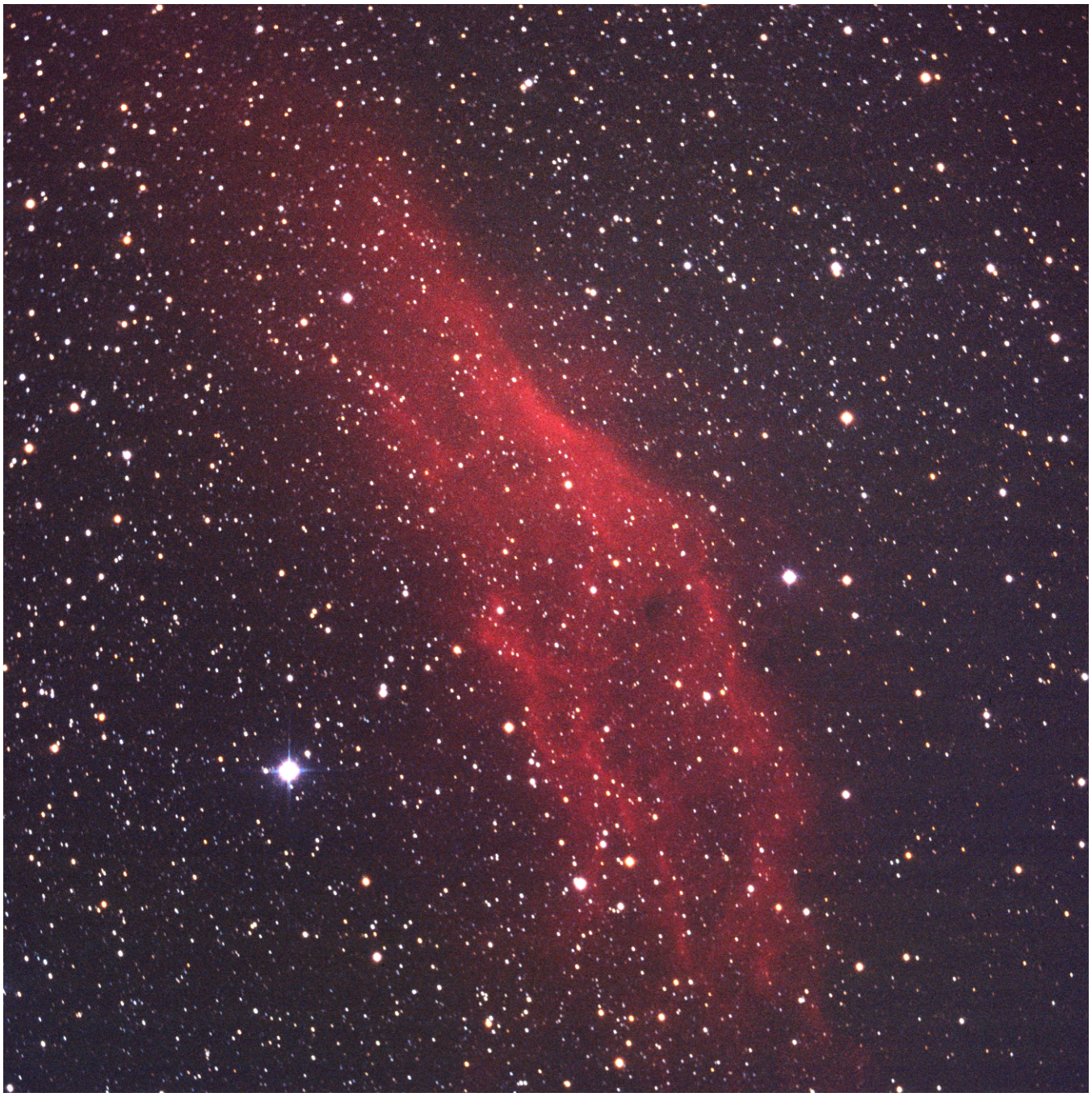
the ASTROGRAPH



Volume 37 No. 5 April/May 2006

the ASTROGRAPH

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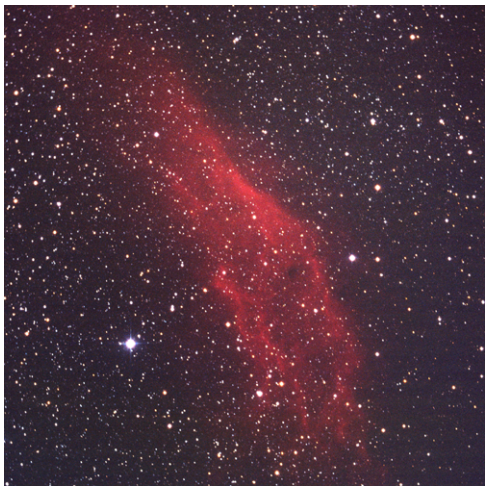

