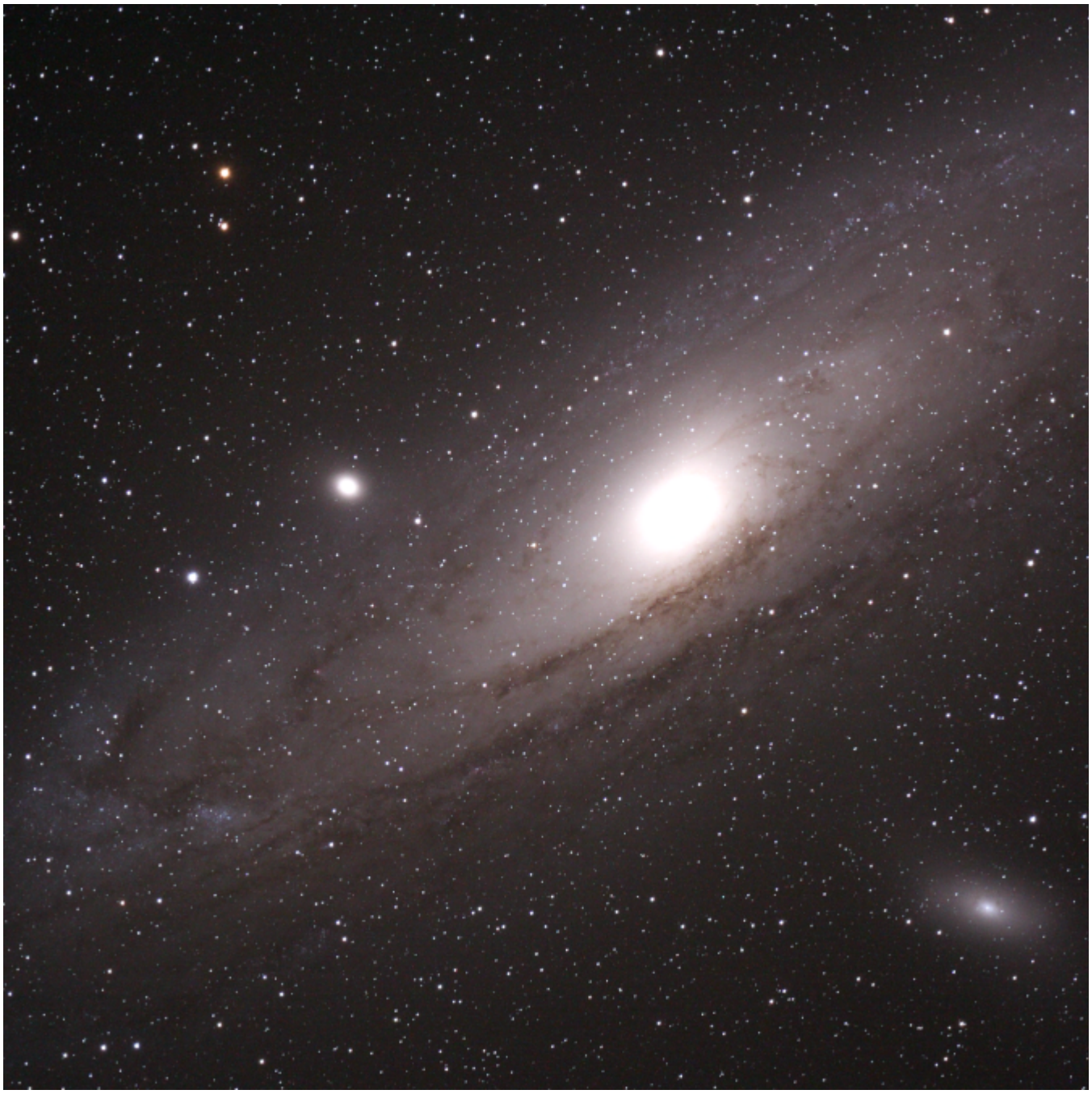
the ASTROGRAPH



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COVER PHOTOGRAPH

Object.....M31, the Andromeda Galaxy

Photographer.....Robert C. Price

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

Exposure/Instrument.....20 minutes/Hutech modified Canon 40D

Date.....30 Novemberr 2007

VOLUME 39 No. 4
EDITOR.....Robert C. Price
CONTRIBUTING EDITOR.....Ralph Proctor
PROOFING CONTRIBUTOR.....Linda Miller
CONTRIBUTORS.....Lee C. Coombs

