



First Light

The Newsletter of the Cape Cod Astronomical Society



December 2007-January, 2008

Vol. 18 No. 9

Thoughts on First Light

This is the December-January issue of First Light. Skylights for both months are presented below for your use. If significant news items having to do with our Society, the Observatory, or the night sky materialize during December, a very abbreviated version of First Light will be published on/about December 24. If not, the February issue will be sent out in late January.

Please continue to send in articles for inclusion in First Light; suggested areas: Member Profiles, "Light Side" articles about members, astronomy resources, favorite observing targets or techniques, astrophotography and photos, special observing experiences you have had. This newsletter is vibrant only if it has input from many members.

We are pleased to present a Member Profile on Tom Leach, our webmaster, in this issue.

CCAS Events

Participants at our November meeting enjoyed two excellent presentations. The first was an entertaining account by Tom Leach of his adventures in building a roof observatory in the attic of his garage. Tom shared wonderful photos of this project which found a new home for an old rotatable dome. In a second very informative program, Jon Greenberg reviewed the nuts and bolts of his project to complete refurbishment of an old Dobsonian telescope.

At our **December 6th meeting** Jon Greenberg will present enticements for observing during the next few months: "Winter Skies, Winter Solstice, and When is Christmas?"

Our **meeting on January 3rd** will feature Betsy Young presenting an overview on technical and practical aspects of different kinds of eyepieces for telescopes and factors to consider in their selection

Executive Corner

The CCAS Executive Committee met on November 12th. Plans were developed further for the programs for upcoming Society meetings. The decision was taken to begin to have "general" meetings of the EC only in alternate months with the next such meeting scheduled for January 14. Meetings in the even months will be scheduled only for special topics. The first such "special topic" meeting is scheduled for February 11. The topic will be strategies to improve publicity about CCAS and its activities. Anyone having input on that topic please inform any member of the EC before 2/11.

From the Dome

Modifications to the dome's shutter system have been completed. Thanks to Bill McDonough, Werner Schmidt, and the school district's electricians, we can now push a button to open and close the lower shutter rather than stand on the stepladder and turn the boat winch.

These were modifications, not changes. Changes is too simple a word to describe the gilded lily, over-engineered, etc. setup provided by Ash Dome. Thanks again guys; even Job would have bailed out on this one.

I will not be available for a while; Ed Swiniarski has been appointed Acting Director for the interim. Requests for star parties and other use of the observatory should be directed to him at 508-896-7270.

Mike Hunter, Director, Werner Schmidt Observatory

Foundation News

...when have input...

Astro Trivia

The question of the month is: **How are comets named?**
...to be discussed at our December meeting.

Mooncusser's Almanac and Monthly Alert¹

By Peter Kurtz

DECEMBER 2007

Full Moon (& perigee) Saturday Nov 24 at 9:30am EST

Last QTR Saturday Dec 1 at 7:44am EST

New Moon Sunday Dec 9 at 12:40pm EST

First QTR Monday Dec 17 at 5:18am EST

Full Moon (~ perigee) Sunday Dec 23 at 8:16pm EST

Mooncusser's Almanac and Monthly Alert¹

By Peter Kurtz

JANUARY 2008

Last QTR Monday Dec 31 at 2:51am EST

New Moon Tuesday Jan 8 at 6:37am EST

First QTR Tuesday Jan 15 at 2:46pm EST

Full Moon Tuesday Jan 22 at 8:35am EST
[Perigee Saturday January 19]

Last QTR Wednesday Jan 30 at 12:03am EST

DECEMBER 2007

Object	Dec. 01 (EST)	Dec.15 (EST)	Dec.31 (EST)
Sun	R: 06:48 S: 16:11	07:00 16:11	07:07 16:19
Moon	R: 23:26 S: 12:13	11:01 21:51	00:20 11:16
Mercury (into sun)	R: 06:04 S: 15:41	07:01 16:00	07:50 16:50
Venus (morning)	R: 03:02 S: 14:13	03:30 14:01	04:04 13:54
Mars (all night)	R: 18:02 S: 09:30	16:43 08:20	15:09 06:53
Jupiter (becoming predawn)	R: 08:08 S: 17:17	07:26 16:35	06:39 15:48
Saturn (morning)	R: 23:02 S: 12:21	22:08 11:26	21:04 10:23
Uranus (evening)	R: 12:25 S: 23:44	11:30 22:50	10:28 21:49
Neptune (evening)	R: 11:20 S: 21:35	10:25 20:41	09:23 19:41