COVER PHOTOGRAPH

Object.....NGC 1499, the California Nebula

Photographer.....Lee C. Coombs

Instrument.....4.25 inch F/4.6 Newtonian

Exposure\Film.....35 minutes/Kodak Ektachrome P200

Date.....2 November 1999

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ATASCADERO OBSERVATORY

by

Lee C. Coombs

My first observatory was constructed at my home in Los Osos, California in 1975. It was a 10 ft. x 12 ft. roll-off roof type that housed my 10 inch F/5 Cave Newtonian reflector on a heavy-duty observatory mount. In 1988, I purchased the Astro-Physics 6 inch F/12 Super Planetary refractor optical tube assembly (OTA). In order to use this instrument, I had to build a special cradle for the low-profile mount I was using with the Newtonian. Switching from one instrument to the other was both bothersome and time-consuming. In 1990 I moved to the town of Atascadero, about 20 miles further inland, and began planning for another observatory that would accommodate both instruments on individual mounts.

My new home in rural Atascadero is on a flat, one acre lot in a very dark location. The main obstacles on the site are two dozen large oak trees. The best site for locating the observatory was one where the western horizon was blocked by the trees but the other three horizons were readily accessible. In order to accommodate both instruments on separate mounts, the building needed to be just 4 feet longer than my previous observatory. The dimensions of the overall observatory is 10 ft. x 16 ft. which requires a 16 ft. track for the roof. The track extends from the west side of the observatory. Since there is plenty of space for the structure, the track is a permanent part of it (Figure 1). The roof is covered with corrugated steel panels and rolls easily on eight 4 inch diameter hard rubber wheels in 1 x 2 steel channel tracks.

It was desirable to have the walls high enough so one could walk around conveniently with the roof closed. The final wall height is 6.5 ft. The refractor is on a tall pier a little more than 5 ft. above the floor



Above: Figure 1, observatory looking north. The 10 ft. x 16 ft. roof rolls off to the west.

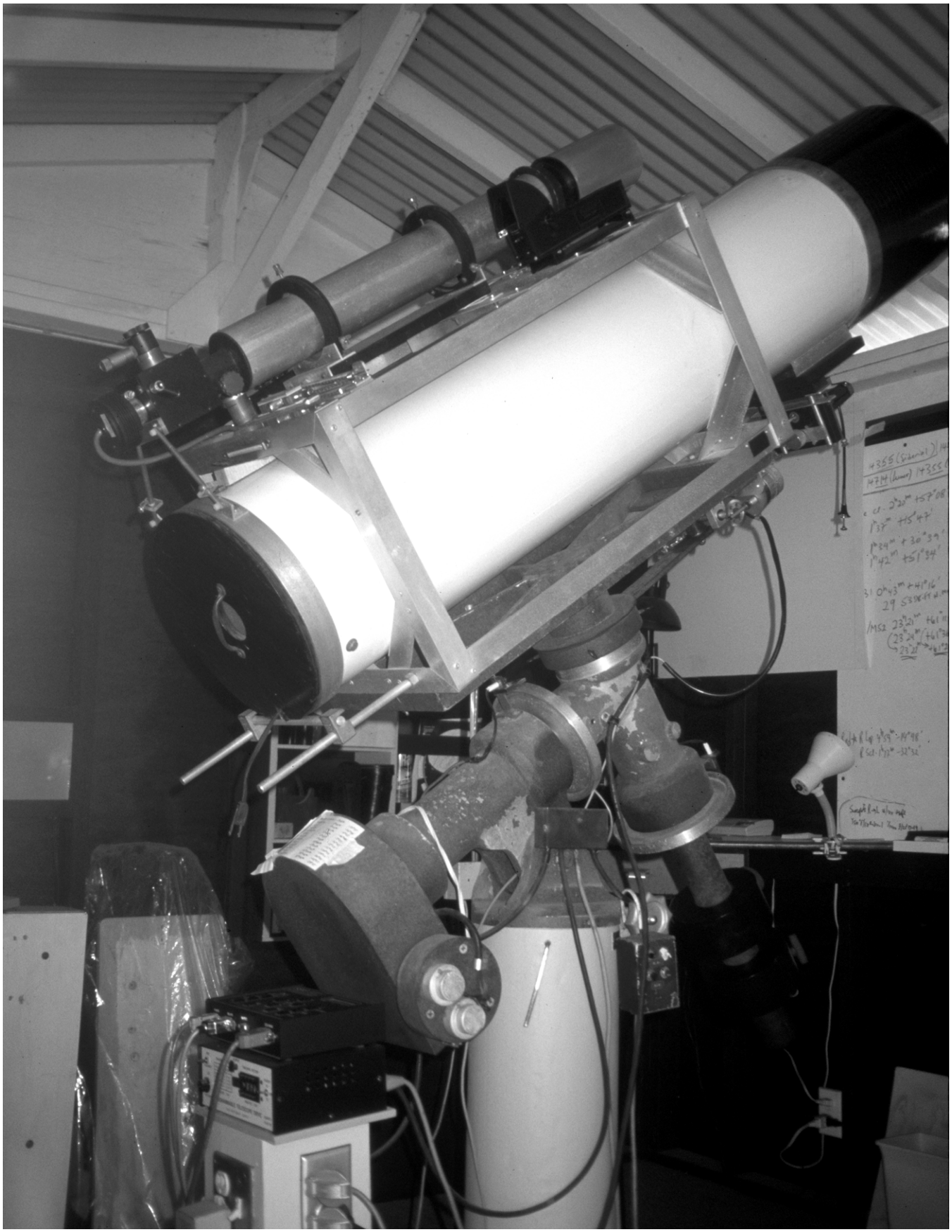
on which the equatorial head sits. This allows access to the southern horizon for the refractor but something had to be done for the low profile Newtonian mount to give that same access. The solution was to make a 2.5 x 6.5 ft. section of wall south of the Newtonian's mount able to drop down. This section of wall was hinged and counterbalanced using pulleys and weights which makes swinging this heavy wall section down an easy task (Figure 2).