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ASTROPHOTOGRAPHY PRODUCT SURVEY

by

Robert C. Price

The last product survey was published in the August/September 2006 issue. As with past surveys this survey is a summary of astrophotography related equipment that has been advertized in the last 12 months in *Sky and Telescope* and *Astronomy* magazine. It is intended to help ASTROGRAPH readers locate equipment and suppliers that meet their astrophotographic needs. Although prices have remained fairly constant for most items, CCD costs still remain high while digital camera costs have been reduced by about half for the same capability. Several film and film related items are no longer available. Lumicon no longer advertizes hypersensitized film or the hypering chambers and hypering gas.

ASTROPHOTOGRAPHY PRODUCT SURVEY

MANUFACTURER	PRODUCT	COST
TELESCOPES DESIGNED PRIMARILY FOR PHOTOGRAPHY		
Takashashi	Epsilon 180 ED f/2.8	$4995.00
	FSQ-106 106mm F/5, 4 element refractor	$3995.00
	BRC 250 Baker Ritchey Chretien	$14995.00
Tele Vue	NP-127is 127mm F/5.2, 4 element refractor	$6995.00
	NP-101is 101mm F/5.4, 4 element refractor	$2995.00
Hutech	Borg 45 EDII F/4.7	$895.00
	Borg 60 ED F/3.8	$1150.00
	Borg 77 ED II F/4.3, 4 element	$1795.00
	Borg 101 ED F/4.1	$2495.00
	Borg 125 SD F/3.9	$5295.00
	7 inch Mak Newtonian F/4	$1995.00
Meade	LXD75 Schmidt Newtonian	$-unk
DSLR CAMERAS MODIFIED for ASTRONOMICAL PHOTOGRAPHY		
Hutech	Canon 350DH	$850.00
	Canon 400DH	$1095.00
	Canon 40DH	$1795.00
	Canon 5DH	$2695.00
OFF AXIS GUIDERS		
Astrodon	Off-axis guider for CCD imaging	$-unk
Celestron	Celestron radial guider	$124.00
Hutech	Mitsuboshi off-axis guider	$395.00
Lumicon	Newtonian Easy-Guider (1.25 or 2 inch)	$199.95
	Cassegrain Easy-Guider F/6.5 for 5 - 9.25 inch SCT	$249.95
Meade	Off-axis guider for SCTs	$79.95
Taurus Technologies	Taurus Tracker III off-axis guider	$394.00
FOCUSING AIDS		
Hutech	Knife edge focuser (specific camera calibration)	$275.00
STI	Knife edge focuser for 35mm and CCD cameras	from $179.00

CAMERA PRODUCTS

Apogee Inc	Piggy-back camera mount	$14.95
Celestron	Focal reducer/Field corrector F/6.3	$139.00
HyperStar	Micro touch wireless autofocuser	$-unk
Lumicon	Camera T-rings	$19.95
	Deluxe piggyback adjustable (6"-14") camera mount	$59.50
	Camera adapter prime focus .965 inch	$19.95
	Camera adapter prime focus 1.25 inch	$24.95
	Camera adapter prime focus 2 inch	$49.95
	Camera adapter eyepiece projection .965 inch	$39.95
	Camera adapter eyepiece projection 1.25 inch	$39.95
	Camera adapter T-thread	$29.95
Meade	Series 4000 F/6.3 focal reducer/field flattener	$129.95
	Series 4000 F/3.3 focal reducer/field flattener	$149.95
	#644 1.25 inch flip-mirror system	$149.95
	#647 2 inch flip-mirror system	$249.95
Scopetronix	MaxView digital camera eyepiece projection adapter 1.25 inch	$129.00
	MaxView digital camera eyepiece projection adapter 2 inch	$189.00
	Digi-T digital camera adapter	$119.95
Williams Optics	2 inch photo adapter	$59.00

