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VOLUME 37 No. 6
EDITOR.....Robert C. Price
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COVER PHOTOGRAPH

Object.....M8, the Lagoon Nebula, and M20, the Trifid Nebula (top)
Photographer.....Robert C. Price
Instrument.....Canon 300mm F/4 lens with 1.4x tele-extender
Exposure/Camera.....533 seconds/Canon 350D at 400ASA
Date.....28 May 2006
Location.....Just south of Blue Knob state park in Pennsylvania

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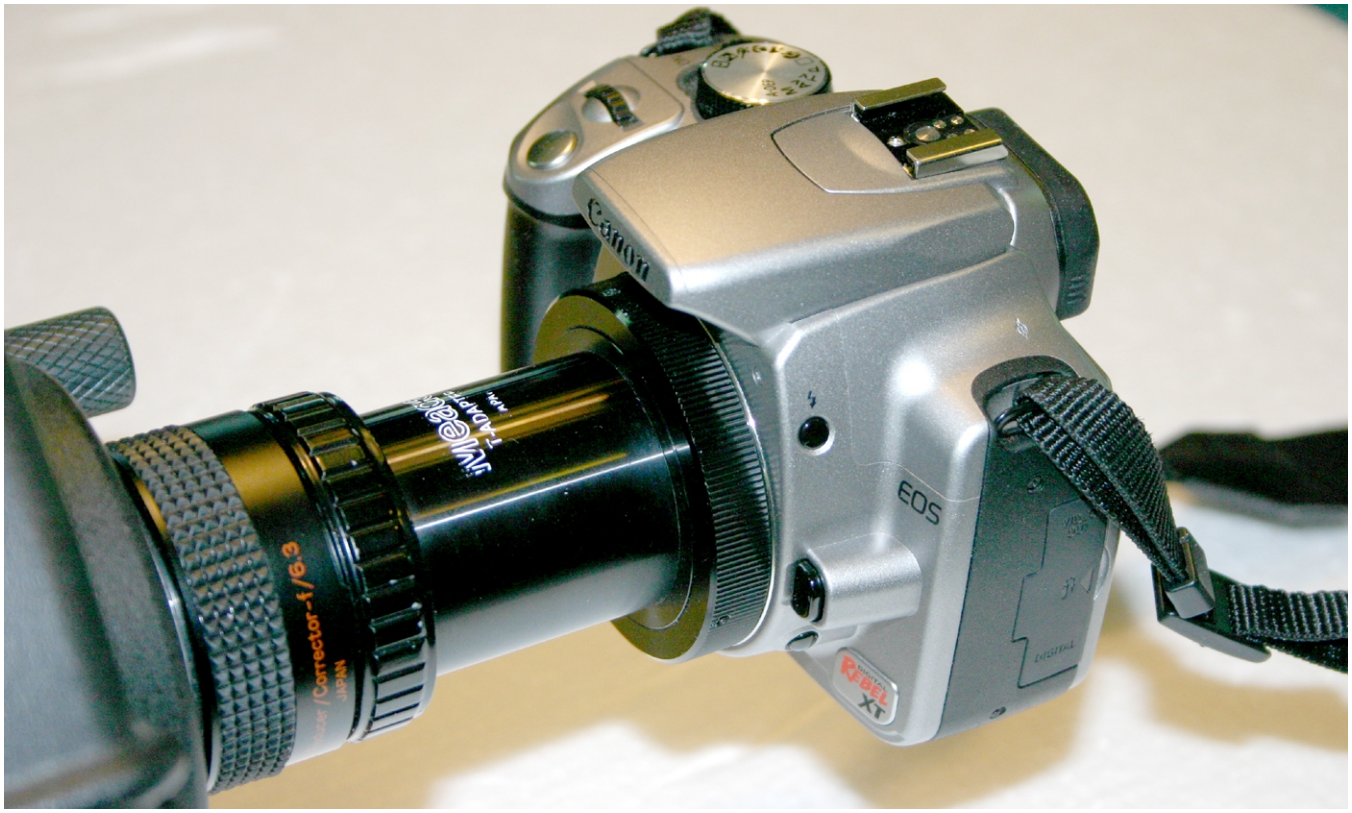
Product Evaluation: Canon 350D