The building sits on eight 4 x 4 inch treated posts set in concrete and the floor level is about 18 inches above ground. The Newtonian mount is bolted onto a 2 foot diameter reinforced concrete pier which extends to floor level and sits 3 feet underground on a 4 ft. x 4 ft. concrete footing. The refractor mounting sits on a 1 foot diameter reinforced concrete pier which extends over 5 feet above the floor and 3 feet underground to a 3 ft. x 3 ft. concrete footing. A one inch space filled with foam rubber between the floor and the piers prevents any vibration from being transferred to the mountings. The distance between the two piers is 6 feet which allows both instruments to be used simultaneously without interference of one by the other. This has made it very nice for hosting groups of people in that the two telescopes can be set on different objects and, after everyone has passed through for a look, can then be repositioned on two new objects and the process repeated. The observatory was completed in 1993 after about 4 months of weekend work.

The primary instrument is the 10 inch F/5 Newtonian (Figure 3) equipped with a 3-inch F/10 guiding refractor with a homemade flip mirror diagonal and ST-4 autoguider (Figure 4). The camera is mounted on a adjustable platform which slides on two 1/2 inch aluminum bar rails (Figure 5). The platform is moved using a screw-fed adjustable shim until knife edge focus is obtained at



Above: Figure 2, observatory open for observing. The 10 inch Newtonian sits behind the drop wall section while the 6 inch refractor is mounted 6 feet to the right.



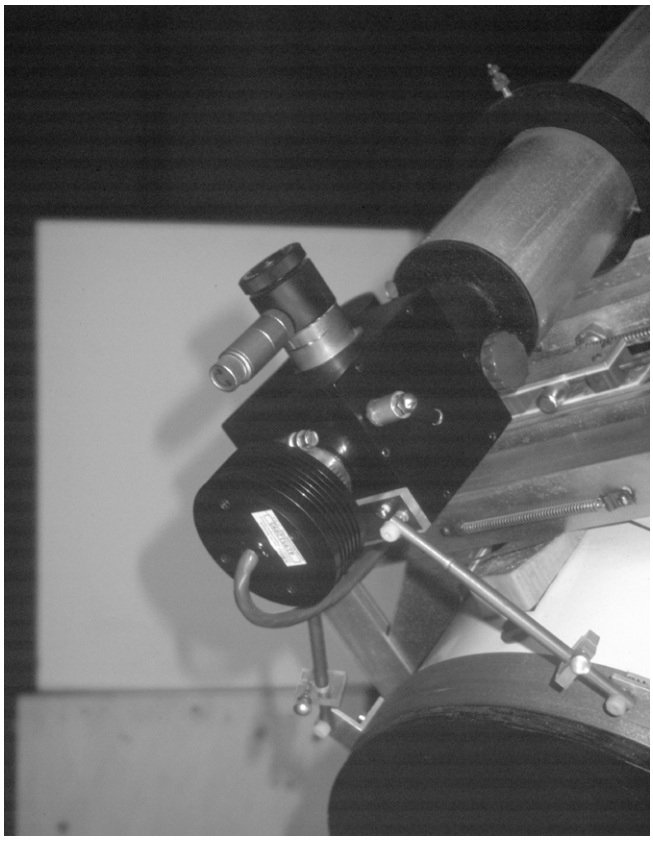
Above: Figure 3, the 10 inch Newtonian with the 3 inch guiding refractor and ST-4 autoguider.

which time it is locked down on the rails. The second main instrument is the 6 inch F/12 Astro-Physics APO refractor which has a Nikon 4 inch F/12 APO refractor attached (Figure 6). Both instruments are used visually as well as photographically. The refractor is used primarily for solar, lunar, and planetary photography. I often use this instrument visually while the Newtonian is being used for photography. The Newtonian is primarily used for deep sky work. After using the Newtonian for over 35 years, I feel I still have not realized its full potential.

