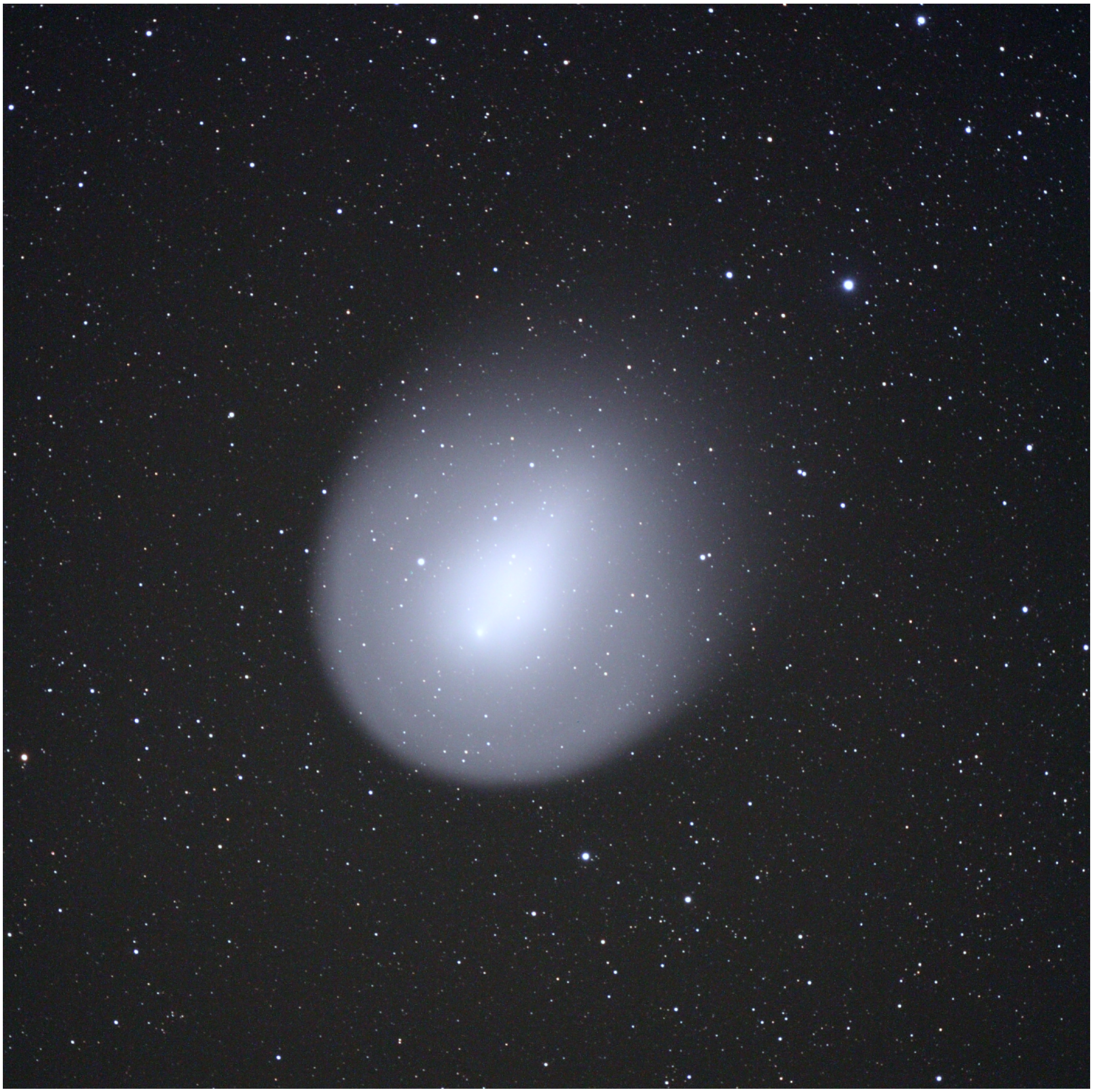
the ASTROGRAPH



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the ASTROGRAPH

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COVER PHOTOGRAPH

Object...,,,...........Comet Holmes

Photographer...Robert C. Price

Instrument...........................Tele Vue NP-101 (4 inch F/5.4 refractor)

Exposure/Instrument............5 minutes/Hutech modified Canon 40D

Date...14 Novemberr 2007

VOLUME 39 No. 3
EDITOR..Robert C. Price
CONTRIBUTING EDITOR..................................Ralph Proctor
PROOFING CONTRIBUTOR................................Linda Miller
CONTRIBUTORS..Lee C. Coombs

Features

Departments

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Product Evaluation: Canon 40DH

by

Robert Price

The Canon 40DH is the designation for a Hutech modified Canon 40D. The Hutech modification replaces the infrared blocking filter in the Canon 40D with a modified infrared blocking filter that is designed to cover the H alpha emission line of Hydrogen at 656 nanometers. The Hutech modification replaces the camera's IR blocking filter with one Hutech calls a type 1b filter. This type 1b filter, according to information on Hutech's web site, passes the visible spectrum from 380 to 690 nanometers (with more than 90 percent transmission). A clear filter replacement is also available. The clear filter modification provides a filter that passes light from 380 to 1000 nanometers. The replacement Hutech type 1b IR blocking filter exactly matches the light path of the standard Canon IR blocking filter that it replaces and enables the camera's auto-focus (AF) to work properly. The Hutech modified Canon 350D (the 350DH) was evaluated in the December 2006/January 2007 issue of the ASTROGRAPH, volume 38 number 3. This current evaluation will compare the Hutech modified Canon 40D with the Hutech modified Canon 350D since the 350D is an excellent camera for long exposure astrophotography. Both the Canon 350D and 40D are (digital single lens reflex) DSLR cameras. The Canon 350D is a consumer oriented digital camera currently costing about $430, while the Canon 40D is a more professional camera costing about $1300. A specific camera specification comparison is shown in Figure 1. Hutech sells the modified Canon 350D (type 1b filter) for $895.00, the modified Canon 400D (type 1b filter) for $1095.00, the modified Canon 40D (type 1b filter) for $1795.00, and the modified Canon 5D (type 1a filter) for 2695.00.

The author took two 20 minute dark frame exposures with a Canon 350DH and a Canon 40DH at room temperature, 70 degrees Fahrenheit. The amount of noise seen in the dark frame taken with the Canon 40DH is shown in Figure 2. The amount of noise under identical conditions was far less with the Canon 350DH and is shown in Figure 3. This was a surprise since one would have expected less noise with Canon's newest processing called DIGIC III which is some 2 years newer than the DIGIC II processing used in the Canon 350D. The author has forwarded the results of this dark frame noise to Canon and Hutech and will publish their response when and if it is received. The author also took a 20 minute dark frame using the Canon 40DH at a lower temperature, 45 degrees Fahrenheit. The noise is shown in Figure 4 and is considerably less than the noise at room temperature, 70 degrees.

