


# More Astrophotography



Interactive Workshop 2002

Dave Payne, Mike Whybray, Neil  
Morley

# Astrophography Using a Telescope



⌘ Afocal

⌘ Prime Focus

⌘ Eyepiece Projection

# Afocal Photography



- ⌘ Simplest telescope coupling (unguided)

  - Skylight filter recommended (protect camera lens)

- ⌘ Difficult alignment and focussing

- ⌘ Variable results - lots of patience!

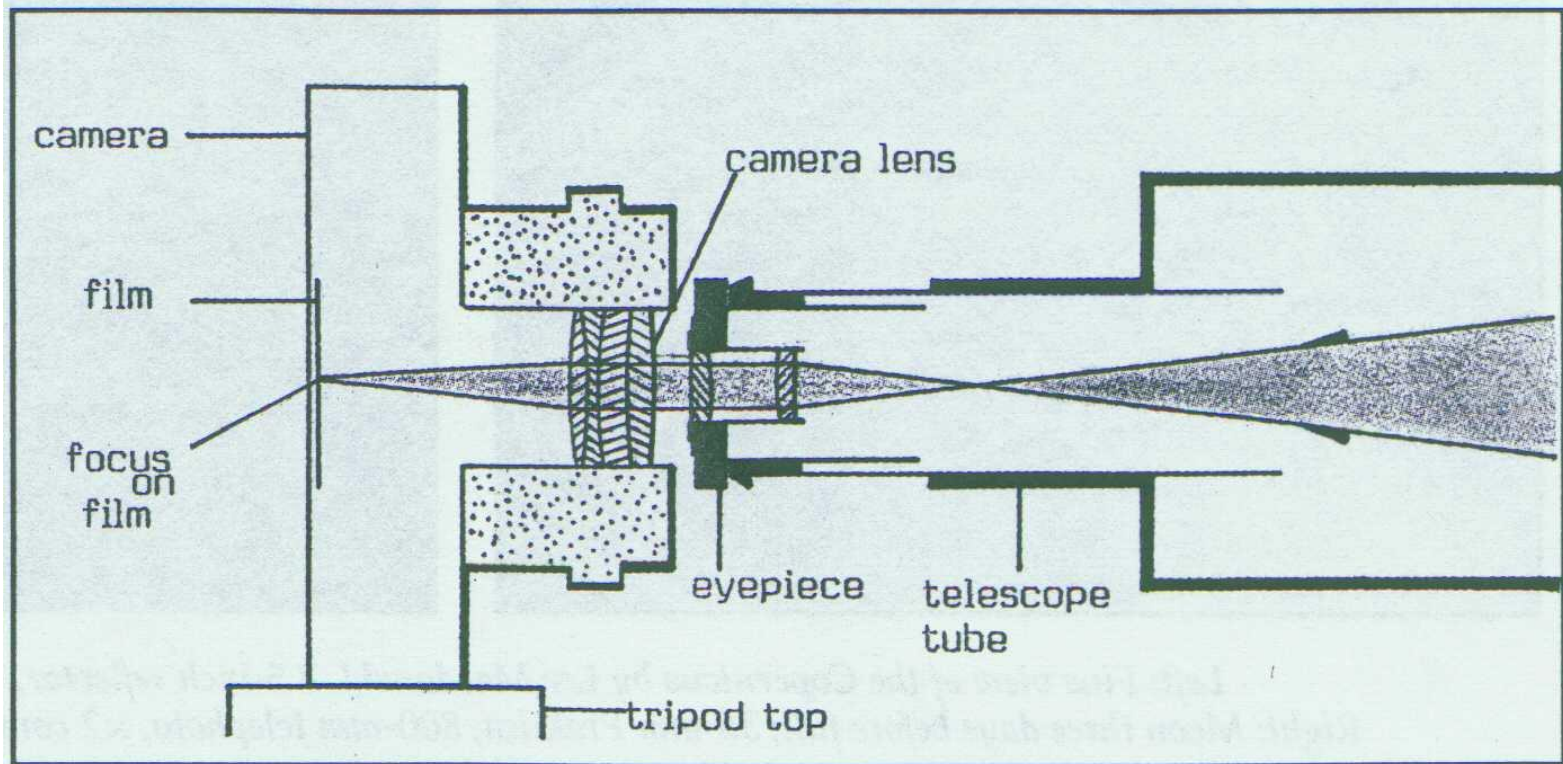
- ⌘ Good telescope method to start with

  - Possibilities with Digital Cameras (covered later)