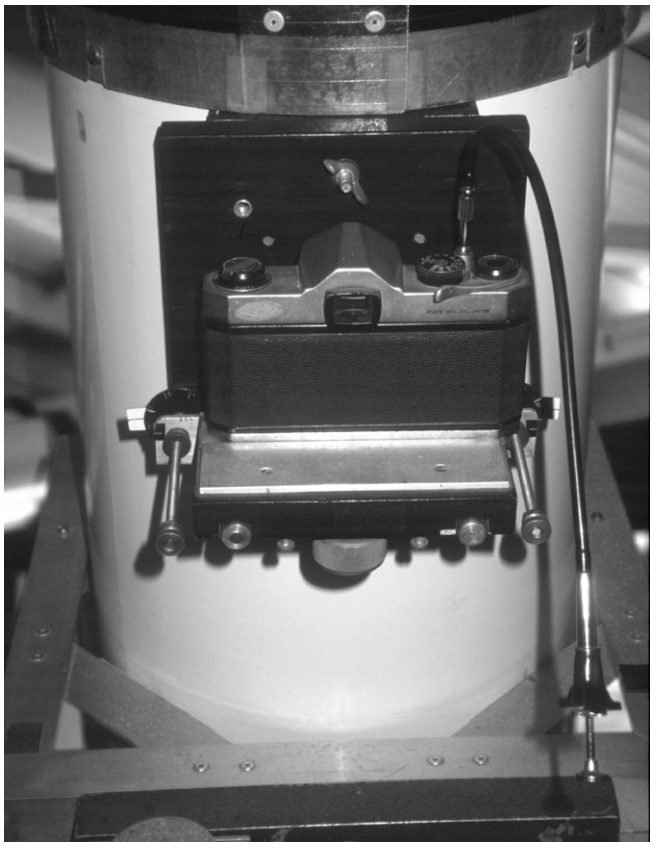
After over twelve years of using this observatory, there is little I would change if I were to build it over again. It is hard to beat the convenience of having your equipment set up and ready to use at a moments notice.



Above: Spiral galaxy M63 photographed by Lee C. Coombs on 1 June 2003 using a 10 inch F/5 Newtonian. Exposure was 35 minutes on Kodak Ektachrome P200 slide film.



Above: Figure 4, the guiding head with flip-mirror diagonal and ST-4 autoguider. The guide scope can be moved off-axis in declination to locate a suitable guide star. Note the two spring-loaded, lockable struts that help prevent differential flexure between guiding head and main instrument.



Above: Figure 5, camera platform with screw fed shim for precise knife-edge focusing.



Above: Figure 6, the 6 inch and 4 inch APO refractors. The gray band at the focus end of the 6 inch is a wrapping of lead foil to help counterbalance the tube in the desired position in the cradle.



Above: Globular cluster M14 photographed by Lee C. Coombs on 2 July 2002 using a 10 inch F/5 Newtonian. Exposure was 30 minutes on Kodak Ektachrome P200 slide film.



Above: Globular cluster M3 photographed by Lee C. Coombs on 15 June 2001 using a 10 inch F/5 Newtonian. Exposure was 21 minutes on Kodak Ektachrome P200 slide film.