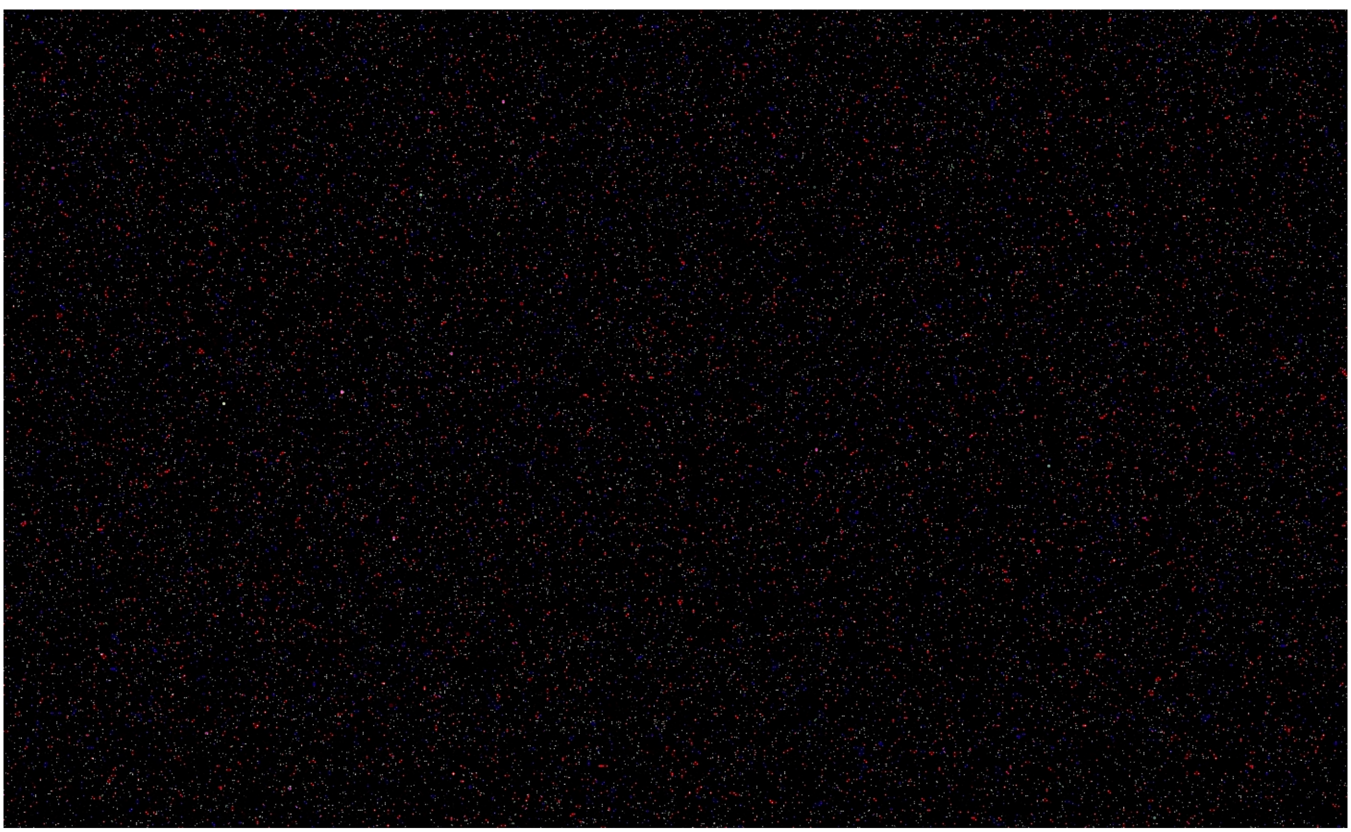
The author took two 20 minute comparison exposures of the Orion Nebula with a Canon 40DH (Figure 5) and a Canon 350DH (Figure 6) using a NP-101 4 inch refractor at F/5.4. Both exposures were taken the same night under near identical conditions. Both cameras were set to 400ASA and the image processing in both images was limited to background normalization and some level adjustment. An examination of both images reveals that the Canon 40DH image has better color saturation, especially the red and magenta parts of the nebula.

Canon 350DH:	Canon 40DH:
Specified size: 8.0 megapixel	Specified size: 10.1 megapixel
Image size: 3456 by 2304 pixels	Image size: 3888 by 2592 pixels
Image sensor: 22.2 by 14.8mm CMOS	Image sensor: 22.2 by 14.8mm CMOS
Camera body weight: 17.1 oz.	Camera body weight: 26.1 oz.
Camera body size: 3.7 by 5.0 by 2.7 inches	Camera body size: 4.2 by 5.7 by 2.9 inches
ISO range 100 to 1600	ISO range 100 to 3200
Mirror lock up: yes	Mirror lock up: yes
Live view: no	Live view: yes, plus 10x magnification
Color Depth: 36 bit RAW format	Color Depth: 36 bit RAW format
In camera dark frame subtraction: no	In camera dark frame subtraction: yes
analog-to-digital converter: 12 bit	analog-to-digital converter: 14 bit

Above, Figure 1: Specification comparison of the Canon 350DH and Canon 40DH digital cameras.