by

Robert C. Price

The product being evaluated is a Canon 350D SLR digital camera with an 8.2 megapixel image sensor and an image size of 3456 by 2304 pixels. The Canon 350D uses a 22.2 by 14.8mm CMOS sensor. The camera body without battery or lens weighs 17.1 oz. and measures 3.7 by 5.0 by 2.7 inches. By comparison the older Canon 300D SLR digital camera uses a slightly larger CMOS sensor that measured 22.7 by 15.1mm and is rated at 6.5 megapixels. The Canon 300D camera body without lens and battery weighs 19.7 oz. and measures 5.6 by 3.9 by 2.9 inches, slightly heavier and larger than the 350D. The Canon 300D image size is 3072 by 2048 pixels. Both the Canon 300D and 350D provide an ASA value that can be set in the manual modes from 100 to 1600. Exposures for both cameras vary from 30 seconds to 1/4000 second and a manual exposure mode provides a bulb setting. The same remote controller is used for both cameras and, with the bulb exposure, will trigger the shutter to open with one action and to close with a second action. The Canon 350D has a mirror lockup capability that is not available with the 300D. Shown in Figure 1 is the Canon 350D mounted to the author's 8 inch Celestron.

The author has used the older Canon 300D to evaluate several optical systems in previous issues. When used at 400ASA and compared to 400ASA color film, both the Canon 300D and 350D seem to be more sensitive than film except for the red end of the visual spectrum. This red end of the spectrum includes the astronomically important hydrogen alpha spectral area at 656 nanometers. Although unfiltered CMOS sensors have better red sensitivity, most digital cameras contain an infrared blocking filter to replicate the visual response and produce images similar to what is seen with the eye and film. There are 3 ways around this poor hydrogen alpha response caused by the infrared blocking filter: 1. There are several web sites with detailed instructions on how to remove the infrared blocking filter. 2. Canon makes the Canon D20a which contains a modified infrared blocking filter which Canon claims allows 2.5 times more hydrogen alpha light to reach the sensor. 3. Hutech both modifies digital



Above: Figure 1. Canon 350D camera attached to the author's 8 inch SCT.

SLRs and sells modified Canon digital SLRs.

When the author first started using the Canon 300D the first characteristic of the digital camera he observed was a noticeable increase in defects when comparing images of normal daylight scenes taken with exposures of less than one second to images of longer exposures used in astronomical photographs. Long exposure images taken with the Canon 300D showed literally hundreds of defects.

There are three types of defects in Canon digital camera images. The most glaring defects are the hot pixels. Hot pixels are bright green pixels that caused secondary defects 3 pixels away from the center bright green pixel. Thus, an area 7 by 7 pixels is affected. The second defect is a fuzzy elongated red or blue area that is usually 3 by 7 pixels in the shape of an ellipse. The third defect is an area of increased background noise located on the right side of the image frame, one on the top right side and one on the bottom right side. There is probably some heat source that is raising the noise level in the sensor at these two locations. Several imaging programs have the ability to subtract a "dark frame" from the long exposure astronomical image. The dark frame is an identical exposure taken under similar conditions and close to the same time as the exposure it is subtracted from. The dark frame exposure allows no light to reach the camera, thus the only features in the image should be camera generated defects that can be subtracted from the astronomical image. This process works fairly well for all but the brighter hot pixels. For some reason these hot pixels cause a negative shift in the sky background two pixels away from the bright hot pixel. Because the dark frame does not contain any sky background this negative shift cannot be subtracted and the resultant dark frame subtracted image contains dark donuts as defects instead of bright hot pixels. The dark frame subtraction process does eliminate most other defects such as the ones shown in Figure 2. Shorter exposure images or images taken under dark sky conditions will exhibit this problem to a lesser extent. All of the author's images that appear in this and previous issues (except



Above: Figure 2. Canon 350D camera evaluation. Shown above is the lower left corner of an unprocessed image taken with a Canon 300D and a Canon 300mm F/4 EF lens at F/4. The area is 673 by 432 pixels and the exposure was 440 seconds. The object photographed (not shown) was M42. Note the numerous defects in this small image which is about 5% of the total image area.

this issue's cover) were taken from his residence 28 miles south of Washington D.C. where sky conditions are usually poor.