EQUATORIAL MOUNTS

Anacortes Telescope and Wild Bird	Paramount ME	$12500.00
	Losmandy G-11	$-unk
Apogee	HD equatorial mount	$169.95
Astro-Physics	900 GTO German equatorial mount	$8250
	1200 GTO German equatorial mount	$9400
	Mach 1 GTO German equatorial mount	$5950
AstroTrac	TT320 ultra portable tracking system	$-unk
Astronomics	Celestron CG5	$399.00
	Celestron CGE	$3000
	Paramount ME	$12,500
	Losmandy Titan	$5995.00
	Losmandy G-8	$1449.00
	Losmandy G-11	$2079.00
Optical-Craft Machining	Equatorial mount and drive 1 - 4.5 inch dia. steel shaft	$300-12,000
	6.6 inch diameter drive	$495.00
	9.0 inch diameter drive	$585.00
Sultan Camera and Video	Vixen Great Polaris equatorial mount	$-unk
Vixen North America	GP-D2 equatorial mount	$-unk
	Sphinx equatorial mount up to 22lb payload	$1825.00
Woodland Hills Camera	Losmandy Gemini G-8	$1499.95
	Losmandy Gemini G-11	$1895.00
	Losmandy Titan with Gemini	$6995.00

CCD CAMERAS

ATK Instruments	ATK 16HR	$-unk
Anacortes Telescope and Wild Bird	Yankee Robotics Trifid-2 CCD camera	$5125
Apogee	A1600	$5995.00
	U9000	$11250.00
	U16M	$14425.00
	U47	$7995.00
	U11000	$9250.00
Astronomics	ST 402XME	$1290.00
	SBIG ST-7XME	$1995.00
	SAC7B	$499.00
Astrodon	CCD	$-unk
Astrovid	Stella Cam 3	$-unk
Celestron	Neximage	$99.99
Finder Lakes Instrumentation	Cooled CCD camera	$1495 to $40,000
Meade	DSI II pro	$599.95
	DSI II pro with filters	$699.00
	Lunar planetary imager	$99.00
Orion	Deep Space CCD color imager	$399.95
	Star Shot solar system color imager II	$179.95
	Color Imager II	$699.95
SAC Imaging	SAC 8 CCD	$549.00
	SAC 10 CCD, 3.3 megapixel	$900.00
SBIG	ST-402ME	$1790.00
	ST-7XME	$2495.00
	ST-8XME	$4494.00
	ST-9XE	$2795.00
	ST-10XME	$8895.00
	ST-2000XM	$3395.00
	ST-2000XCM	$2695.00
	ST-4000XCM	$4495.00
	STL-1001E	$9491.00
	STL-1301E	$6996.00
	STL-4020CM	$5995.00
	STL-6303E	$12995.00
	STL-11000M	$8495.00
	STL-11000CM	$9495.00
Starlight Xpress Ltd	SXV-M25C	$7295.00
	SXV-M8C	$2595.00
	SXVF-H36 35mm format 16 megapixels	$-unk

ILLUMINATED RETICLE GUIDING EYEPIECES

Lumicon	25mm Kellner crosshair	$69.95
	12.5mm Orthoscopic wireless 1.25 inch	$149.95
	Pulse guide illuminator	$42.95
Meade	MA 35mm Plossl1.25 inch cordless	$129.95
	MA 12mm 1.25 inch cordless	$99.95
	Series 4000 Plossl 9mm wireless 1.25 inch	$149.95
Orion	12.5mm illuminated reticle Plossel	$69.95
	Ultrascopic 5mm illuminated reticle	$169.95
Rigel Systems	Pulse Guide 12.5mm Plossl reticle 1.25 inch	$119.95

BOOKS/SOFTWARE

Willmann-Bell	The Handbook of Astronomical Image Processing by Richard Berry and James Burnell	$99.95
	Photoshop Astronomy by R Scott Ireland	$39.95