Astrophotography for April and May

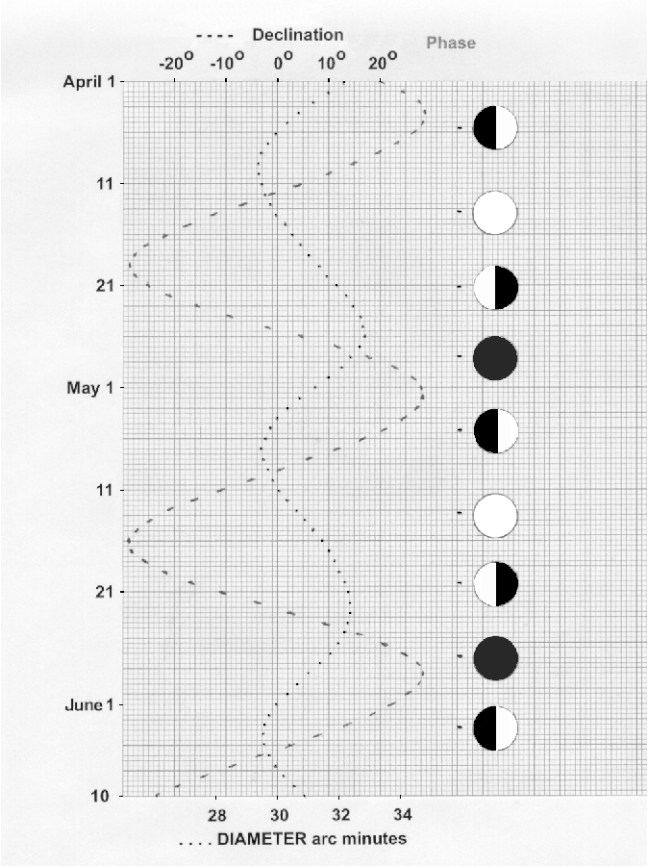
by

Ralph Proctor

Mercury begins April as a morning object low in the eastern sky. During April Mercury moves higher in the eastern sky and reaches a greatest western elongation of 28 degrees on 8 April when it will be in poor photographic position with a declination of minus 6 degree. During the remainder of April Mercury moves lower in the eastern sky and disappears into the Sun's glare in early May, reaching superior conjunction on 18 May. Mercury emerges from the Sun's glare in late May as an evening object low in the western sky.

Venus begins April as a morning object low in the eastern sky. During April and May Venus moves higher in the eastern sky and reaches a greatest western elongation of 47 degrees on 25 May when it will be in poor photographic position with a declination of minus 14 degrees.

Lunar Declination and Diameter:



The Moon's waxing quarter phase will be located high on the ecliptic and in excellent photographic position during April (April 4) and May (May 2 and 29), with an apparent declination of up to +29 degrees.

Mars begins April as an evening object high in the western sky in the constellation Taurus, but moves into the constellation Gemini in early April, and then into Cancer in late May. During April and May Mars moves lower in the western sky, decreases in brightness from magnitude + 1.2 to + 1.7, and decreases in diameter from 5.8 to 4.4 arc seconds.

Jupiter begins April as a morning object high in the eastern sky in the constellation Libra, reaching opposition on 4 May. During April and May Jupiter moves higher in the eastern sky, increases in brightness from magnitude -2.4 to -2.5, and increases in diameter from 42.7 to 43.7 arc seconds.

Saturn begins April as an evening object low in the western sky in the constellation Cancer. During April and May Saturn moves lower in the western sky, decreases in brightness from magnitude +0.1 to + 0.4, and decreases in diameter from 19.2 to 17.3 arc seconds.

Uranus begins April as a morning object low in the eastern sky in the constellation Aquarius. During April and May Uranus moves higher in the eastern sky, remains constant in brightness at magnitude + 5.9, and increases in diameter from 3.37 to 3.50 arc seconds. Uranus is located at R.A. 22 hours 58.9 minutes declination -7 degrees 20 minutes on 15 April and at R.A. 23 hours 03.1 minutes declination -6 degrees 54 minutes on 15 May.

Neptune begins April as a morning object low in the eastern sky in the constellation Capricornus. During April and May Neptune moves higher in the eastern sky, increases in brightness from magnitude +8.0 to +7.9, and increases in diameter from 2.22 to 2.29 arc seconds. Neptune is located at R.A. 21 hours 27.6 minutes declination -15 degrees 10 minutes on 15 April and at R.A. 21 hours 29.1 minutes declination -15 degrees 03 minutes on 15 May.

Pluto begins April as a morning object low in the eastern sky. During April and May Pluto moves higher in the eastern sky and remains constant in brightness at magnitude + 13.9. Pluto is located at R.A. 17 hours 46.0 minutes declination -15 degrees 45 minutes on 15 April and at R.A. 17 hours 44.0 minutes declination -15 degrees 42 minutes on 15 May.

Events:

Uranus will be occulted by the Moon on 24 April (02 hours Universal Time) for southeastern Australia and South Island New Zealand; and on 21 May (10 hours Universal Time) for the southwestern edge of southern Africa and most of Antarctica.

Spica will be occulted by the Moon on 13 April (17 hours Universal Time) for southern Asia and northern Australia; and on 11 May (00 hours Universal Time) for eastern North America and the western portion of west and central Africa.

Antares will be occulted by the Moon on 17 April (09 hours Universal Time) for southern South America; and on 14 May (15 hours Universal Time) for Indonesia, Australia, and New Zealand.

Venus will be occulted by the Moon on 24 April (14 hours Universal Time) for the southern, central, and southeastern portion of South America and the southeastern portion of western Africa.