- ⌘ Requires good quality eyepiece

- ⌘ Discussion

# Here's how it works...



*Diagram 1: The arrangement of camera and eyepiece in the afocal method.*

# Telescope Photography

LX200 - Afocal and Piggyback methods



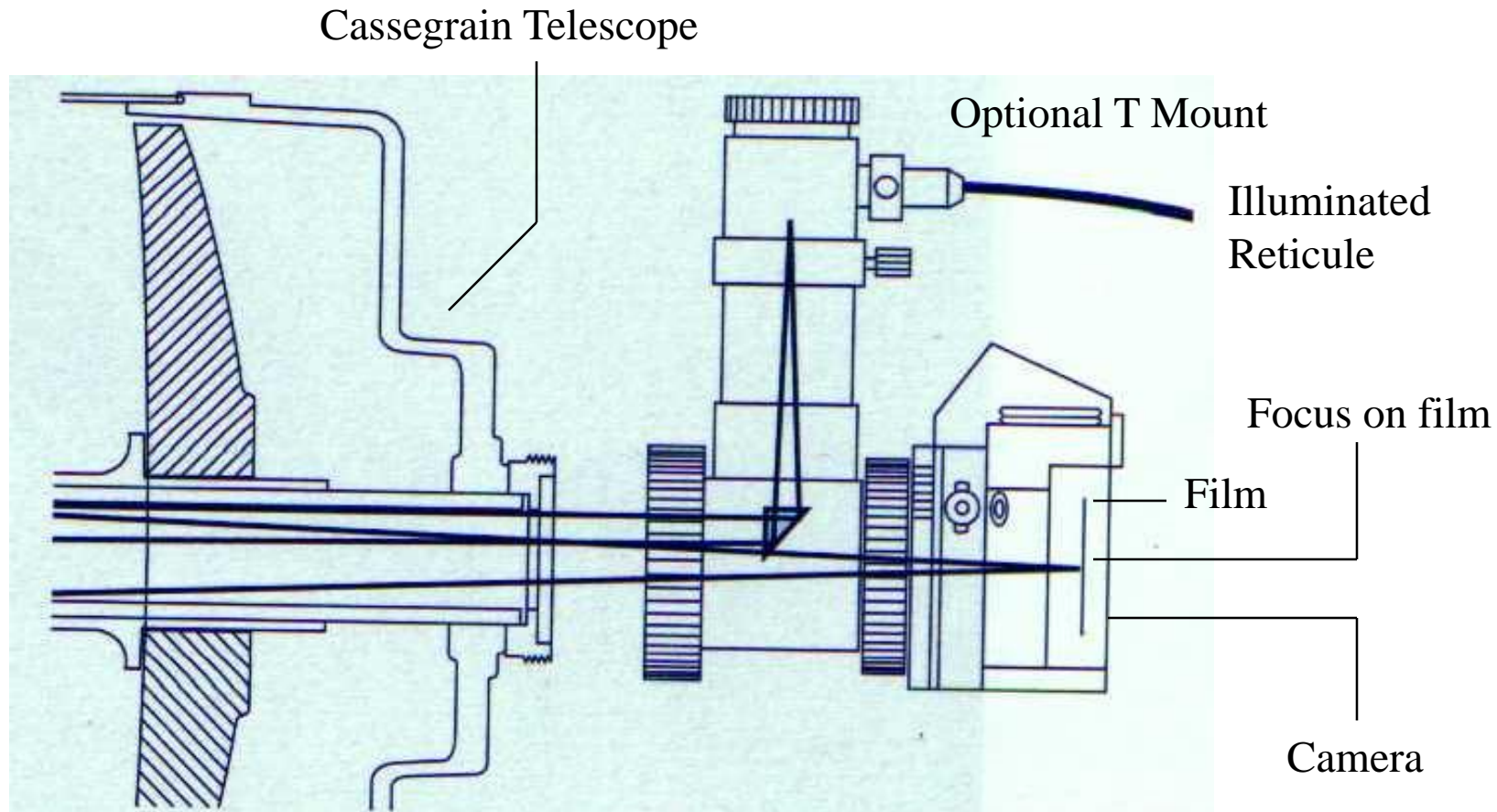
# Prime Focus



- ⌘ Camera directly coupled to telescope
- ⌘ Telescope objective acts as very long focus lens - no magnification
- ⌘ Camera replaces telescope eyepiece
- ⌘ Focussing easier than afocal method
- ⌘ Telescope guiding desirable!