JANUARY 2008

Object	Jan. 01 (EST)	Jan.15 (EST)	Jan. 31 (EST)
Sun	R: 07:07 S: 16:20	07:05 16:34	06:54 16:54
Moon	R: 01:24 S: 11:39	10:38 00:25	02:16 11:05
Mercury (evening mid to end month)	R: 07:53 S: 16:54	08:06 17:56	07:15 17:58
Venus (predawn)	R: 04:06 S: 13:54	04:35 13:59	05:00 14:17
Mars (all night)	R: 15:03 S: 06:47	13:50 05:34	12:41 04:23
Jupiter (predawn)	R: 06:36 S: 15:45	05:54 15:04	05:06 14:17
Saturn (morning)	R: 21:00 S: 10:19	20:02 09:23	18:54 08:18
Uranus (evening)	R: 10:24 S: 21:45	09:30 20:52	08:28 19:53
Neptune (early evening)	R: 09:19 S: 19:37	08:25 18:44	07:24 17:44

More on December and January Observing:

There is a wealth of things happening in the sky in December and January. Not a time for “a long winter’s nap” if you are an amateur astronomer!

Lunar Librations and distance of the moon from the celestial equator:

As we view it, the moon is seen to “wobble” a bit from one night to another. This exposes small slices of the side of the moon we otherwise cannot see. The result is that at certain times of the month, we have the opportunity to see “more” moon than at other times. Once each month, a maximum extra portion of the right side (“maximum longitudinal”) or left side (“minimum longitudinal”) or north side (“maximum latitudinal”) or south side (“minimum latitudinal”) of the moon is exposed toward us. As an example from the table below, on 11/29 8° extra of the east limb (right hand side) is turned toward us and is visible; i.e., “maximum longitudinal” libration; while on 12/16 6° (-6°) extra of the west limb (left hand side) is turned toward us; i.e., “minimum longitudinal”. On 12/8 7° extra of the north limb is turned toward us and is visible; i.e., “maximum latitudinal” libration; while on 12/21 7° (-7°) extra of the south limb is turned toward us; i.e., “minimum latitudinal”.

Because of the tilt in the earth’s polar axis, the path of the moon around the earth varies day to day in distance from the celestial equator. Thus it varies in declination by a range of more than 50° during the month most months which influences how high in the sky we might see it. As an example, on 12/23 it is at greatest declination (28°) and most southerly on the 10th (-28°).

Libration and Declination Tables for the moon for December and January:

DECEMBER	
Max Longitudinal	Min Longitudinal
11/29(8°)12/27(7°)	12/16 (-6°)
Max Latitudinal	Min Latitudinal
12/8 (7°)	12/21 (-7°)***
Max Declination	Min Declination
12/23 (28°)	12/10(-28)
JANUARY	
Max Longitudinal	Min Longitudinal
1/24 (6°)	1/11 (-5°)

JANUARY continued (moon)	
Max Latitudinal	Min Latitudinal
1/4 (7°) 1/31 (7°)	1/18 (-7°)
Max Declination	Min Declination
1/19 (28°)	1/6 (-28°)

*** See note on viewing Mount Clementine below.

Other Observing Events

“Close Encounters” with moon:

DECEMBER

- 11/27 Mars 2° south of **nearly full moon**
- 11/30 Regulus 0.3° north of last QTR moon
- 12/1 Saturn 2° north of last QTR moon
- 12/5 **PHOTO OP: Venus, Spica, and the thin (16%) crescent moon will hang 7° next to each other about 17° above the horizon predawn at 5am.**
- 12/12 Vesta 0.4° north of **3-day old moon.**
- 12/15 Pallas 1° south of first QTR moon
- 12/21 Pleiades 1° south of **nearly full moon.**
- 12/23 Mars, at opposition, **0.9° south of full moon**
- 12/27 Regulus 0.6° north of 17 day moon
- 12/28 Saturn 3° north of 18 day moon