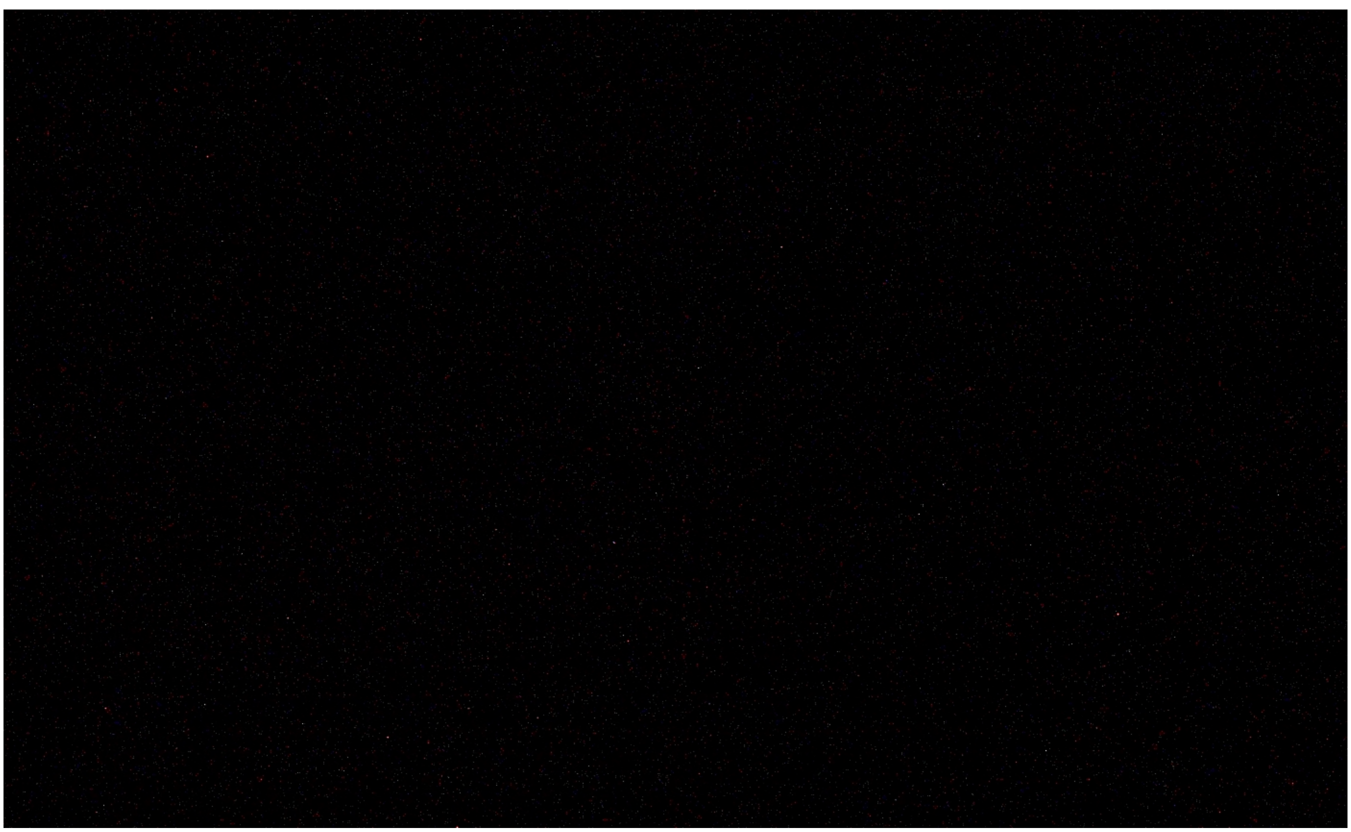
The Canon 40DH also has better over exposure penetration. There is less of the nebula that is totally overexposed to the extent that all color information is lost in the over exposed portion of the image. Looking at the small upside down comma shaped nebula just north of the main nebula shows just how much better the Canon 40DH handles the brighter regions. No difference in noise was seen between these two images, perhaps because the temperature during these exposures was about 30 degrees Fahrenheit. A close examination of the RAW unprocessed images did show slightly more noise in the 40DH image, but the 40DH image had more contrast and more color saturation. In summary the 40DH image had more "pop" and despite having more noise would be the author's preferred image for additional processing.

Beside the increase in pixels, there are several specified differences between the 40DH and 350DH that will effect its performance for long exposure astrophotography. Image processing specified for the 350DH is DIGIC II while that for the 40DH is DIGIC III. The DIGIC II processing made the 350DH suitable for long exposures because it reduced camera noise to acceptable levels. Previous Canon and other DSLRs had so much noise in the long exposure image that dark frame subtraction was a necessity. Analog-to-digital conversion is specified as 12 bits for the 350DH and 14 bits for the 40DH. The 40DH is capable of displaying 16,384 colors per pixel as compared to 4,096 colors per pixel for the 350DH. The 40DH has the ability to provide a live LCD display of the scene being imaged. It can also provide this live view at 5x and 10x magnification. The author examines the 10x LCD display with a 10x film magnifier, thus providing the equivalent of a 100x image plane magnification. This provides the ability to precisely focus the camera as it is attached to the telescope. The best focus method the author had found previously for DSLR cameras was a separate knife edge focuser that was specifically calibrated to the camera being used. In summary the Canon 40DH is an improvement over the Canon 350DH. Its increased resolution and color saturation were noticeable while its increase in noise was not noticeable during long exposures in the winter. Long exposure imaging under summer temperatures is still open to question. Image noise may be a real problem at temperatures of 70 degrees and higher.



Above, Figure 2: Dark frame 20 minute exposure using a Canon 40DH. The center part, 1400 by 850 pixels, of the image is shown above. Temperature was 70^{o}F

Above, Figure 3: Dark Frame 20 minute exposure using a Canon 350DH. The center part, 1400 by 850 pixels, of the image is shown above.   Temperature was 70^{o}F



Above, Figure 4: Dark Frame 20 minute exposure using a Canon 40DH. The center part, 1400 by 850 pixels, of the image is shown above.   Temperature was 45^{o}F

Above, Figure 5: Full-frame image of the Orion Nebula photographed by the author using a NP-101 refractor and Hutech modified Canon 40D. Exposure was 20 minutes at 400ASA.

Above, Figure 6: Full-frame image of the Orion Nebula photographed by the author using a NP-101 refractor and Hutech modified Canon 350D. Exposure was 20 minutes at 400ASA.

Above: Face-on spiral galaxy M33 photographed by Lee C. Coombs on 1 November 1999 using a 4.25-inch F/4.6 Newtonian. Exposure was 30 minutes on Ektachrome 200 professional film.

Above: IC 434, the Horsehead Nebula photographed by Lee C. Coombs on 8 January 2000 using a 70mm F/5.1 Tele Vue Pronto. Exposure was 30 minutes on Ektachrome 200 professional film.