# Here's How it Works...



*The arrangement of the Prime Focus Method  
as described in the Meade Catalogue*

# Eyepiece Projection



⌘ Camera directly coupled to telescope

- T Ring and Camera Adapter

⌘ Telescope eyepiece required “in-line”

- Eyepiece provides image magnification

⌘ Focussing more difficult

- Image less bright due to being magnified

⌘ Telescope guiding desirable



# Here's How it Works...

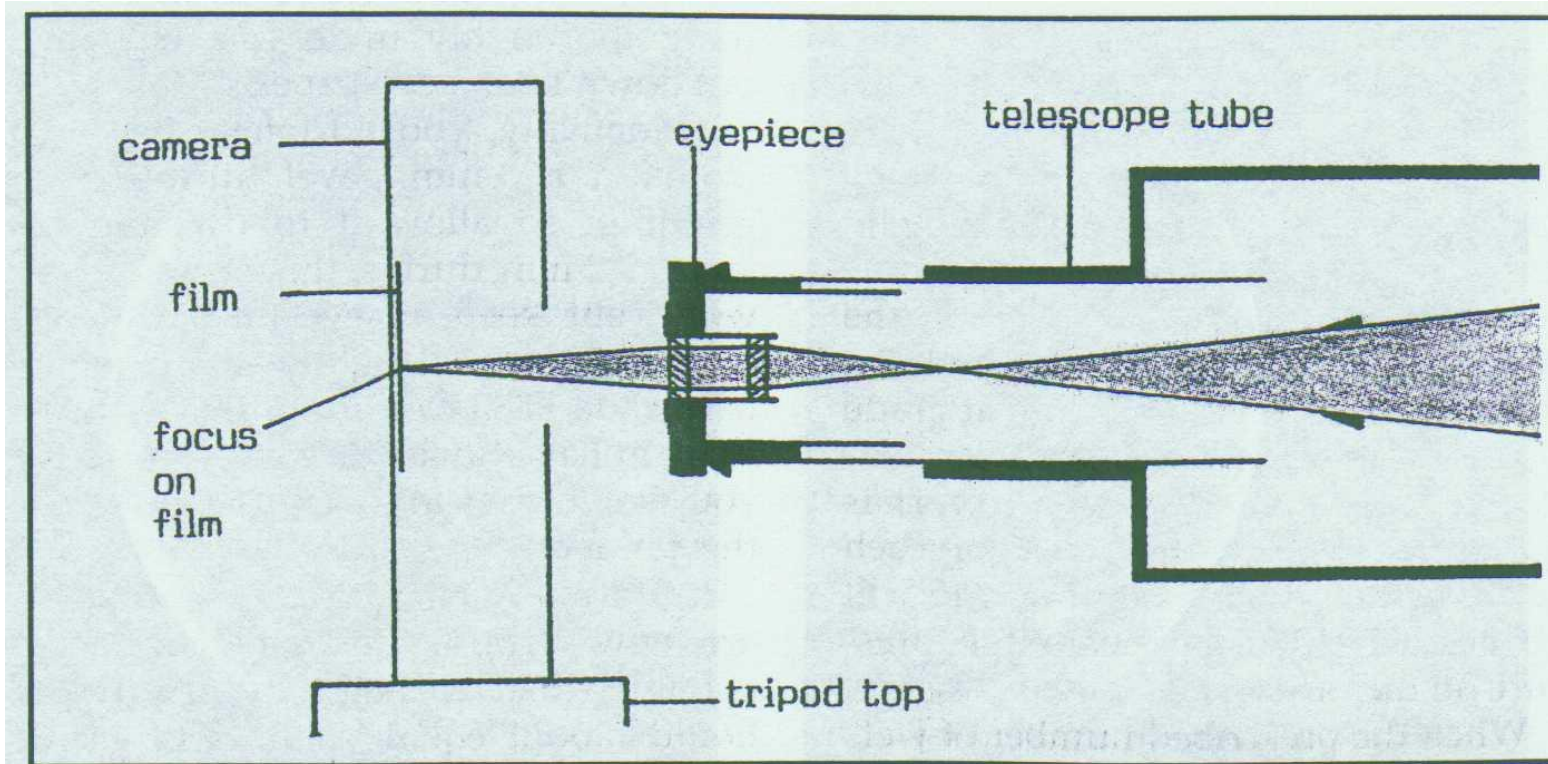


Diagram 2: The arrangement of the eyepiece projection method.

# Astrophotography with Digital Cameras



Interactive Workshop

Neil Morley

Contributions from OASI and Internet

# Format



Part 1 - Basics

Part 2 - Digital camera photos


- ☒ OASI members

- ☒ Internet

Part 3 - Conclusions

Part 4 - Future project ideas

# Part 1 - Basics...



- ⌘ Good for... Moon, Planets, Brighter DSOs and Constellations / Asterisms
- ⌘ Specs + pricing improving all the time!
- ⌚ Inferior to dedicated astro CCD cameras (uncooled CCD)
- ⌚ Lots of patience!