JANUARY

- 1/10 Neptune 0.5° north of **crescent moon.**
- 1/12 Uranus 3° south of 4 day moon.
- 1/19 Mars 1° south of **nearly full moon**
- 1/24 Regulus 0.7° north of **nearly full moon**
- 1/25 Saturn 3° north of **nearly full moon**

Perseus, Algol, and Mars:

As this is written, the main reason to look in Perseus these days is to see what the (for now) magnitude 3 Comet (17P) Holmes is doing. If you haven’t yet seen Holmes you MUST try to see it. On December 1, Holmes should still be at least a broad “mist” very close to ι-Persei, just toward the south or to the right from the bright star Mirphak, and on January 1, if Holmes is still bright and concentrated enough to see at all, it should be just to the south (right) of Misam, κ-Persei.

As long as Comet Holmes has us spending time in Perseus, and because Perseus is nice and high in the sky in the evening during December and January, move to the south and west a bit from where the comet is near Marphak and plan to observe the varying brightness of β-Persei, Algol. The table below shows the many convenient times Algol will be at minimum brightness

2
these two months for Cape Codders . A bit more on Algol as a variable star system is provided in our references at the end of this issue of First Light.

Minima of Algol visible after dark at Cape Cod: 1,2

DECEMBER	
02 14	Sat 12/1
23 04	Mon 12/3
19 53	Thur 12/6
16 42	Sun 12/9
13 31	Wed 12/12
00 48	Mon 12/24
21 37	Wed 12/26
18 26	Sat 12/29
JANUARY	
23 21	Tues 1/15
20 11	Fri 1/18
17 00	Mon 1/21

While in Perseus, don't forget to watch Mars which is in Auriga just east of and coming toward Perseus during this period.

Other December/January Highlights:

The **winter solstice** occurs at 1:08AM on December 22; three days before Christmas. Take heart! Hours of daylight begin to increase each day from this point. Curiously, the earth is closer to the sun (at perihelion) than it is any time all year just a few days later on January 2nd. Clearly the average temperature outside in winter is not all that dependent on nuances in distance between earth and sun.

In the December January period we are blessed with what should be two of the best meteor showers in a twelve month period.

The **Geminid meteor shower** peaks on December 14 at noon our time. Make sure to spend time with the geminids either that evening or evenings close on either side of peak night since the debris field which causes the show is somewhat compact. (Some meteor showers having more diffuse debris fields are broadly active over more days before and after the peak.) Up to 100 meteors per hour are possible in the geminid event at peak and most of that should be viewable since the radiant is high in the sky. The show should be especially good this year since on 12/13 the waxing moon is still smaller than 25% illuminated, located well in the west, and, for Cape Codders, sets just 2 hours after the radiant in Gemini rises in the east shortly after 5pm. The moon sets just an hour later the next evening. The Geminid shower is one of the few where the radiant climbs high enough for attentive viewers to see close to the maximum rate possible nearly all night long.

The **Quadrantid meteor shower** peaks on January 4th at 2am our time. So a look the previous evening or the next evening makes sense. This shower has its radiant in the now defunct constellation Quadrant which was named some centuries ago in honor of the navigating instrument of the same name. The radiant position is just west of the star Mizar in the handle of the Big Dipper. Make sure to spend time with the quarantids on or within a night of the 4th of January since, as is true of the geminids, the debris field which causes the show is quite compact. Up to 120 meteors per hour are possible in the quadrantid event. The show should be especially good this year since both nights the near half waxing moon sets "early" in the west away from where the radiant rises in the east.

As December begins, **Mercury** rises only 9° before the sun and is working towards superior conjunction which occurs 12/17. By January 1, it is moving about 9° after the sun in our skies and so becomes an evening target again. It reaches greatest eastern elongation on 1/22 when it is separated from the sun by 18°.

Venus continues to be queen of the morning sky during December and January moving slowly toward the sun so that by end January it is available in the predawn sky only for two hours before the sun rises.

Our **Saturn** is very slowly moving into Leo, with the two rising about 11pm at the beginning of December, becoming more convenient to view in the evening at the start of January when they rise about 9pm. Saturn will be in Leo all of 2008.

Jupiter becomes lost in the sun during December arriving at superior conjunction on December 23. Jupiter will begin to emerge into morning twilight mid-month in January setting up for end of month **PHOTO-OPS** rising almost behind (0.6° separation!) Venus just before sunrise on January 30th.