FILTERS

Astronomics	Tele Vue UHC filter 1.25 inch	$95.00
	Tele Vue UHC filter 2 inch	$185.00
	Tele Vue Oxygen III filter 1.25 inch	$95.00
	Tele Vue Oxygen III 2 inch	$185.00
Celestron	Oxygen III filter 1.25 inch	$69.00
	Oxygen III filter 2 inch	$99.00
	Minus Violet filter 1.25 inch	$49.00
	UHC/LPR filter 1.25 inch	$69.00
	UHC/LPR filter 2 inch	$99.00
	UV/IR cutoff filter 1.25 inch	$59.00
Lumicon	UHC (Ultra High Contrast) filter 1.25 inch	$99.95
	UHC (Ultra High Contrast) 48mm or 2 inch dia.	$199.95
	Deep Sky 1.25 inch	$99.95
	Deep Sky 48mm or 2 inch T-threaded	$199.95
	H-alpha pass 1.25 inch	$79.95
	H-alpha pass 48mm	$69.95
	H-alpha pass 58mm	$79.95
	H-alpha pass 77mm	$89.95
	H-alpha pass 82mm	$99.95
	Hydrogen beta, 1.25 inch	$99.95
	Hydrogen beta, 48mm and 2 inch	$199.95
	Oxygen III 1.25 inch	$99.95
	Oxygen III 48mm and 2 inch	$199.95
	Minus violet 48mm	$79.95
	Minus violet 58mm	$89.95
	Minus violet 72mm	$99.95
	Comet band filter 1.25 inch	$99.95
	Comet band filter 48mm and 2 inch	$199.95
Meade	Series 4000 nebula broadband 1.25 inch #908B	$79.95
	Series 4000 nebula broadband 36mm for SCT #911B	$99.95
	Series 4000 nebula narrowband 1.25 inch #908N	$89.95
	Series 4000 nebula narrowband 36mm for SCT #911N	$119.95
	Series 4000 Oxygen III, 1.25 inch #908x	$99.95
	Series 4000 Oxygen III, 36mm for SCT #911x	$149.95

SOLAR FILTERS

Coronado	Solar Max 40	$1450
	Solar Max 60	$2590
	Solar Max 90	$5045

LISTING OF MANUFACTURERS

NAME	ADDRESS	PHONE #
Adorama www.adoramacamera.com	42 W. 18th St, New York NY 10011	(800) 223-2500
Anacortes Telescopes and Wild Bird www.buytelescopes.com	unk	(800) 850-2007
Apogee Instruments Inc. www.ccd.com	1020 Sundona Way Ste 150, Roseville CA 95661	(916) 218-7450
Astronomics www.astronomics.com	680 SW 24th Ave., Norman OK 73069	(800) 422-7876
Astrodon www.astrodon.com	unk	unk
Astro-Physics www.astro-physics.com	11250 Forest Hills Rd, Rockford IL 61115	(815) 282-1513
Astrovid www.astrovid.com	unk	(877) 348 8433
ATIK Instruments www.ATIK-instruments.com	unk	unk
Celestron International www.celestron.com	2835 Columbia Street, Torrance CA 90503	(800) 421-1526
Colorado www.coronadofilters.com	unk	(866) 786-9282
Finger Lakes Instrumentation www.fli-cam.com	unk	(585) 624-3760
Hutech www.hutech.com	23505 Crenshaw Blvd # 225, Torrance CA 90505	(877) 289 2674
HyperStar www.starizona.com	5747 N Oracle Rd Suite 103, Touson AX 85704	(520) 292 5010
Lumicon www.lumicon.com	2111 Research Dr, Livermore CA 94550	(415) 447-9570
Meade Instruments Corp. www.meade.com	1675 Toronto Way, Costa Mesa CA 92626	(714) 556-2291
Orion Telescope Center www.telescope.com	421 Soquel Ave Box 1150, Santa Cruz CA 95061	(800) 447-1001
Optical-Craft Machining www.opticcraft.com	33918 Macomb, Farmington MI 48335	(248) 476-5893
Regel Systems www.regelsys.com	26850 Basswood Ave, Rancho Palos Verdes CA 90275	(310) 375-4149
SAC Imaging www.sac-imaging.com	PO box 360982, Melbourne FL 32935	(321) 259-6498
SBIG www.sbig.com	147-A Castilian Dr, Santa Barbara CA 93117	(805) 571-7244
Scopetronix www.scopetronic.com	1423 SE 10th Street, Cape Coral FL 33990	(941) 945-6763
Shutan Camera and Video www.shutan.com	312 W. Randolph, Chicago IL 60606	(800) 621-2248
Starlight Xpress Ltd. www.starlight-xpress.uk.co	unk	
STI (Stellar Technologies International) www.stellar-international.com	408 E. Bowie, Alamo TX 78516	(800) 232 9416
Takahashi www.takahashiamerica.com	Texas Nautical Repair, 1925a Richmond Ave, Houston TX 77098	(713) 529 3551
Taurus Technologies www.taurus-tech.com	PO Box 14, Woodstown NJ 08098	(609) 769-4509
Tele Vue www.televue.com	32 Elkay Drive, Chester NY 10918	(845) 469 4551
Vixen North America www.vixennamerica.com	32 Elkay Dr, Chester NY 10918	(845) 469 8660
Willmann-Bell Inc www.willbell.com	PO Box 35025, Richmond VA 23235	(800) 825-7827
Woodland Hills Camera www.whtelescopes.com	5348 Topanga Cyn Blvd, Woodland Hills CA 91364	(818) 347-2270
William Optics www.william-optics.com	11155 Knott Ave # H, Cypress CA 90630	(866) 918 6888