Vesta will be occulted by the Moon on 31 May (12 hours Universal Time) for eastern Asia, Japan, northern North America, and the extreme northern portion of Europe.

The Sun will undergo a total eclipse on 29 May 2006. The eclipse starts in eastern Brazil, crosses the Atlantic and continues into Ghana, Togo, Benin, Nigeria, Niger, northwestern Chad, Libya, the northwestern tip of Egypt, Turkey, northwestern Georgia, southwestern Russia, Kazakstan, the southern tip of Russia, and ends in the northern tip of Mongolia. The eclipse begins and ends at 7 hours 36.8 minutes and 12 hours 45.6 minutes Universal Time respectively. Central eclipse at local apparent noon occurs at 10 hours 33.2 minutes Universal Time.

The Moon will undergo a penumbral eclipse on 14-15 May 2006 for Africa, Europe, the Middle East, western Russia, and Greenland. Mid-eclipse occurs at 23 hours 47.7 minutes Universal Time.

MINOR PLANETS

		position			
		15 April		15 May	
Planet	Magnitude	R.A.	Decl.	R.A.	Decl.
Ceres	09.1 - 08.7	21 hr 22.5 min	-21 deg 42 min	21 hr 53.4 min	-21 deg 03 min
Pallas	10.0 - 09.7	18 hr 57.9 min	+15 deg 56 min	18 hr 59.3 min	+20 deg 49 min
Juno	09.7 - 10.3	06 hr 29.0 min	+14 deg 03 min	07 hr 23.8 min	+15 deg 04 min
Vesta	07.8 - 08.2	07 hr 09.5 min	+25 deg 37 min	07 hr 52.8 min	+24 deg 24 min

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Volume No. 12 issue 1, 2, 3, 4, 5, and 6
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Volume No. 14 issue 1, 2, 3, 4, 5, and 6
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Product Evaluation: Orion Express80 Lens

by

Robert C. Price

The product being evaluated is an Orion Express80. The Orion Express80 is an 80mm diameter F/6 lens that consists of 2 elements and is described as a semi APO lens. The lens is 15 inches long and weights 5.5 pounds. The lens comes with a built-in lens hood and tripod collar. The tripod collar allows attaching the lens to a tripod mount or mounting plate. The lens, shown in Figure 1, is mounted on a Losmandy dovetail plate by means of this tripod collar. The camera is attached to the lens by means of an Orion 2 inch prime focus camera adapter shown in Figure 2. The prime focus camera adapter purchased from Orion was too long and hit an edge within the Express80 eyepiece holder before it was fully into the eyepiece holder. As a result the camera and adapter were tilted when the adapter was tightened in the eyepiece holder as seen in Figure 3. The author used a metal cutter blade to shorted the T-ring adapter as shown in Figure 4.

The author's testing consisted of short exposures of the Moon and long exposures of M42, the Horsehead Nebula, and M82. Exposures were 1, 5 and 10 minutes with M42 and the Horsehead Nebula, and 5 minutes with M82. The one minute tests consisted of exposures of M42 in focus and slightly out of focus. These tests were performed both inside and outside focus.

Short exposures of the quarter and gibbous Moon were taken at F/6. Exposures ranges from 1/500 second to 1/1000 second. Lunar images were sharper than images of the Moon taken at the same time with a Canon 300mm EF lens. The images did, however, have more chromatic aberration than the Lunar images taken with the Canon 300mm lens.



Above: Figure 1, Orion Express80 lens mounted on a Losmandy dovetail plate by means of a built-in tripod collar. A Canon 350D is attached to the Express80 by means of an Orion 2 inch prime focus adapter.

Five and ten minute exposures of the Orion Nebula and the Horsehead Nebula showed that image quality, especially at the edge of the frame, was about average for a two-element refractor. Figure 5 shows what star images look like in the upper left corner of a typical 10 minute exposure. The image of M42 is centered in this frame and the cropped image shown in Figure 5 is 4/10ths the width of the full frame and 1/4 the height of the full frame. Figure 6 shows the center of this same image. There is an obvious difference in quality between star images in the center of the frame and those towards the edge, as can be seen in Figures 5 and 6. Note that the faint stars are well focused in the center of the frame despite the bloated images of the brighter stars caused by the optics not being fully color corrected.

The inside and outside of focus test consisted of 40 second exposures of a star field as shown in Figures 7 and 8. The results are similar to results obtained with the Canon 300mm EF lens and one other refractor telescope the author has tested. Ideally the images taken inside and outside of focus with the Express80 should look identical, but with refractive optics they do not seem to look identical, but rather are similar to the results depicted in Figures 7 and 8. The images from the Canon 300mm EF lens are better color corrected than the Orion Express80 lens and also better color corrected than one other refractor the author has tested in this manner.