# Afocal Coupling





# Digital Camera Adapters





# Part 2 - Photographs...



Neil Morley

Martin Cook

Nick Sullivan

James Appleton (MX916 CCD)

Internet sources

# First Attempts with Casio QV2800UX Digicam...



Shots from Neil Morley

# Casio QV2800UX

Viewfinder would assist framing constellation shots

2 MP CCD

F3.2-3.5 6-48mm Lens  
(43mm thread)

40-320mm equiv

8x optical 4x digital

F3.2-F8 Aperture

1 cm macro mode

60 sec shutter (Bulb)

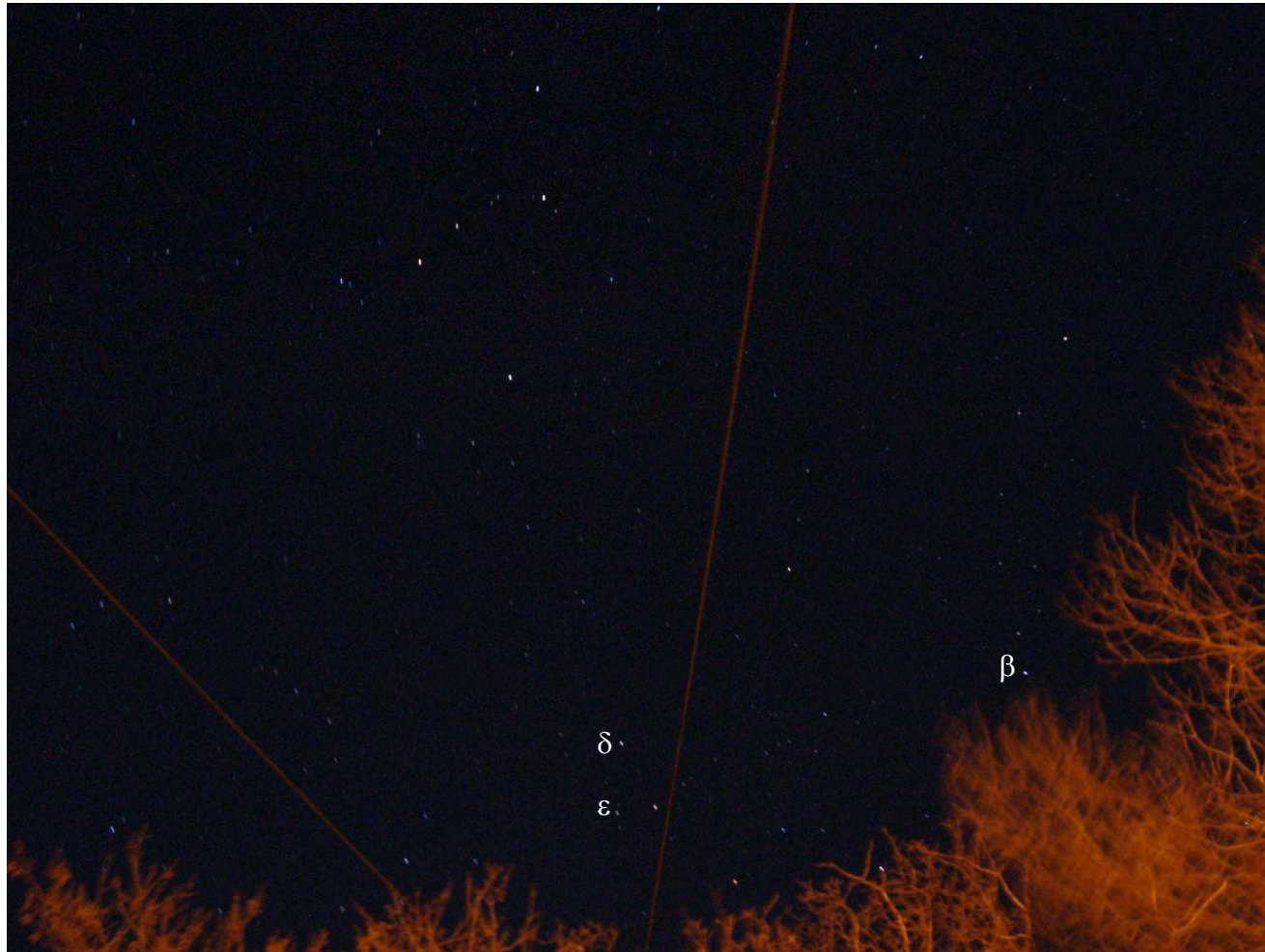
Remote control