Above: Globular cluster M2 photographed by Lee C. Coombs on 13 August 2001 using a 10 inch f/5 Newtonian. Exposure was 30 minutes on Ektachrome 200 professional film.

Above: Globular cluster M4 photographed by Lee C. Coombs on 16 June 2001 using a 10 inch f/5 Newtonian. Exposure was 31 minutes on Ektachrome 200 professional film.

Astrophotography for February and March

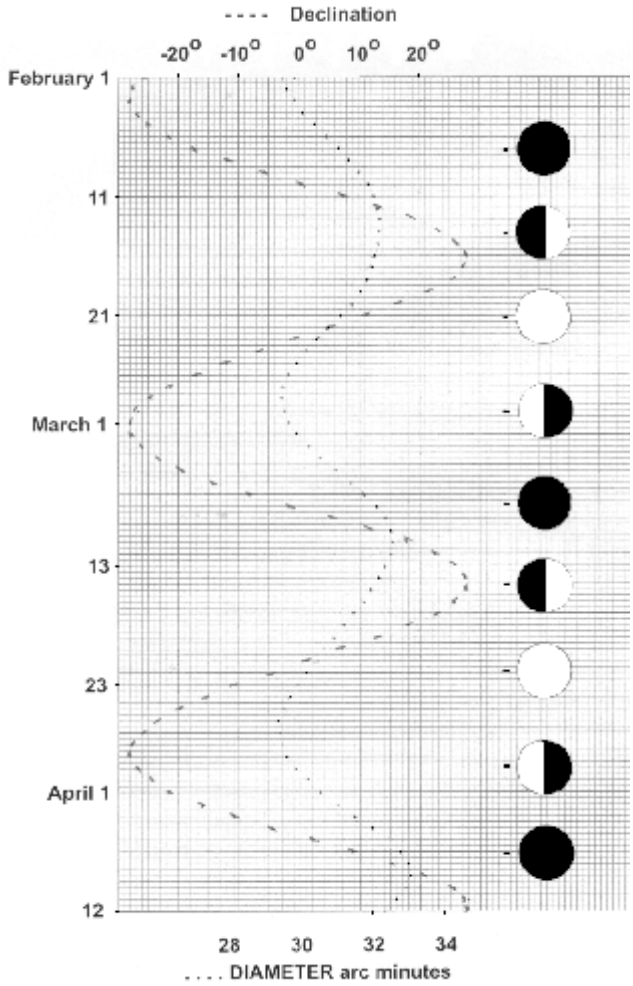
by

Ralph Proctor

Mercury begins February lost in the Sun's glare, reaching inferior conjunction with the Sun on 6 February. Mercury emerges from the Sun's glare in mid-February as a morning object low in the eastern sky. Mercury moves higher in the eastern sky and reaches a greatest western elongation of 27 degrees on 3 March when it will be in poor photographic position with a declination of minus 16 degrees. During the remainder of March Mercury moves lower in the eastern sky and by the end of March disappears into the Sun's glare.