In summary the author concludes that this lens is suitable for astrophotography. It is fast and provides sharp star images of faint stars over about half the field covered by the Canon 350D camera, 14.8mm by 22.2mm. Bright stars have poor color correction.



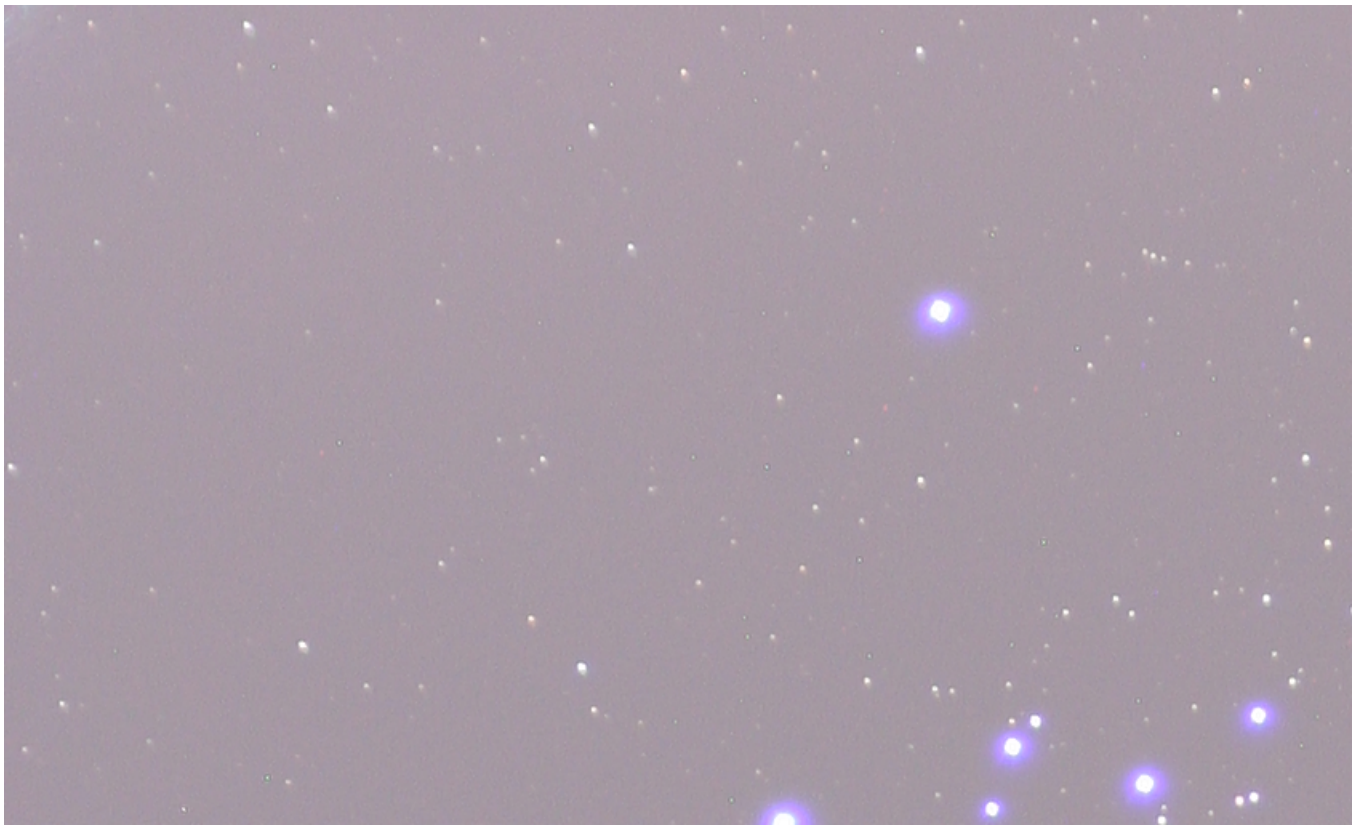
Above: Figure 4, Orion prime focus adapter cut down so it will fit in the Orion Express80 eyepiece holder.



Above: Figue 2, original Orion 2 inch prime focus adapter shown with Canon EOS T-ring attached.