Astrophotography for December and January

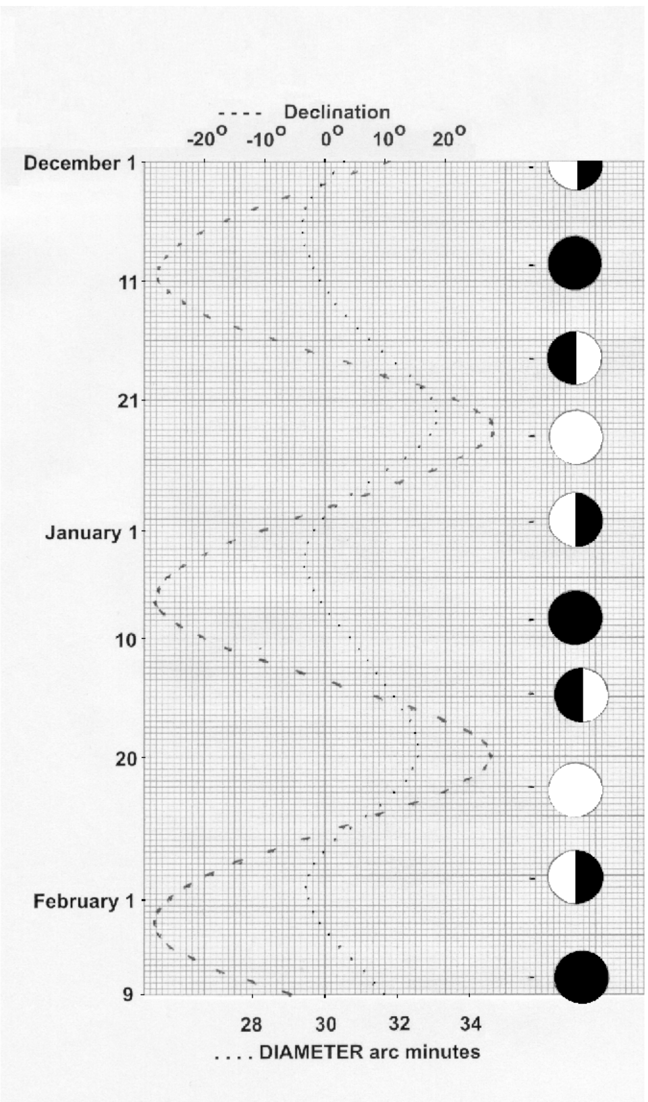
by

Ralph Proctor

Mercury begins December lost in the Sun's glare but emerges from the Sun's glare in early January as an evening object low in the western sky. Mercury reaches a greatest eastern elongation of 19 degrees on 22 January when it will be in poor photographic position with a declination of minus 15 degrees.

Venus begins December as a morning object high in the eastern sky. During December and January Venus moves lower in the eastern sky, decreases in brightness from magnitude -4.2 to -4.0, and decreases in diameter from 17.7 to 12.5 arc seconds

Lunar Declination and Diameter:



The Moon's full phase will be located high on the ecliptic and in excellent photographic position during December (December 24) and January (January 20), with an apparent declination of up to +28 degrees.

Mars begins December as an evening object high in the eastern sky in the constellation Gemini. Mars reaches opposition on 24 December when it will be high in the sky and in excellent photographic position. Mars moves into the constellation Taurus in late December. During December and January Mars moves lower in the western sky, decreases in brightness from magnitude -1.3 to +0.6, and decreases in diameter from 15.1 to 12.0 arc seconds.

Jupiter begins December as an evening object low in the western sky in the constellation Ophiuchus. Jupiter moves into Sagittarius in early December and by mid December is lost in the Sun's glare. Jupiter emerges from the Sun's glare in early January as a morning object low in the eastern sky. During December and January Jupiter increases in brightness from magnitude -1.8 to -1.9, and increases in diameter from 31.8 to 32.5 arc seconds.

Saturn begins December as a morning object high in the eastern sky in the constellation Leo. During December and January Saturn moves higher in the eastern sky, increases in brightness from magnitude +0.7 to +0.3, and increases in diameter from 18.0 to 19.8 arc seconds.

Uranus begins December as an evening object low in the western sky in the constellation Aquarius. During December and January Uranus moves lower in the western sky, decreases in brightness from magnitude +5.8 to +5.9, and decreases in diameter from 3.51 to 3.35 arc seconds. Uranus is located at R.A. 23 hours 05.7 minutes declination -06 degrees 38 minutes on 15 December and at R.A. 23 hours 19.2 minutes declination -06 degrees 15 minutes on 15 January.

Neptune begins December as an evening object low in the western sky in the constellation Capricornus. During December and January Neptune moves lower in the western sky and is lost in the Sun's glare by the last week in January. During December and January Neptune decreases in brightness from magnitude +7.9 to +8.0, and decreases in diameter from 2.21 to 2.16 arc seconds. Neptune is located at R.A. 21 hours 29.3 minutes declination -15 degrees 09 minutes on 15 December and at R.A. 21 hours 32.9 minutes declination -14 degrees 51 minutes on 15 January.

Pluto begins December in the constellation Sagittarius but is lost in the Sun's glare, reaching conjunction with the Sun on 21 December. Pluto emerges from the Sun's glare in late January as a morning object low in the eastern sky. During December and January Pluto remains constant in brightness at magnitude +14.0. Pluto is located at R.A. 17 hours 53.5 minutes declination -17 degrees 07 minutes on 15 December and at R.A. 17 hours 58.6 minutes declination -17 degrees 10 minutes on 15 January.

Events:

The Pleiades will be occulted by the Moon on 18 January (08 hours universal time) for northern North America.

Vesta will be occulted by the Moon on 12 December (21 hours universal time) for all but the northwestern part of South America, and New Zealand.

Mars will be occulted by the Moon on 24 December (04 hours universal time) for northwestern Canada, Alaska, the Arctic region, northern Russia, eastern Europe, and the northeastern British Isles; and on 20 January (00 hours universal time) for northwestern North America and the Arctic.

Neptune will be occulted by the Moon on 14 December (18 hours universal time) for part of Antarctica, the southern tip of South America, and the southern part of Africa; and 11 January (01 hours universal time) for northern Russia, the Arctic regions, and the northwestern tip of North America.

Pallas will be occulted by the Moon on 16 December (01 hours universal time) for northwestern Canada, Alaska, the eastern tip of Siberia, and the Hawaiian Islands.

Regulus will be occulted by the Moon on 28 December (05 hours universal time) all but the southern part of South America and the southern Atlantic Ocean; and on 24 January (15 hours universal time) for southern Indonesia, Australasia, and part of Antarctica.

Antares will be occulted by the Moon on 5 January (10 hours universal time) for southern South America, and part of Antarctica.