Venus begins February as a morning object low in the eastern sky. During February and March Venus moves lower in the eastern sky.

Lunar Declination and Diameter:



The Moon's waxing quarter phases will be located high on the ecliptic and in excellent photographic position during February (February 16) and March (March 14), with an apparent declination of up to +28 degrees.

Mars begins February as an evening object high in the western sky in the constellation Taurus. Mars moves into the constellation Gemini in early March. During February and March Mars moves lower in the western sky, decreases in brightness from magnitude -0.5 to +0.9, and decreases in diameter from 12.1 to 7.0 arc seconds.

Jupiter begins February as a morning object low in the eastern sky in the constellation Sagittarius. During February and March Jupiter moves higher in the eastern sky, increases in brightness from magnitude -1.9 to -2.0, and increases in diameter from 32.6 to 37.3 arc seconds.

Saturn begins February as a morning object high in the eastern sky in the constellation Leo. Saturn reaches opposition on 24 February when it will be in good photographic position with a declination of plus 11 degrees. During February and March Saturn decreases in brightness from magnitude +0.3 to +0.4, and decreases in diameter from 19.8 to 19.6 arc seconds.

Uranus begins February as an evening object low in the western sky in the constellation Aquarius. Uranus mover lower in the western sky and by mid-February is lost in the Sun's glare, reaching conjunction with the Sun on 8 March. During February and March Uranus remains constant in brightness at magnitude +5.9 and decreases in diameter from 3.37 to 3.36 arc seconds. Uranus is located at R.A. 23 hours 14.4 minutes declination -05 degrees 42 minutes on 14 February and at R.A. 23 hours 20.7 minutes declination -05 degrees 02 minutes on 15 March.

Neptune begins February lost in the Sun's glare, reaching conjunction with the Sun on 11 February. During February and March Neptune is located in the constellation Capricornus, remains constant in brightness at magnitude +8.0, and increases in diameter from 2.20 to 2.23 arc seconds. Neptune is located at R.A. 21 hours 37.2 minutes declination -14 degrees 31 minutes on 14 February and at R.A. 21 hours 41.4 minutes declination -14 degrees 10 minutes on 15 March.

Pluto begins February as a morning object low in the eastern sky in the constellation Sagittarius. During February and March Pluto moves higher in the eastern sky and remains constant in brightness at magnitude +14.0. Pluto is located at R.A. 18 hours 01.7 minutes declination -17 degrees 09 minutes on 14 February and at R.A. 18 hours 03.9 minutes declination -17 degrees 06 minutes on 15 March.

Events:

Antares will be occulted by the Moon on 1 February (18 hours universal time) for Australia, New Zealand, the southern portion of South America, and part of Antarctica; on 29 February (03 hours universal time) for part of Antarctica, and the southern tip of Australia; and on 27 March (10 hours universal time) for northern New Zealand, Polynesia, the southern part of South America, and part of Antarctica.

Venus will be occulted by the Moon on 5 March (19 hours universal time) for eastern Melanesia, Polynesia, and all but the northeastern and northwestern portions of North America.

Neptune will be occulted by the Moon on 5 March (22 hours universal time) for all but the northern part of Australia, New Zealand, Polynesia, and western Mexico.

Mercury will be occulted by the Moon on 5 March (14 hours universal time) for the southern half of South America, and northwestern Africa.

Regulus will be occulted by the Moon on 21 February (00 hours universal time) for most of South America and part of Antarctica; and on 19 March (08 hours universal time) for New Zealand, eastern Melanesia, Polynesia, and part of Antarctica.

The Sun will undergo an annular eclipse on 7 February for most of Antarctica, New Zealand, the southeastern part of Australia, Vanuatu, Fiji, and Western Samoa. The eclipse begins at 01 hours 38.5 minutes and ends at 06 hours 11.9 minutes universal time.