Rotating lens barrel



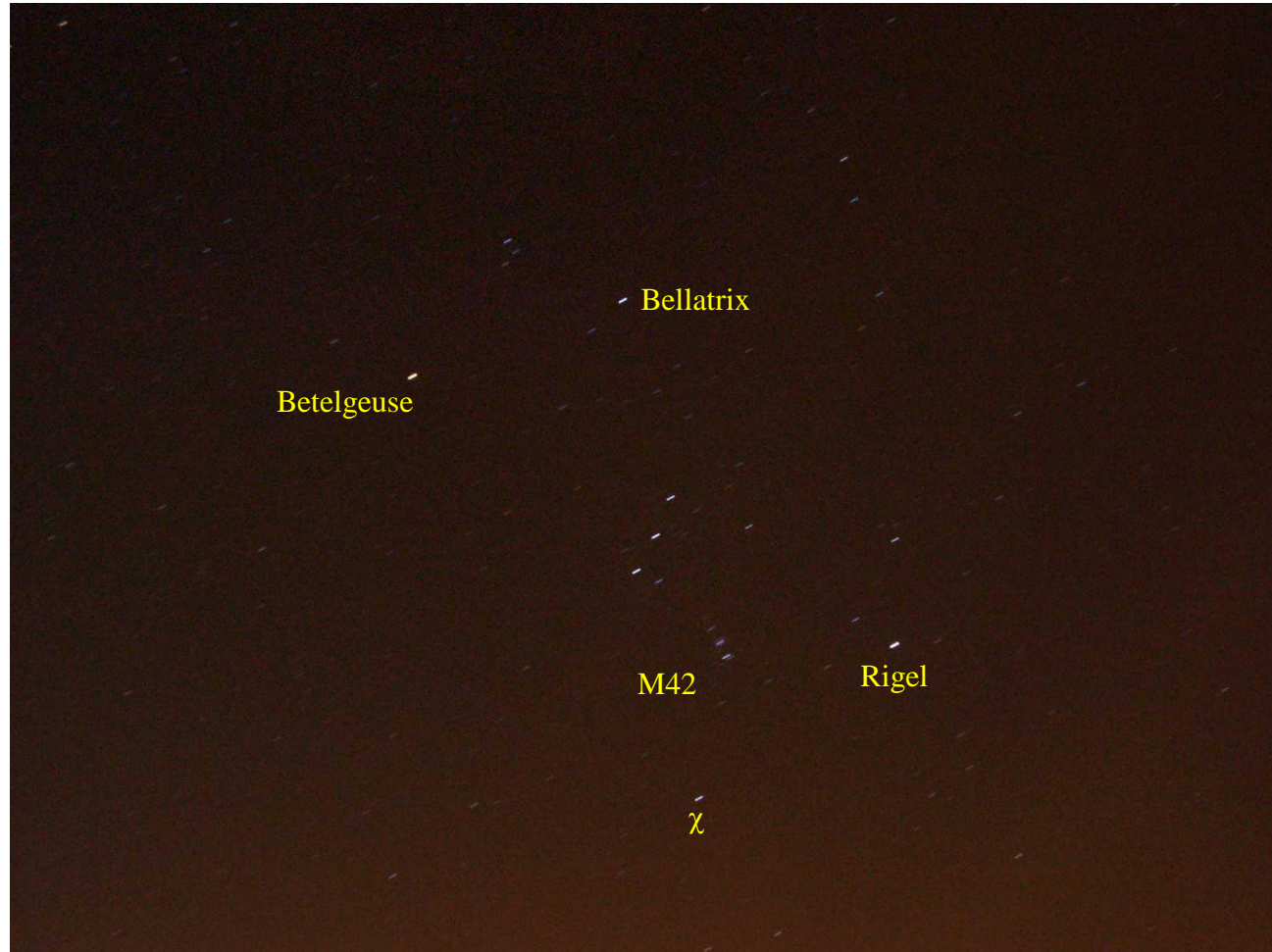
# QV2800 - Cassiopea/Ceph

60sec F3.2 unguided, Blandford Dorset, 01.01.02



# QV2800 - Orion

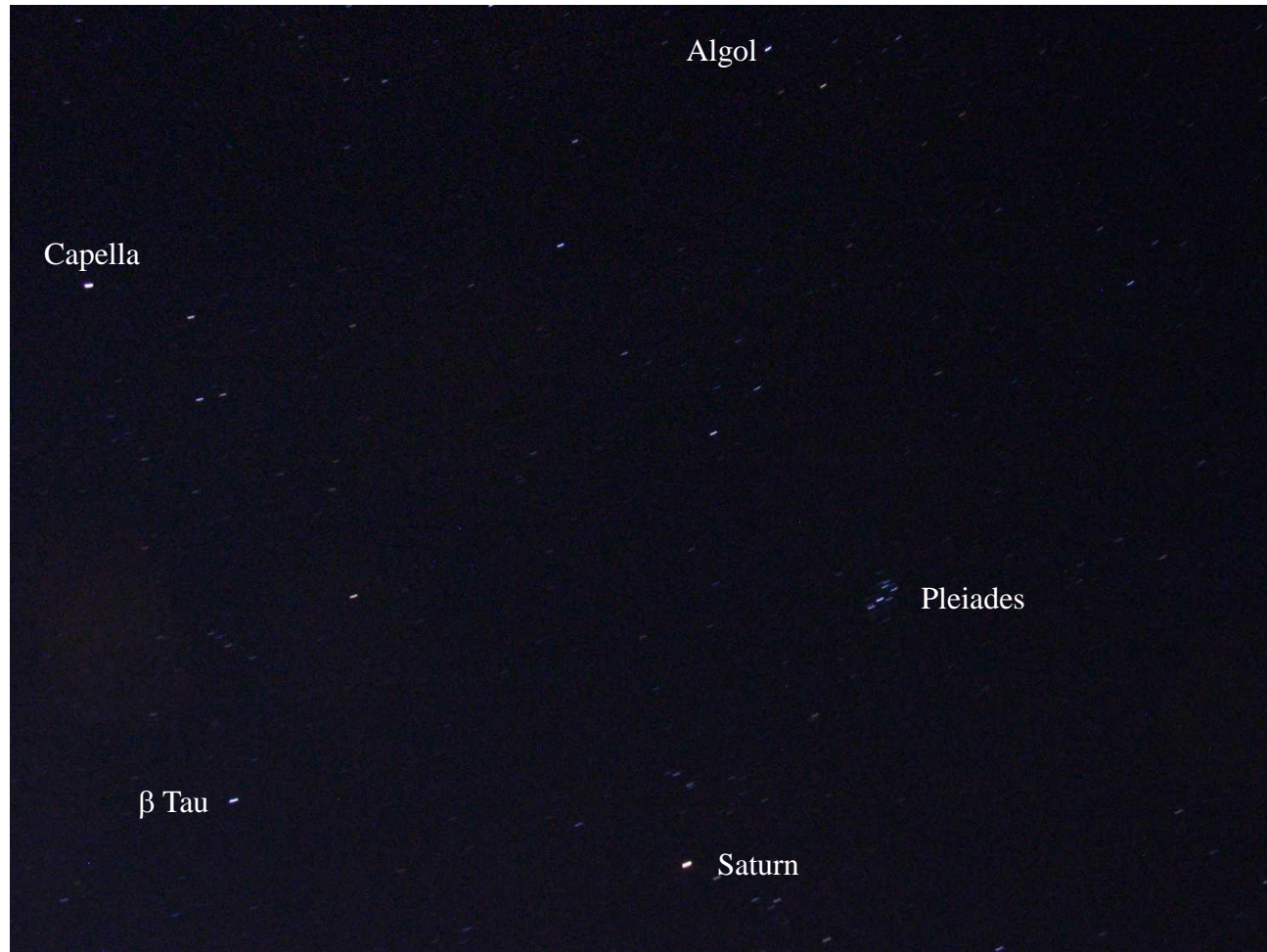
60sec, F3.2 unguided, Orwell Pk, 02.01.02