MINOR PLANETS

		position			
		15 December		15 January	
Planet	Magnitude	R.A.	Decl.	R.A.	Decl.
Ceres	07.6 - 08.6	02 hr 39.6 min	+08 deg 33 min	02 hr 38.4 min	+10 deg 55 min
Pallas	10.0 - 10.1	22 hr 31.7 min	- 09 deg 36 min	23 hr 05.1 min	- 08deg 58 min
Juno	11.4 - 11.5	16 hr 08.1 min	- 11 deg 25 min	16 hr 48.1 min	- 12 deg 06 min
Vesta	07.9 - 07.9	20 hr 01.1 min	- 23 deg 06 min	21 hr 06.9 min	- 19 deg 46 min

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Volume No. 9 issue 1, 4, 5, and 6
Volume No. 10 issue 2, 3, 5, and 6
Volume No. 11 issue 1, 2, 3[1], 4, 5, and 6
Volume No. 12 issue 1, 2, 3, 4, 5, and 6
Volume No. 13 issue 1, 2, 3, 4, 5, and 6
Volume No. 14 issue 1, 2, 3, 4, 5, and 6
Volume No. 15 issue 1, 2, 3, 4, 5, and 6
Volume No. 16 issue 1, 2, 3, 4, 5, and 6
Volume No. 17 issue 1, 2, 3[2], 4, 5, and 6
Volume No. 18 issue 1, 4, 5, and 6
Volume No. 19 issue 1, 2, 3, 4, 5, and 6
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Volume No. 23 issue 4 and 5
Volume No. 24 issue 5 and 6
Volume No. 25 issue 1, 2, 4, and 6
Volume No. 26 issue 1, 2, 3, 5, and 6
Volume No. 27 issue 2, 3, 4, 5, and 6
Volume No. 28 issue 5 and 6
Volume No. 29 issue 1, 2, 3, 4, 5, and 6
Volume No. 30 issue 1, 2, 3, 4[1], 5, and 6
Volume No. 31 issue 1, 2, 3, 4, 5, and 6
Volume No. 32 issue 1, 2, 3, 4, 5, and 6
Volume No. 33 issue 1, 2, 3, 4, 5, and 6
Volume No. 34 issue 1, 2, 3, 4, 5, and 6
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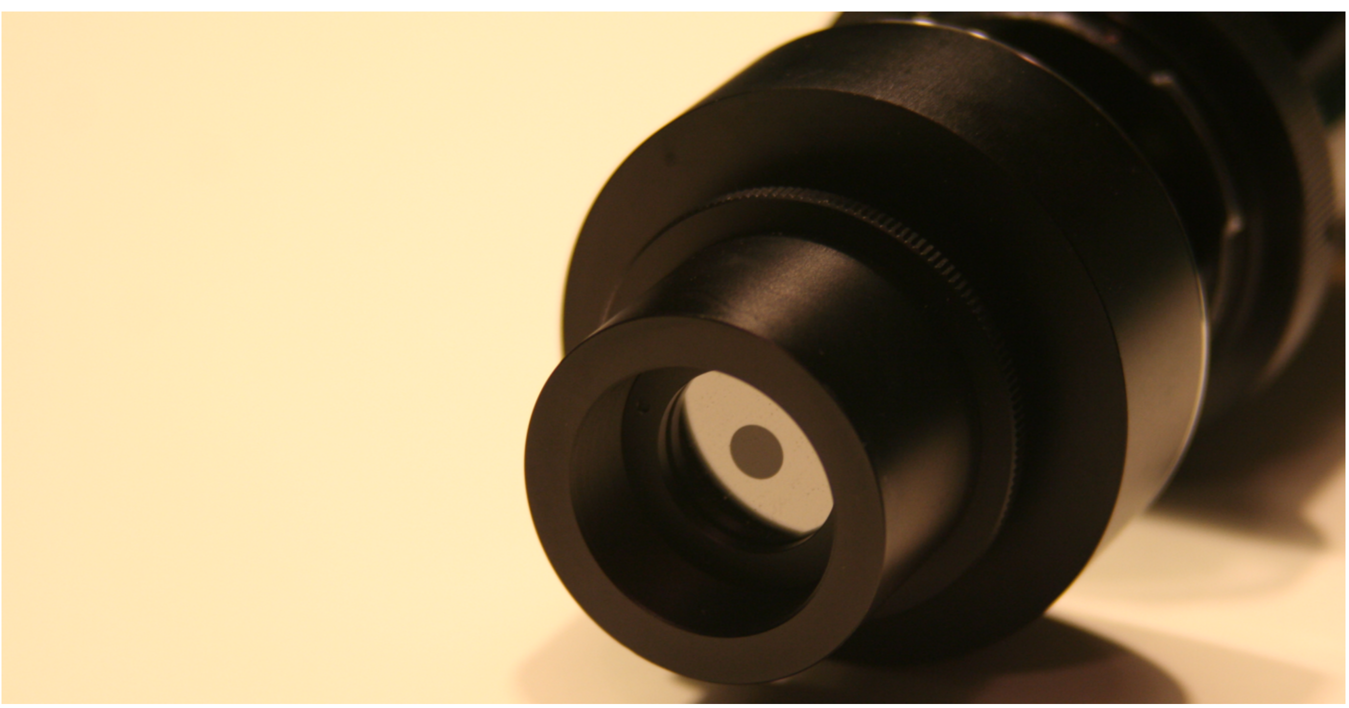
Focusing the DSLR Camera