The Moon will undergo a total eclipse on 21 February for the Arctic, the western part of Russia, most of Arabia, Africa, Europe, and the Americas. The eclipse begins (Penumbra contact) at 00 hours 34.9 minutes and ends at 06 hours 17.2 minutes universal time. Umbra contact begins at 01 hours 42.9 minutes and ends at 05 hours 09.1 minutes. Mid-eclipse occurs at 03 hours 51.1 minutes universal time.

MINOR PLANETS

		position			
		14 February		15 March	
Planet	Magnitude	R.A.	Decl.	R.A.	Decl.
Ceres	08.6 - 09.0	02 hr 58.2 min	+14 deg 18 min	03 hr 32.6 min	+17 deg 57 min
Pallas	10.1 - 09.6	23 hr 44.3 min	- 07 deg 10 min	00 hr 27.2 min	- 04 deg 51 min
Juno	11.5 - 11.0	17 hr 22.1 min	- 11 deg 37 min	17 hr 47.0 min	- 10 deg 08 min
Vesta	07.9 - 08.1	22 hr 08.3 min	- 15 deg 19 min	23 hr 06.0 min	- 10 deg 14 min

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Volume No. 6 issue 6
Volume No. 7 issue 5 and 6
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
Volume No. 19 issue 1, 2, 3, 4, 5, and 6
Volume No. 20 issue 1, 2, 3[1], 4, 5, and 6
Volume No. 21 issue 1, 2, 3, 4, 5, and 6
Volume No. 22 issue 1, 2, 3, and 4
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
Volume No. 35 issue 1 and 2

NOTES: 1 - Color issue - $2.00 each
2 - Comet photography issue.

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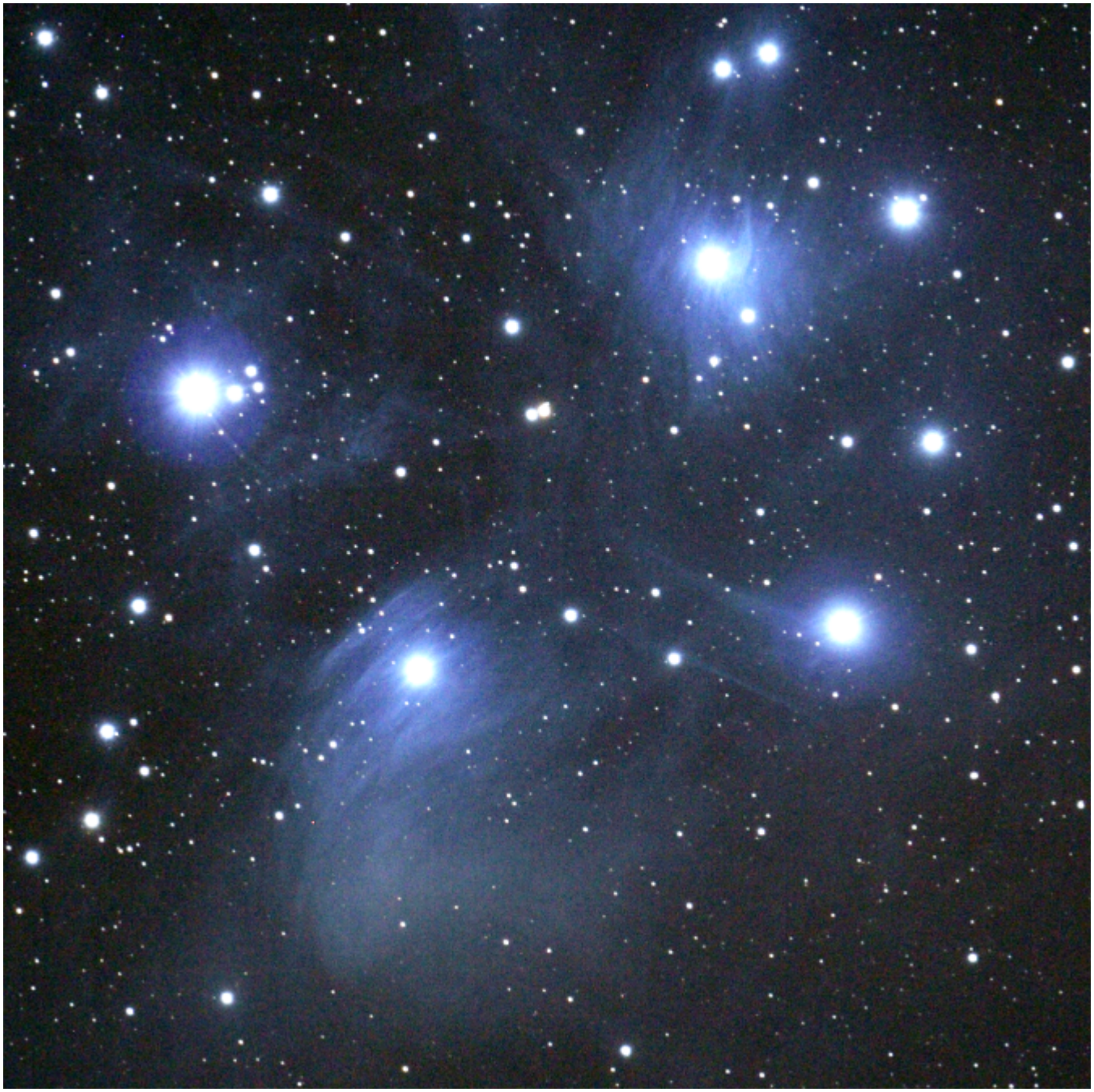
Image Processing: Stacking Images