# QV2800 - Taur/Pers/Auriga

60sec F3.2 unguided, Blandford Dorset, 01.01.02





# QV2800 - Gemini

60sec, F3.2 unguided, Orwell Pk, 02.01.02



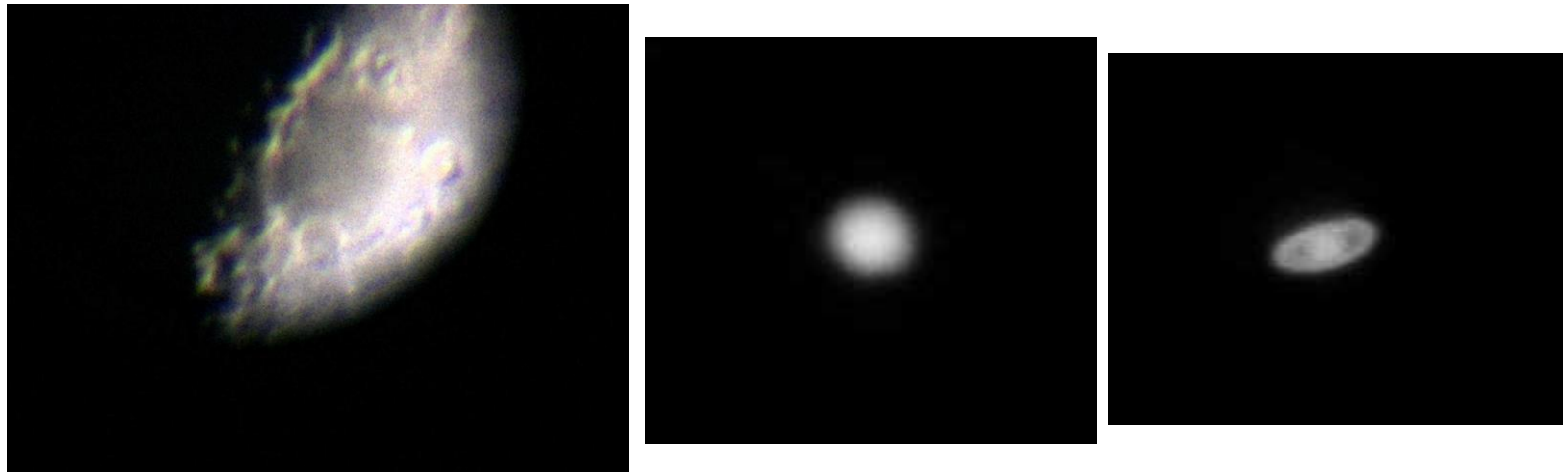
# QV2800 - Auriga

60sec, F3.2 unguided, Orwell Pk, 02.01.02



# QV2800 - Moon & Planets

1/8 sec F3.2 (auto), Handheld Afocal, 02.01.02



⌚ Positioning, Vignetting, Focussing and Exposure!



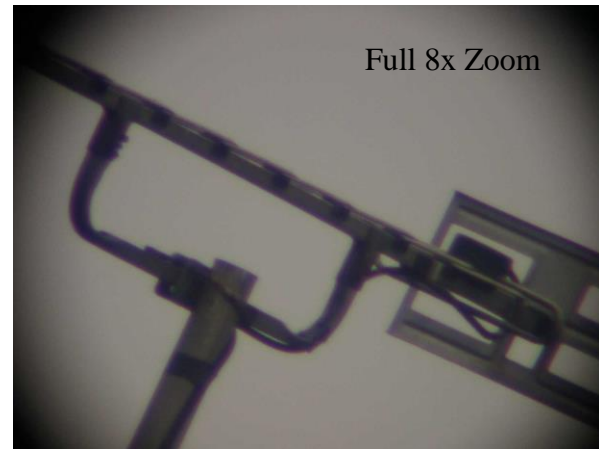
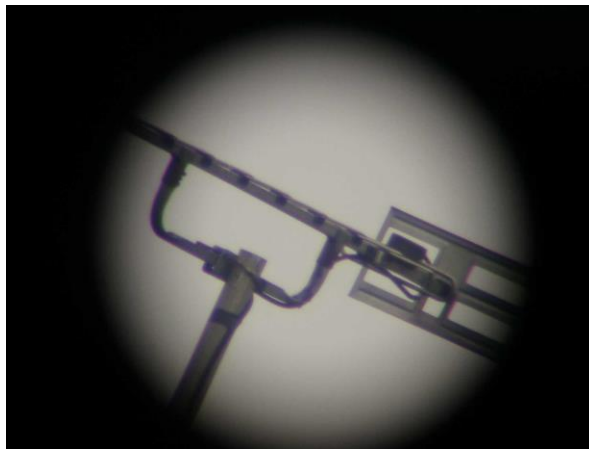
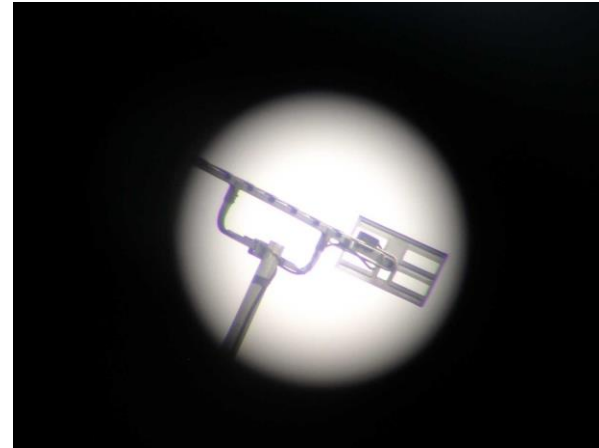
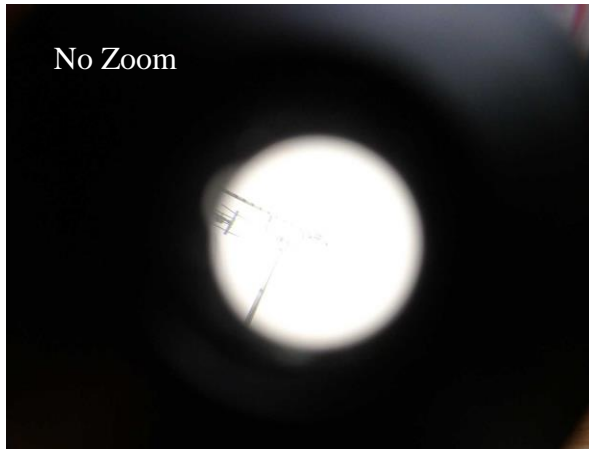
# QV2800 and Meade ETX-70

Demonstration of BCF Afocal Mount



# QV2800 Afocal Photography

Demonstration of vignetting with variable zoom. QV2800 afocally coupled to ETX70 15mm EP. Infinity focus and auto shutter.