The author's first long exposures with the Canon 350D revealed far less image defects than the older Canon 300D. Figure 2 shows the lower left corner of an unprocessed image taken with a Canon 300D. The area is 673 by 432 pixels and the exposure was 440 seconds. The object photographed (not shown) was M42. Figure 3 shows the lower left corner of an unprocessed image taken with a Canon 350D. The area is 675 by 431 pixels and the exposure was 547 seconds. The object photographed (not shown) was also M42. The author has not used dark frame subtraction with images from the Canon 350D because the few defects that do show up in enlarged images can easily be "cloned" out of the image.

Figure 4 is a full frame image of the Horsehead Nebula taken with the Canon 350D and an Orion Express80, which seems to be a sharper lens but with more edge distortion and chromatic aberration than the Canon lens used to take the images in Figures 5, 7,8, and 9. Figure 5 is a full frame image of M42 the author obtained with the Canon 350D and a Canon 300mm F/4 EF lens with 1.4x tele-extender. It is difficult to compare images taken with different instruments, but the author has included the image in Figure 6 for comparison purposes. Note the difference in sky background between Figure 6 and Figure 7. Figure 6 was taken on a very cold and dark night. The author only used the 400ASA setting with the Canon 300D because of an increase in noise reported at 800 and 1600ASA on several web sites. Because the Canon 350D seemed to produce "cleaner" images the author tried some exposures at 800 and 1600ASA. The images in Figures 7, 8 and 9 on pages 93, 94 and 95 show the result of increasing the ASA value while reducing the exposure. The 800ASA exposure, Figure 8, seems very similar to the 400ASA exposure, Figure 7, while some increase in noise can be seen in the 1600ASA image, Figure 9. This author concludes that the Canon 350D is a major improvement over the older Canon 300D for long exposures.



Above: Figure 3. Canon 350D camera evaluation. Shown above is the lower left corner of an unprocessed image taken with a Canon 350D and a Canon 300mm F/4 EF lens with a 1.4x tele-extender (420mm at F/5.6). The area is 675 by 431 pixels and the exposure was 547 seconds. The object photographed (not shown) was M42.



Above: Figure 4. Canon 350D camera evaluation. Shown above is a full frame image centered on the Horsehead Nebula. Photographed by Robert C. Price on 26 January 2006 using an Orion Express80 (80mm diameter) lens at F/6. Exposure was 657 seconds with a Canon 350D at 400ASA. Image processing was limited to level adjustment and color correction.



Above: Figure 5. Canon 350D camera evaluation. Shown above is a full frame image centered on M42. Photographed by Robert C. Price on 28 January 2006 using a Canon 300mm F/4 EF lens with a 1.4x tele-extender at F/5.6. Exposure was 547 seconds with a Canon 350D at 400ASA. Image processing was limited to level adjustment and color correction.



Above: M71 photographed by Lee C. Coombs on 12 August 2004 using a 10 inch F/5 Newtonian. Exposure was 30 minutes on Ektachrome 200 professional film.



Above: M55 photographed by Lee C. Coombs on 12 August 2001 using a 10 inch F/5 Newtonian. Exposure was 35 minutes on Ektachrome 200 professional film.