Mars begins its best six-week show in several years beginning in early December when it rises just a few minutes before sunset. On December 19th it will be as close to earth as it will get on this opposition (December 24) cycle when it will show itself magnitude -1.5 and subtend an angle of 15" in a telescope. It will be nine years before Mars appears this large again. Beginning the month in periodic westward retrograde motion, it will continue westward relative to the stars until the last day in January when its eastern movement vs. the stars resumes. At its closest, on 12/19, a good telescope on a clear night should show its white polar cap, (now at its maximum as Mars' long northern winter concludes), Syrtis Major, (Mars' prominent dark "maria"), and the bright Hellas basin. Mars will be visible to the naked eye through May diminishing in size only slowly through the spring.

After most of a year knowing that Neptune or Uranus are always “there” in the evening, it is appropriate to begin thinking about the upcoming “disappearance” of Neptune and Uranus into the sun for a while. By end January Neptune will set only one hour after sunset with Uranus setting two hours later. These two planets move so very slowly. But, meanwhile, the earth moves pretty fast. In late February the two will again become viewable but only predawn which is usually less convenient for most folks than early evening. So if you like to “find” those two with your telescope in the evening, do it soon.

Comet 8P/Tuttle: Will two comets be visible at the same time in January? That could be possible if 17P/Holmes stays bright. An old comet, the fast moving Comet 8P/Tuttle, makes its best trip past earth since 1980 and the last good one until 2021 beginning end December. It moves fast relative to earth and will only be a good observing opportunity for about two weeks in early January. On December 26 it is traveling south through Andromeda at expected magnitude near 6.5 and will be closest to earth and brightest at mag 6.0, a good binocular object, on the first of the year. It moves rapidly to the south staying visible to binoculars and then to telescopes finding itself weaker and much farther away south of Cetus by the 10th of the month. At that time, fading of the comet and brightening of the moon will end the apparition. See the Finder chart in reference.³

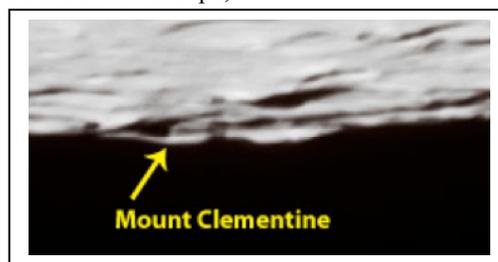
TELESCOPE PHOTO-OP: There will be a near conjunction of 8P/Tuttle and M33, the Pinwheel galaxy, when it is dark enough to see both on the night of December 30. Photos taken about an hour apart will show the speed of motion of the comet. North Americans should be ready as darkness falls December 30, because the comet has just passed the Pinwheel Galaxy and will be only a degree away by midnight. Two pictures taken a few hours apart will make a stereo pair that can be viewed in pseudo 3-D.

Our largest familiar asteroid Ceres should be a good viewing target in good binoculars or a small telescope as it passes through the tail of Cetus in December and January. This 600 mile-wide rock, mag 8, travels through Cetus’ tail toward Aries during January and February. See reference for star-hopping instructions.³

Minimum Latitudinal Libration of the Moon: View 3-Mile-High Mount Clementine:

How often do we welcome the full moon? How often do we talk about something special to see at full moon? Well 12/21, a night when the moon is almost full, presents a special opportunity. (Use a blue or green “moon” filter if the full moon’s brightness is unpleasant.) That night the moon is at minimum latitudinal libration exposing about

7° of the southern part of the the backside of the moon to view. Near the south pole then, on the 21st, with good binoculars or a telescope,



we should be able to view Mount Clementine, a 3-mile-high peak. It is just beyond the south pole from us. If you start two days before the 21st, and take a look each night for two days following the 21st, you can scale the mountain from bottom to top and down again as the libration proceeds night to night. This is a great example of a unique view that is possible only because of libration. North/South longitudinal libration is caused by the location of the moon well above or below the ecliptic plane. Further details on this are given the RASC handbook.¹

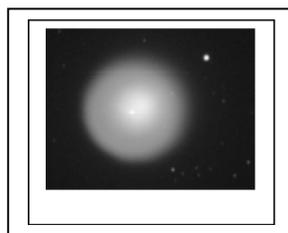
Members’ Observing Notes:

Please submit short reports with or without pictures of special observing experiences you would like to share with your colleagues.

