. will present. There is a \$300 fee per four day workshop. Please contact Dr. Waller at his email address.

More at: <http://sites.google.com/site/sciencegazette/workshops>

Following Pages.....

- Masthead and References Page (p 7)
- Flyer Announcing Orientation for Snow Library Telescope Loan Program
- “Thank You” Note from Girl Scouts

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Cape Cod Astronomical Foundation

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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 γ Andromedae to Algol's west, mag 2.1, and ϵ Persei 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) Here is the web address for Astronomy Magazine's "The Sky This Month" online for July: <http://www.astronomy.com/magazine/sky-this-month/2016/05/mercury-and-venus-return>
- 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>
- 7) The Retrograde Motion Chart is taken from a Skymania article found at: http://www.skymania.com/wp/wp-content/uploads/2007/09/path_mars_2016_1.jpg
- 8) The schematic explaining the "mechanics" behind apparent retrograde motion was taken from an *Earthsky* article at <http://earthsky.org/?p=235532> Click on "About" at the top of the website page to learn more about the *Earthsky* team and their work. *Earthsky* credits Wikipedia User Rursus for this schematic.

Explore the Cape Cod Night Sky!

Snow Library will be offering a telescope lending program.
You will be able to check out a telescope for two weeks
(just like you check out a book).

If you have an interest in borrowing our telescope in the
near future, please be sure to attend an introductory
informational session at Snow Library.

The first one will be held on

Wednesday, July 13th at 7:00 pm

Peter Kurtz from the Cape Cod Astronomical Society will give
an introduction to using the Orion Starblast telescope
and what you can see with it.



This program is free; no registration is required.

THANK YOU

Thank you
so much for
inviting our
troop to your
observatory!

- Lily

P.S. Sorry for breaking
your telescope...

I had so much fun
at your observatory!
Thanks for letting
us ~~be~~ come!

- Nellie

Thanks
so much for
the amazing tour
and lesson about
the stars!

- Caterina
Landon

Thank you so much for
Inviting us to your Observatory.
It was so cool! Rose ♡

Thank you
for the fun
letting us
see the stars
and Jupiter!
- Melissa

Dear Cape Cod Astronomical Society,
Thank you for your Home
Knowledge + expertise that you
shared with us! We appreciated
it very much!
Girl Scout Troop 80776