Astrophotography for June and July

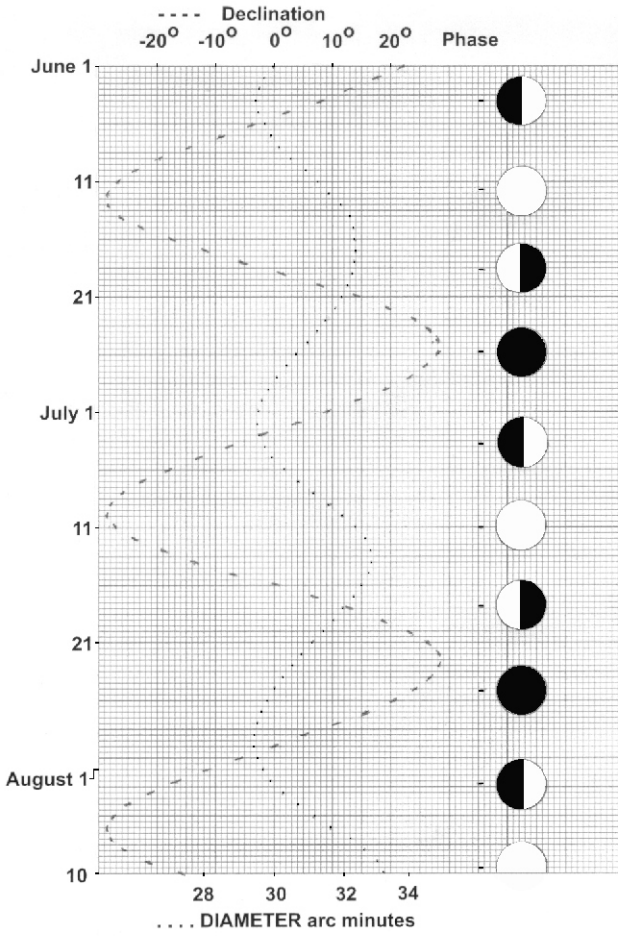
by

Ralph Proctor

Mercury begins June as an evening object low in the western sky. During June Mercury moves higher in the western sky and reaches a greatest eastern elongation of 25 degrees on 20 June when it will be in good photographic position with a declination of plus 22 degree. During the remainder of June Mercury moves lower in the western sky and disappears into the Sun's glare in early July, reaching inferior conjunction on 18 July. Mercury emerges from the Sun's glare in late July as a morning object low in the eastern sky.

Venus begins June as a morning object high in the eastern sky. During June and July Venus moves lower in the eastern sky.

Lunar Declination and Diameter:



The Moon's full phase will be located high on the ecliptic and in excellent photographic position during June (June 25) and July (July 23), with an apparent declination of up to +28 degrees.

Mars begins June as an evening object high in the western sky in the constellation Cancer, but moves into the constellation Leo in early July. During June and July Mars moves lower in the western sky, decreases in brightness from magnitude + 1.7 to + 1.8, and decreases in diameter from 4.4 to 3.8 arc seconds.

Jupiter begins June as an evening object high in the western sky in the constellation Libra, having reached opposition on 4 May. During June and July Jupiter moves lower in the western sky, decreases in brightness from magnitude -2.4 to -2.1, and decreases in diameter from 43.7 to 37.3 arc seconds.

Saturn begins June as an evening object low in the western sky in the constellation Cancer. During June and July Saturn moves lower in the western sky and disappears into the Sun's glare in mid-July. During June and July Saturn increases in brightness from magnitude +0.4 to + 0.3, and decreases in diameter from 17.3 to 16.37 arc seconds.

Uranus begins June as a morning object low in the eastern sky in the constellation Aquarius. During June and July Uranus moves higher in the eastern sky, increases in brightness from magnitude + 5.9 to + 5.8, and increases in diameter from 3.50 to 3.66 arc seconds. Uranus is located at R.A. 23 hours 04.9 minutes declination -6 degrees 44 minutes on 15 June and at R.A. 23 hours 04.0 minutes declination -6 degrees 51 minutes on 15 July.

Neptune begins June as a morning object low in the eastern sky in the constellation Capricornus. During June and July Neptune moves higher in the eastern sky, increases in brightness from magnitude +7.9 to +7.8, and increases in diameter from 2.29 to 2.35 arc seconds. Neptune is located at R.A. 21 hours 28.6 minutes declination -15 degrees 06 minutes on 15 June and at R.A. 21 hours 26.5 minutes declination -15 degrees 17 minutes on 15 July.

Pluto begins June as a morning object low in the eastern sky. During June and July Pluto moves higher in the eastern sky and remains constant in brightness at magnitude + 13.9. Pluto is located at R.A. 17 hours 41.0 minutes declination -15 degrees 42 minutes on 15 June and at R.A. 17 hours 37.8 minutes declination -15 degrees 44 minutes on 15 July.