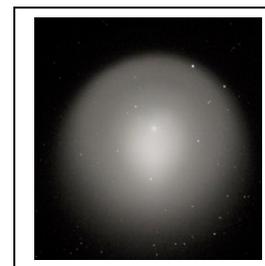
You never know, when observing, if you will see what you hoped or expected to see, or not, with or without a surprise.

Your editor had a momentary and unusual experience when observing the remarkable (and now fading) comet 17P/Holmes on November 13th at exactly 6pm EST.

First of all, isn’t (wasn’t?)Holmes a treat! I first saw Holmes on October 29th when it looked a lot like image “A” below through simple 7x35 binoculars.



“A” (Chris Cook Photo)⁴



“B” More diffuse⁵

It was a great show during November as it wandered toward and then past Mirphak in Perseus and gradually became more and more diffuse as seen in "B" above. Now, on November 29th, it is barely visible as a ghost about 0.8° wide south of Mirphak.

Now the unusual experience: I went out to check on Holmes at 6pm exact on November 13 and it looked much like "B" above in the center of my handheld 7 x 35 binocular field. Immediately there was the slow passage left to right (north to south) of a little mag 4.0 dot right through the center of the comet and then right over

Mirphak! As the object was moving about at the rate usually seen for earth-orbiting satellites, I checked a bit later with Heavens-Above.com and confirmed that what I saw passing through (in front of) Holmes was the Cosmos Rocket satellite, the booster for the Cosmos satellite launched 27 years ago! The path map puts the booster rocket right through where Holmes and Mirphak were at that time on that night.

Peter Kurtz

FEATURE ARTICLE FOR NOVEMBER

Member Profile: Tom Leach

This month we are pleased to present a member profile on Tom Leach, current CCAS webmaster and Harwich harbormaster. At our meeting on November 1, Tom gave us a wonderful account of his project to mount an observing dome on top of his garage. Thanks to Tom for giving us this and his other contributions.

As a doldrums filler in 2005, Tom Leach decided that he would like to learn celestial navigation. For years he found his way across Nantucket Sound in various harbormaster vessels and his sailboat with a compass, and became well adept at "dead reckoning". Eventually equipped with Loran (long range navigation), then ultimately GPS it made the need to understand the stars more remote. However, as an accomplished ocean racer and dinghy sailor, Tom was envious of the handful of people who were capable of using celestial navigation and always wanted to know how. He spent some time that winter looking for such a class on Cape Cod and found none convenient or available and, even somewhat of a lost art, decided that maybe he could teach himself. Armed with several of the technical volumes, in the naval tradition, he started learning about this time-dependant science.

That winter Tom's wife Jackie spotted Jarvis Hunt's astronomy course being taught at Chatham Library and it seemed to Tom that in order to navigate you need to understand more than how to locate Polaris and this might be fun. It didn't take very long for him to understand astronomy holds an endless fascination of material.

He reminisces about the family excitement one evening long ago, outside their Dennisport cottage, with all eyes peeled to the night sky to catch a look at Sputnik. Tom doesn't remember seeing the world's first satellite in space at the age of seven, but instead remembers his dad, brother Jim and older cousins' excitement about some bright object in the sky and the smell of oak on the fireplace. Quoting Tom: "Growing up Dad would often get us outside with his binoculars to view Saturn, moon, a meteor shower or try for some object that was being reported in the space race." "Jimmy had a subscription to Sky & Telescope and a small refractor but I had more interest in flying model planes. I must confess I spent hours looking through those magazines". "As we grew up outside Princeton, my folks were always dragging five of us, like the Cleavers, to whatever university sports and cultural events that were available. I believe this had the positive effect on my siblings and me which my folks were hoping for: each one of us attended some great universities and landed successful careers in areas of our interests."

Tom shares something in common with Foundation trustee Werner Schmidt. They are both graduates of Tufts University with degrees in chemistry although Werner followed a path into industry, Tom was hired as the first Natural Resources Director for the Town of Harwich and has also served as Harbormaster for 35 years. He is past president of the Cape & Islands Harbormasters Association and has enjoyed a career that is mostly outdoors and on the water. His current interests beyond astronomy include sailboat racing, tennis, windsurfing, surfing, wakeboarding, watercolor, reading (mostly nonfiction) and hanging out at Nauset. He also serves as a local Tufts Alumni Admission Program representative.