by

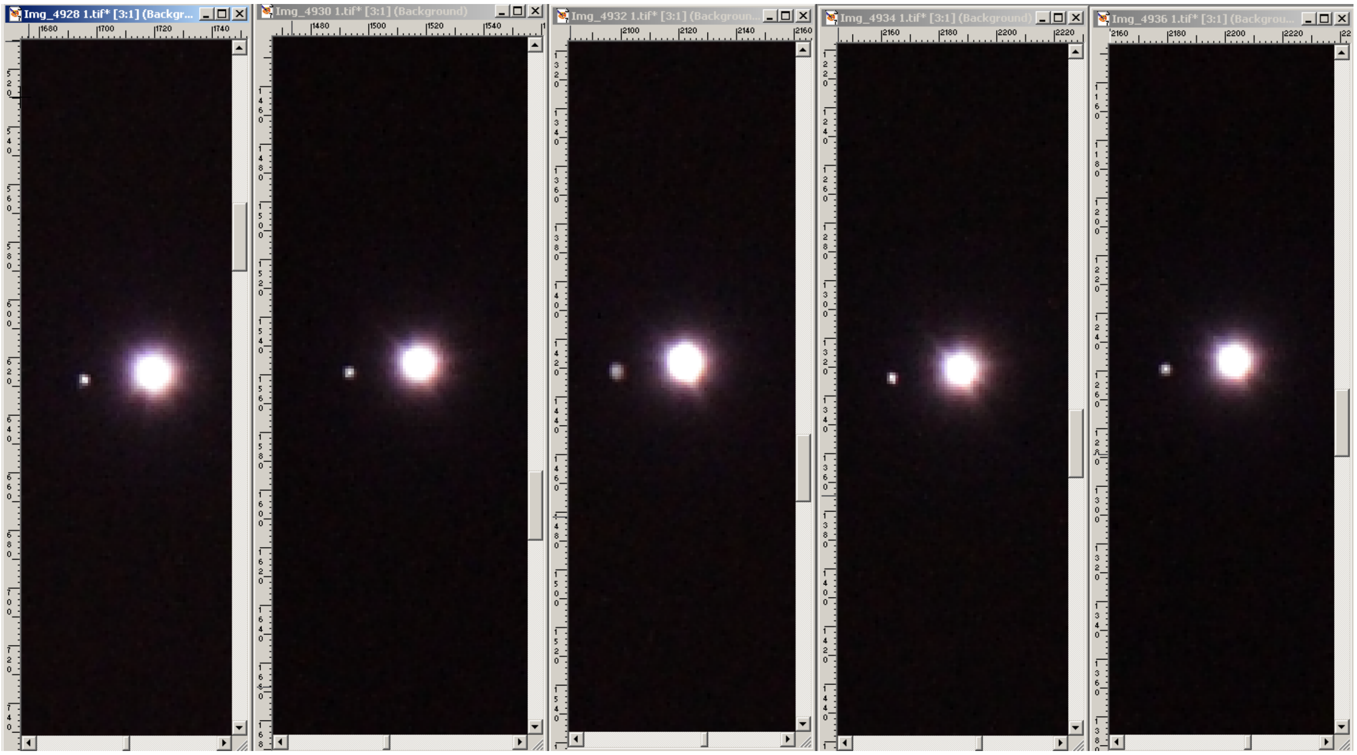
Robert Price

Film cameras are relatively easy to focus because most have a ground glass type focusing screen designed for focus by the photographer. In addition most cameras have options for different types of focus screens. If the option to use a different screen is not available, the photographer can open the camera, place a piece of ground glass where the film would normally be positioned, and use a film magnifier to focus the camera. Enterprising photographers built their own calibrated knife-edge focusers to achieve exact focus. Such a knife-edge focuser can achieve exact focus with any type of camera, digital or film. The digital camera is more difficult to focus because of their auto focus capability. Since focus is automatic, most digital cameras have a clear view screen which makes manual focus far more difficult compared to the film camera with its ground glass screen that was designed for manual focus by the photographer. Hutech makes a knife edge focuser calibrated to the camera it sells. In addition some digital cameras have a live view capability that allows the photographer to examine the LCD display with a magnifier to determine exact focus. The author has been using the Hutech knife-edge focuser (shown in Figure 1) with good results, but decided to compare the old eyeball focusing technique with the Hutech knife-edge and the live view feature on the Canon 40DH. Figure 2 is a set of five highly magnified images of Zeta Orionis taken with a Canon 350DH. Each image is a short unguided exposure of approximately 10 seconds. Each exposure was focused using the Hutech knife-edge focuser. Figure 3 is a set of five highly magnified images of Zeta Orionis taken with a Canon 40DH. Each image is a short unguided exposure of approximately 10 seconds. Each exposure was focused using the live-view feature at 10x with a film magnifier to view the LCD display. Figure 4 is the same as Figure 2 except the star was allowed to trail and the image was brightened. Figure 5 is the same a Figure 3 except the star was allowed to trail and the image was brightened. Figure 6 is a set of star trails using the eye to focus the Canon 350DH camera.

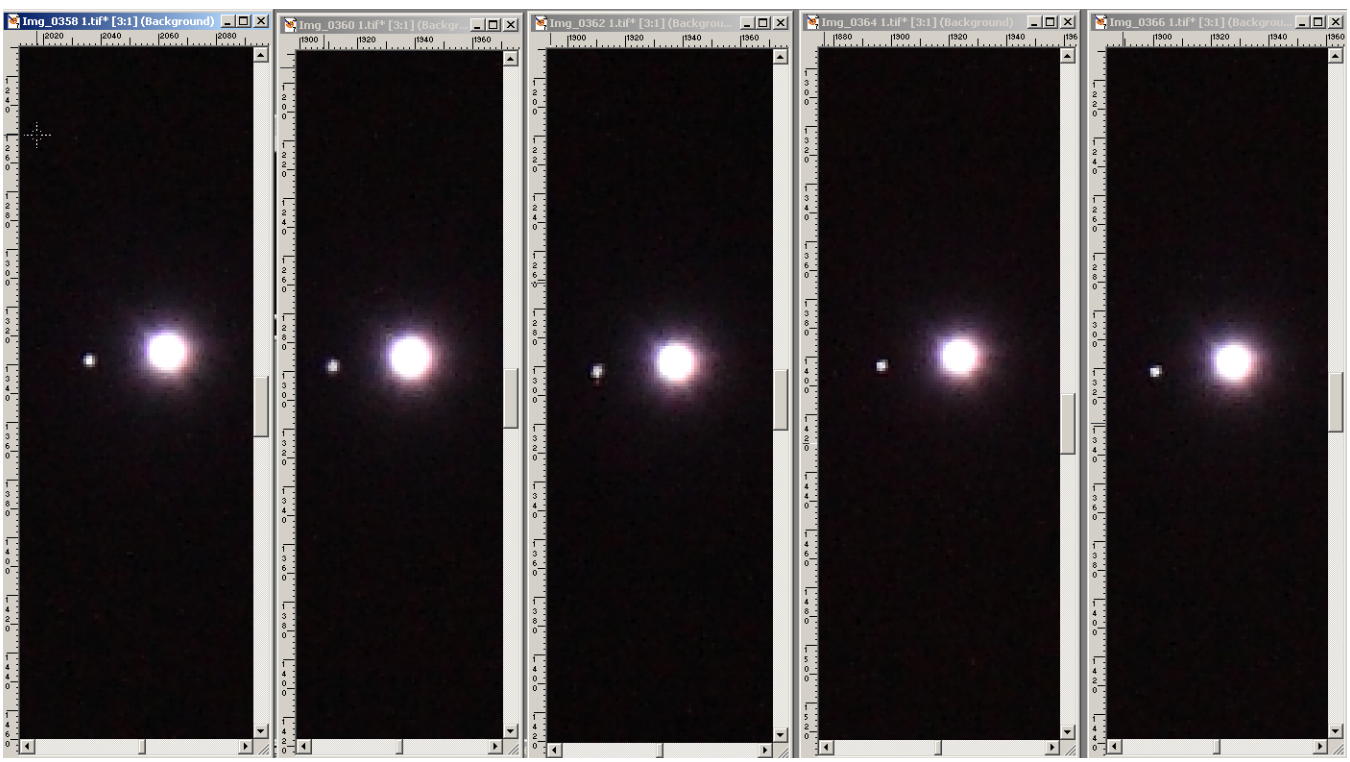
Conclusion: The knife-edge and eye focus methods look like they achieve good focus 4 out of 5 times. In the images taken with the Canon 40DH using the live view feature the focus appears more consistent. Although the 40DH images may look slightly less focused, this appearance is partly caused by the fact that because of the better sensor resolution, the image is 25 percent larger that the image taken with the 350DH. Using the 40DH live view the author can focus and easily see all four stars in the Trapizium. After 3 nights of use the author' s preference is the 40DH live view. It is very easy to use, gives consistent results, and does not require that the camera be uncoupled from the telescope.