Events:

Uranus will be occulted by the Moon on 17 June (17 hours Universal Time) for New Zealand; and on 14 July (23 hours Universal Time) for the southern tip of South Africa and Southeast Asia.

Spica will be occulted by the Moon on 7 June (09 hours Universal Time) for the extreme eastern part of Asia and most of Japan; and on 4 July (17 hours Universal Time) for the western and southern part of Africa.

Antares will be occulted by the Moon on 10 June (23 hours Universal Time) for northeastern South America, southern Africa, and Madagascar; and on 8 July (08 hours Universal Time) for northern and eastern Australia, New Guinea, and New Zealand.

Mars will be occulted by the Moon on 27 July (17 hours Universal Time) for part of Greenland, Europe, and the British Isles.

Vesta will be occulted by the Moon on 28 July (19 hours Universal Time) for Central America, the Caribbean, and northern and central South America.

The Sun will undergo an annular eclipse on 22 September 2006. The eclipse starts in northeastern South America, crosses the Atlantic, continues between Africa and Antarctica, and ends in the ocean southeast of southern Africa. The eclipse begins and ends at 8 hours 39.9 minutes and 14 hours 40.2 minutes Universal Time respectively. Central eclipse at local apparent noon occurs at 12 hours 07.1 minutes Universal Time.

The Moon will undergo a partial eclipse on 7 September 2006 for Antarctica, Australasia, Asia, Africa, Europe, and the British Isles. The eclipse begins (Umbra contact) at 18 hours 01.5 minutes and ends at 19 hours 37.6 minutes Universal Time. Mid-eclipse occurs at 18 hours 51.3 minutes Universal Time. Only a small portion of the Moon is eclipsed by the Umbra.

MINOR PLANETS

		position			
		15 June		15 July	
Planet	Magnitude	R.A.	Decl.	R.A.	Decl.
Ceres	09.1 - 07.7	22 hr 10.6 min	-22 deg 00 min	22 hr 07.5 min	-24 deg 47 min
Pallas	10.0 - 09.7	18 hr 41.8 min	+23 deg 37 min	18 hr 17.5 min	+22 deg 17 min
Juno	09.7 - 10.5	08 hr 22.3 min	+14 deg 13 min	09 hr 17.6 min	+11 deg 56 min
Vesta	07.8 - 08.1	08 hr 45.2 min	+21 deg 53 min	09 hr 39.0 min	+18 deg 14 min

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Volume No. 8 issue 11, 3, 4, and 5
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
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Above: Figure 6. Canon 350D camera evaluation. Top image is a portion of an unprocessed image of M42 taken by the author with an Orion Express80 F/6 lens. Exposure was 596 seconds with a Canon 300D at 400ASA. Bottom image is this same image after level and color correction.



Above: Figure 7. Canon 350D camera evaluation (400ASA). Top image is a portion of an unprocessed image of M42 taken by the author with a Canon 300mm F/4 EF lens and a 1.4x tele-extender at F/5.6. Exposure was 547 seconds with a Canon 350D at 400ASA . Bottom image is this same image after level and color correction.



Above: Figure 8. Canon 350D camera evaluation (800ASA). Top image is a portion of an unprocessed image of M42 taken by the author with a Canon 300mm F/4 EF lens and a 1.4x tele-extender at F/5.6. Exposure was 264 seconds with a Canon 350D at 800ASA . Bottom image is this same image after level and color correction.



Above: Figure 9. Canon 350D camera evaluation (1600ASA). Top image is a portion of an unprocessed image of M42 taken by the author with a Canon 300mm F/4 EF lens and a 1.4x tele-extender at F/5.6. Exposure was 132 seconds using a Canon 350D at 1600ASA. Bottom image is this same image after level and color correction.



Above: NGC 869 and 884, the Double Cluster, photographed by Lee C. Coombs on 30 October 2005 using a 10 inch F/5 Newtonian at F/5.6. Exposure was 35 minutes on Ektachrome 200 professional film.