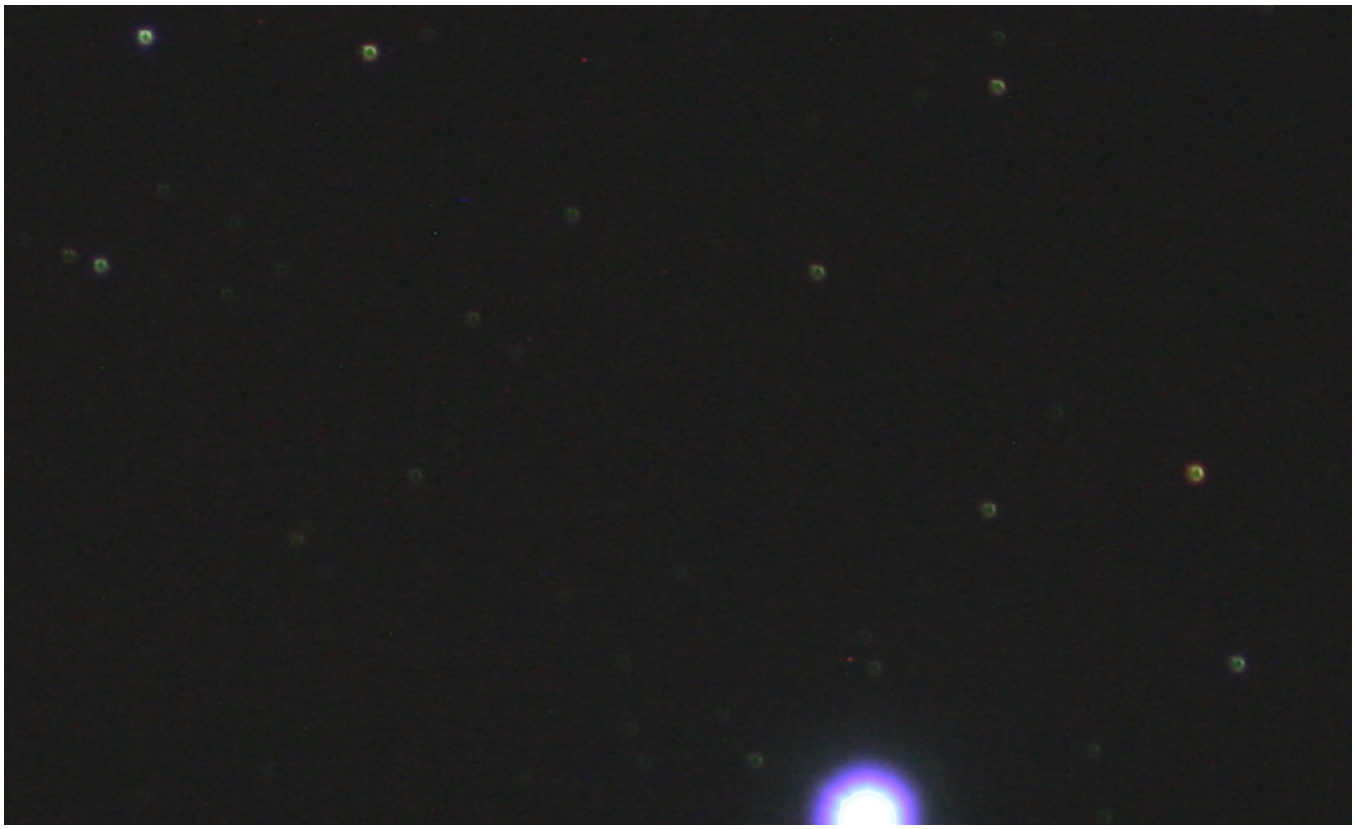
Above: Figure 3, the tilt of the Orion 2 inch prime focus adapter is shown above. Overall image is tilted, but the difference in height of the 2 inch prime focus adapter between the Express80 eyepiece holder on the left and right side of the image can be seen.



Above: Figure 5, Orion Express80 lens evaluation. Shown above is the top left portion of an image frame centered on M42. Photographed by Robert C. Price on 7 January 2006. Exposure was 596 seconds using a Canon 350D camera at 400ASA. Above image was cropped but no image processing was used.



Above: Figure 6, Orion Express80 lens evaluation. Shown above is the center portion of the same image frame at the top of this page. The frame is centered on M42. Above image was cropped but no image processing was used. In the top image bright stars are slightly distorted and faint stars show off-axis distortion.



Above: Figure, Orion Express80 lens evaluation. Shown above is the inside focus appearance of stars. Photographed by Robert C. Price on 7 January 2006. Exposure was 49 seconds using a Canon 350D camera at 400ASA. Above image was cropped but no image processing was used.



Above: Figure 8, Orion Express80 lens evaluation. Shown above is the outside focus appearance of stars. Photographed by Robert C. Price on 7 January 2006. Exposure was 44 seconds using a Canon 350D camera at 400ASA. Above image was cropped but no image processing was used.



Above: Orion Express80 lens evaluation. Shown above is a full image frame centered on M42. Photographed by Robert C. Price on 18 January 2006. Exposure was 586 seconds using a Canon 350D camera at 400ASA. Image processing included level adjustments and color corrections. No dark frame or hot pixel correction was used.