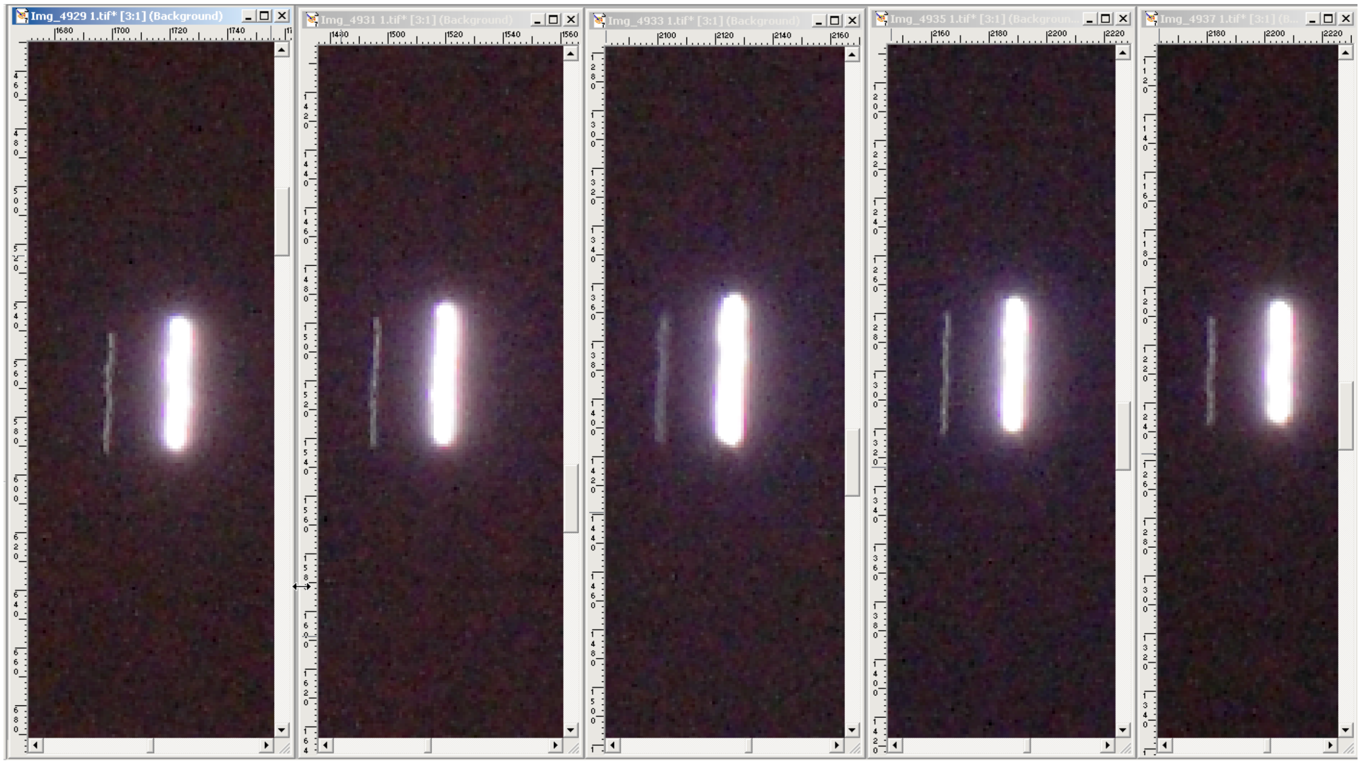
Above, Figure 1: Hutech knife-edge focusing for a Canon 350DH camera.



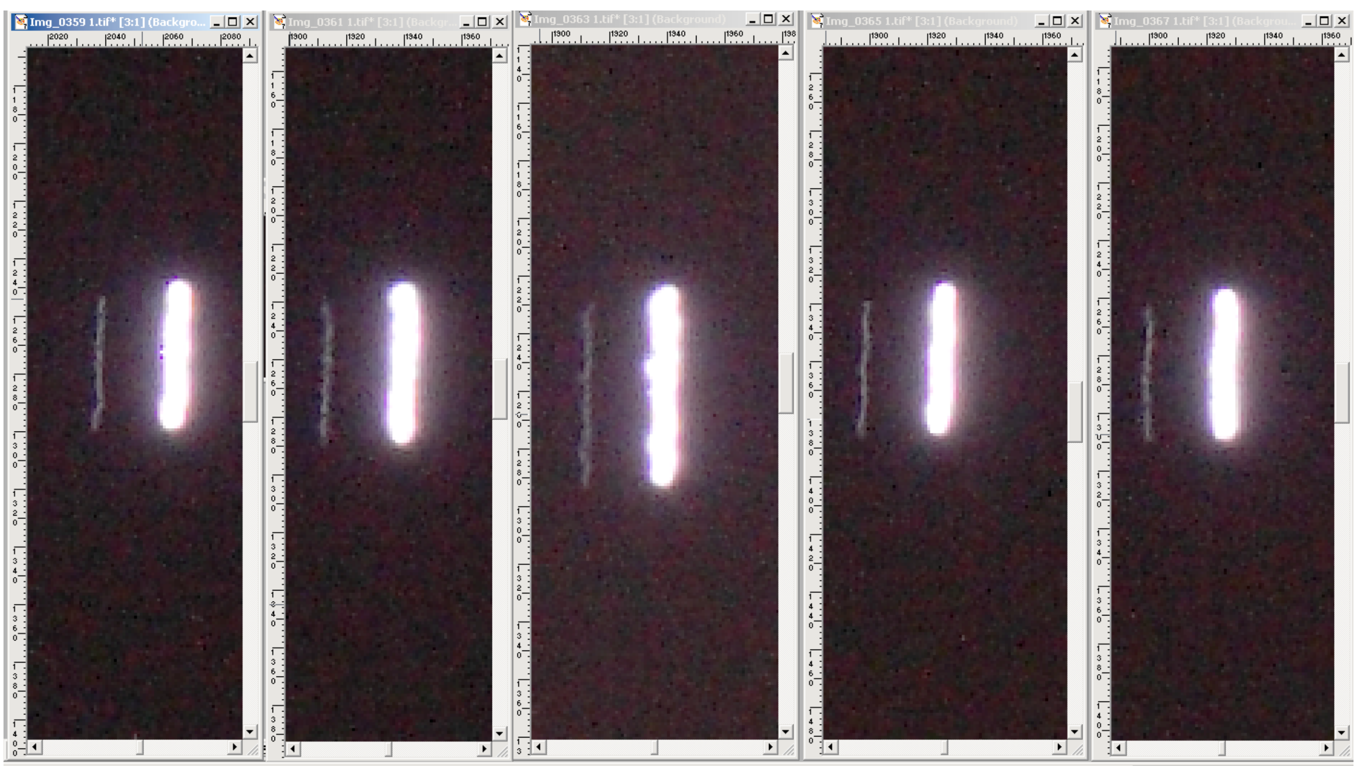
Above, Figure 2: Shown here is a set of five highly magnified images of Zeta Orionis taken with a Canon 350DH. Each image is a short unguided exposure of approximately 10 seconds. Each exposure was focused using the Hutech knife-edge focuser. Note that the image size of Figure 2 is less that Figure 3 bacause the resolution of the Canon 350DH is 8 megapixels and the Canon 40DH is 10 megapixels.