by

Robert Price

Stacking two or more 10 minute exposures together can make a big improvement in the final result. Figure 1 and Figure 2 demonstrate this improvement. Figure 1 and Figure 2 are full scale cropped images at 200 DPI. Figure 1 is a single 540 second exposure of the Pleiades taken with a NP-101 and unmodified Canon 350D DSLR (Digital Single Lens Reflex) camera. Figure 2 is the addition of the image in Figure 1 and two other exposures of 548 and 553 seconds taken immediately before and after. Not only is there less noise in the nebulosity but there is more nebulosity and the bright stars are smaller and less bloated. Even the addition of a 5 minute exposure to a longer exposure can make a



Above, Figure 1: The Pleiades photographed by the author on 30 October 2006 using a NP-101 refractor and unmodified Canon 350D camera. Exposure was 540 seconds.

difference. Figure 3 is a 611 second exposure of the Rosette Nebula. Figure 4 is the addition of the image in Figure 3 and a 278 second exposure taken immediately before the 611 second exposure. At the time this image was used to verify the placement of the nebula in the frame. Both the nebulosity and color appear to be stronger in the stacked image. Figures 3 and 4 are near full frame images, reduction is about 33 percent from the original.

Addendum to the Canon 40D Evaluation

In the previous issue the editor raised a concern about the Canon 40D. The amount of dark frame noise was greater than in a identical dark frame taken with an older Canon 350D. In reply to our concern, Astro Hutech sent us another Canon 40D dark frame which indicated the amount of noise was normal for the 40D. As of this date we have received no help from the manufacturer, Canon U.S.A., as to why the newer Canon 40D has more dark frame noise than the older Canon 350D.

Above, Figure 2: The Pleiades photographed by the author on 30 October 2006 using a NP-101 refractor and unmodified Canon 350D camera. Stacked image consists of 3 images whose exposures were 548, 540(Figure 1), and 553 seconds.

Above, Figure 3: The Rosette Nebula photographed by the author on 30 October 2006 using a NP-101 refractor and Hutech modified Canon 350D camera. Single image was a 611 second exposure.

Above, Figure 4: The Rosette Nebula photographed by the author on 30 October 2006 using a NP-101 refractor and Hutech modified Canon 350D camera. The image in Figure 3 was combined with a 278 second exposure to yield this 2 image stack.

Above: Globular cluster NGC 6819 photographed by Lee C. Coombs on 7 August 2002 using a 10 inch f/5 Newtonian. Exposure was 25 minutes on Ektachrome 200 professional film.