When Ed Swinarski started asking over several meetings last spring if any CCAS members had an interest in taking over an old dome that had been received by CCAS from Woods Hole Oceanographic and also used by Bill Boyd, Tom decided this might augment his plans for a more powerful telescope perfectly. Jackie felt that his idea to perch the aluminum dome into the back roof of their barn was architecturally the only good place for the dome in their yard. The second story elevation would also help improve the sky view above the tree line. Tom pulled a building permit and went to work on the idea and the dome was lifted in

place by October, 2007. He insists that having the dome just a few steps out the back door is incredibly convenient and enjoys deep sky viewing with a 10” Meade Schmidt-Newtonian telescope almost any good viewing night. He is gearing up for driving the Autostar system with his computer and eventually doing astrophotography. “Timing means a lot in any interest or hobby and deep sky takes time and resources that when you are young seem fleeting or impossible to find. However, now that I am older, I can find time for a greater appreciation of the whole shebang and I believe astronomy will be of the greatest interest for me on into my golden years”.



In October, while visiting their son Tom who works as a mechanical engineer in Orange County CA, Tom and Jackie Leach toured the Mount Palomar Observatory and Griffith Observatory in southern California. “I cannot tell you how incredibly uplifting that experience was, to be standing next to the Halley telescope which Edwin Hubble used to determine that Andromeda was an entire galaxy separate from our own. There is just so much history there and at Griffith that to astronomers these become hallowed places.” “I was even blown away by the telescopes at the OPT Store in Oceanside.”

Tom's real introduction to CCAS came when Jim Carlson was in his last year as Director of the observatory. “I spent many evenings with Jim trying to gather what I could about his role in the AAVSO (American Association of Variable Star Observers). He really has the program down pat. A totally dedicated astronomer.” Of course variables were most valuable in helping conclude that the Universe is expanding. Tom hopes we get our CCD at the Schmidt back on line soon.

Doing our website was a natural, he manages several other webpages for the town and other non-profits including the Sea Scouts. “I figured I could learn about astronomy by researching what would be useful on ww.ccas.ws and Pio Petroschi didn't seem to mind my jumping in.”

Submitted November 10th by Tom Leach

Editors note: Mike Hunter and colleagues have begun work on getting the CCD camera up and running again. The capability should be ready early in 2008.

Other Items of Interest:

Opportunity “Bends its Brush” in Duck Bay:

As of the last issue of First Light, Opportunity was testing its ability to move into and out of the top edge of Victoria crater at Duck Bay. Since that time, the rover moved down a bit into the crater and was preparing to scratch the surface of a rock in the area known as “Smith”: part of the “bathtub ring” of rock just beneath edge of the crater rim. The idea is to abrade the surface of the rock at the “bathtub ring” and then collect compositional data about the rock using the α -particle X-ray spectrometer on board. Well, due to a communication mix-up during a maneuvering test, rover bent its abrading brush so that it is not presently capable of doing the target job. The command team is working on a solution. Meanwhile, Opportunity is otherwise healthy, with solar array energy levels around 660 watt-hours and atmospheric dust measurements, known as Tau, not problematical at 0.9⁶

REMINDER: Bob Gunshor's 4” Reflector Telescope is still for sale; details on last page of the November issue of FL.

Cape Cod Astronomical Society

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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, no charge 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) 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.
- 3) Astronomy Magazine Online, "The Sky This Month", for December 07:
<http://www.astronomy.com/asy/default.aspx?c=a&id=6144>
- 4) Chris Cook photo. 10/30/07 10 superimposed 2 sec images; SBIG ST-8E NABGCCD camera at 20C thru Stellarview SV80S 80mm f/6 triplet refractor @ f/4.8 from Harwich MA
- 5) Picture made available by Sky & Telescope Online:
<http://www.skyandtelescope.com/community/skyblog/observingblog/10775326.html>; this picture was actually taken on November 5th but it captures the increasingly diffuse nature of Holmes as time passed through November 13 when your editor saw the satellite pass directly through the center of the comet.
- 6) <http://marsrovers.jpl.nasa.gov/mission/status.html#opportunity>