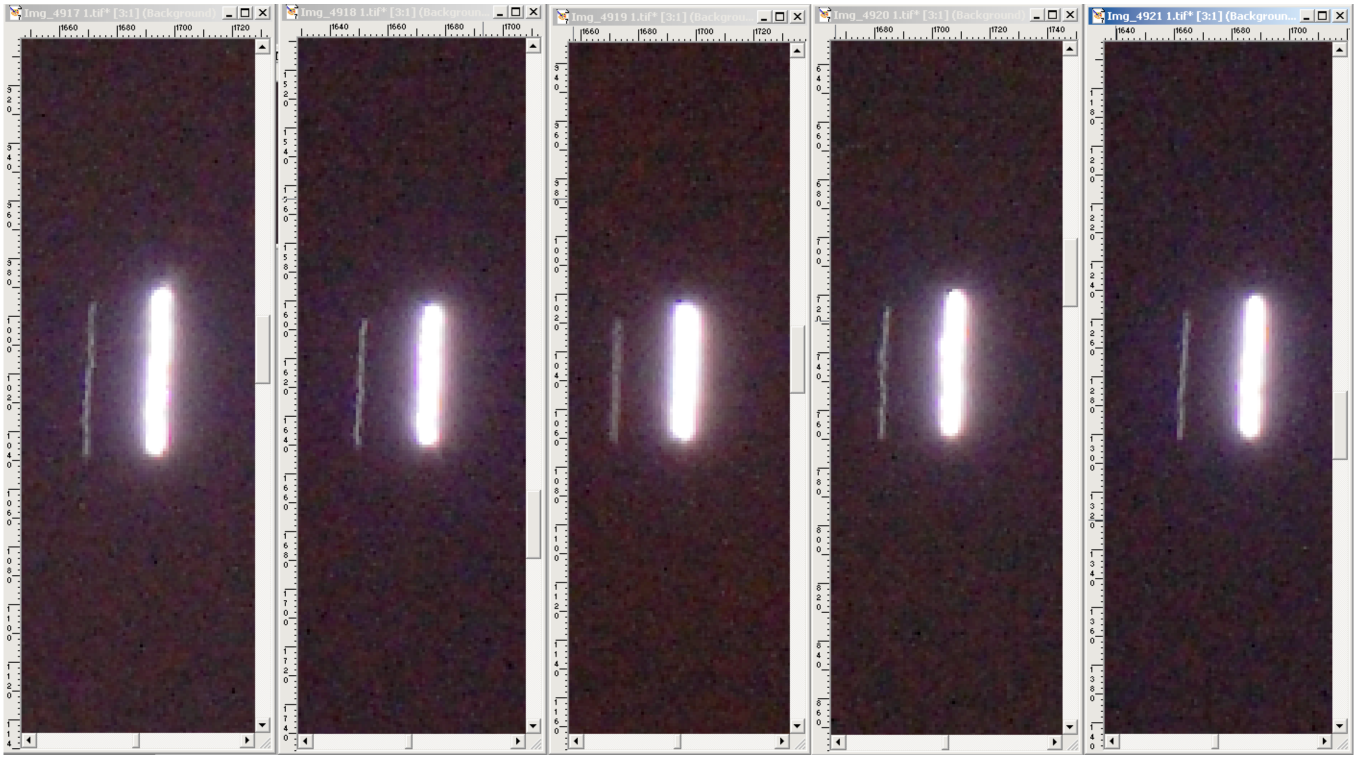
Above, Figure 3: Shown here is a set of five highly magnified images of Zeta Orionis taken with a Canon 40DH. Each image is a short unguided exposure of approximately 10 seconds. Each exposure was focused using the live-view feature of the 40DH at 10x and with a film magnifier to view the LCD display.



Above, Figure 4: This set of 5 images is the same as those in Figure 2 except that the star was allowed to trail by turning off the right ascension drive. The brightness of this image was increased to better show the faint star trail. Note the wavey pattern of the star image caused by atmospheric turbulance.



Above, Figure 5: This set of 5 images is the same as those in Figure 3 except that the star was allowed to trail by turning off the right ascension drive. The brightness of this image was increased to better show the faint star trail. Note the wavey pattern of the star image caused by atmospheric turbulance.



Above, Figure 6: This set of 5 images is the same as those in Figure 4 except that focus was achieved by using the eye and viewfinder on the Canon 350DH.

Above, Figure 7: Center of the Orion Nebula showing the 4 stars of the Trapezium. Exposure was 10 seconds with a Canon 40DH camera and NP-101 refractor. The stars that comprise the bottom and right side of the Trapezium are seperated by 20 arc seconds.

Above, Figure 8: Same image as in Figure 7 except highly magnified and allowing the stars to trail. Image scale is the same as Figures 4, 5, and 6.

Above: Galactic star clusters M38 and NGC 1907 photographed by Lee C. Coombs on 14 March 2002 using a 10 inch F/5 Newtonian. Exposure was 20 minutes on Ektachrome 200 professional film.