# QV2800 - Saturn

ETX70 guided afocal, 25mm EP, 8x Opt Zoom 4x Digital, F3.2, ASA80, 1/6 sec exposure, focus varied, raw images, 03.01.02

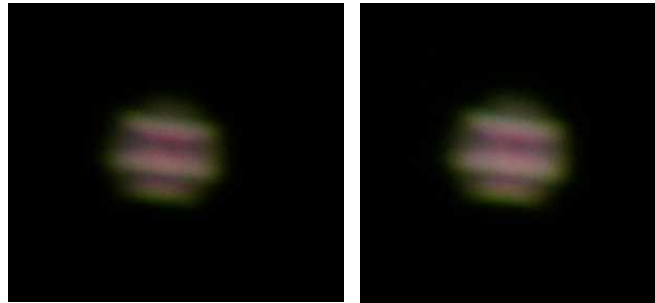


- ⌚ Focussing almost impossible (tiny image)
- ⌚ Zooming moves image!
- ⌘ Telescope drive essential!



# QV2800 - Jupiter

ETX70 guided afocal, 25mm EP, 8x Zoom, 112x, F3.2, ASA80, 1/6 sec, infinity focus, raw images, 03.01.02



# QV2800 - Moon 1/2

ETX70 unguided afocal, 25mm EP, 8x Zoom, 112x, F3.2, ASA80, 1/8sec auto shutter, infinity focus, raw image, 03.01.02



# QV2800 - Moon 2/2

ETX70 unguided afocal, 25mm EP, 8x Zoom, 112x, F3.2, ASA80, 1/8 sec auto shutter, infinity focus, raw image, 03.01.02



# Comparison Shot

Prime focus, F/15, OASI 10" Refractor, Zenit 122E, 1/60 sec, Jan 2000,

Scanned image.



# Martin's Moon Shot









# Internet Sources...



Greg Konkkel

Daniel Ethier

Bob Reim

# Olympus Camedia 2020z

Greg Konkel

2 MP CCD

F2-2.8 6.5-19.5mm Lens

30-105mm equiv

3x optical 2.5x digital

F2-F11 Aperture

20 cm macro mode

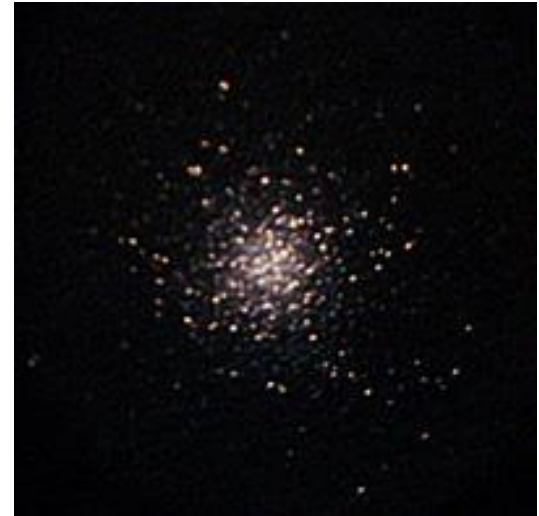
15 sec shutter

Remote control



# c2020z - DSOs

20" Newtonian



# C2020z - Planets

20" Newtonian



# Nikon Koolpix 880

Daniel Ethier

2 MP CCD

F2.8-4.2 8-20mm Lens

38-95mm equiv

2.5x optical x digital

F2.8-F11.3 Aperture

4 cm macro mode

8 sec shutter plus Bulb





# Koolpix 880 - Moon

6" Newtonian, 1/250 sec exposure, 60x magnification



# Koolpix 880 - Planets

6" Newtonian, multiple images (10) stacked using freely available Astrostack software

---



# Casio QV8000

Bob Reim

1.3 MP CCD

F3.2-3.5 6-48mm Lens

40-320mm equiv

8x optical 4x digital

F3.2-F8 Aperture

1 cm macro mode

64 sec shutter (Bulb)

Remote control

Rotating lens barrel



# QV8000 - Orion

F3.2, 64 s



# Casio QV8000 - Planets

Celestron NextStar 5, 25mm EP, 8x zoom, 18 images stacked with Astroart software, unsharp mask and adaptive processing



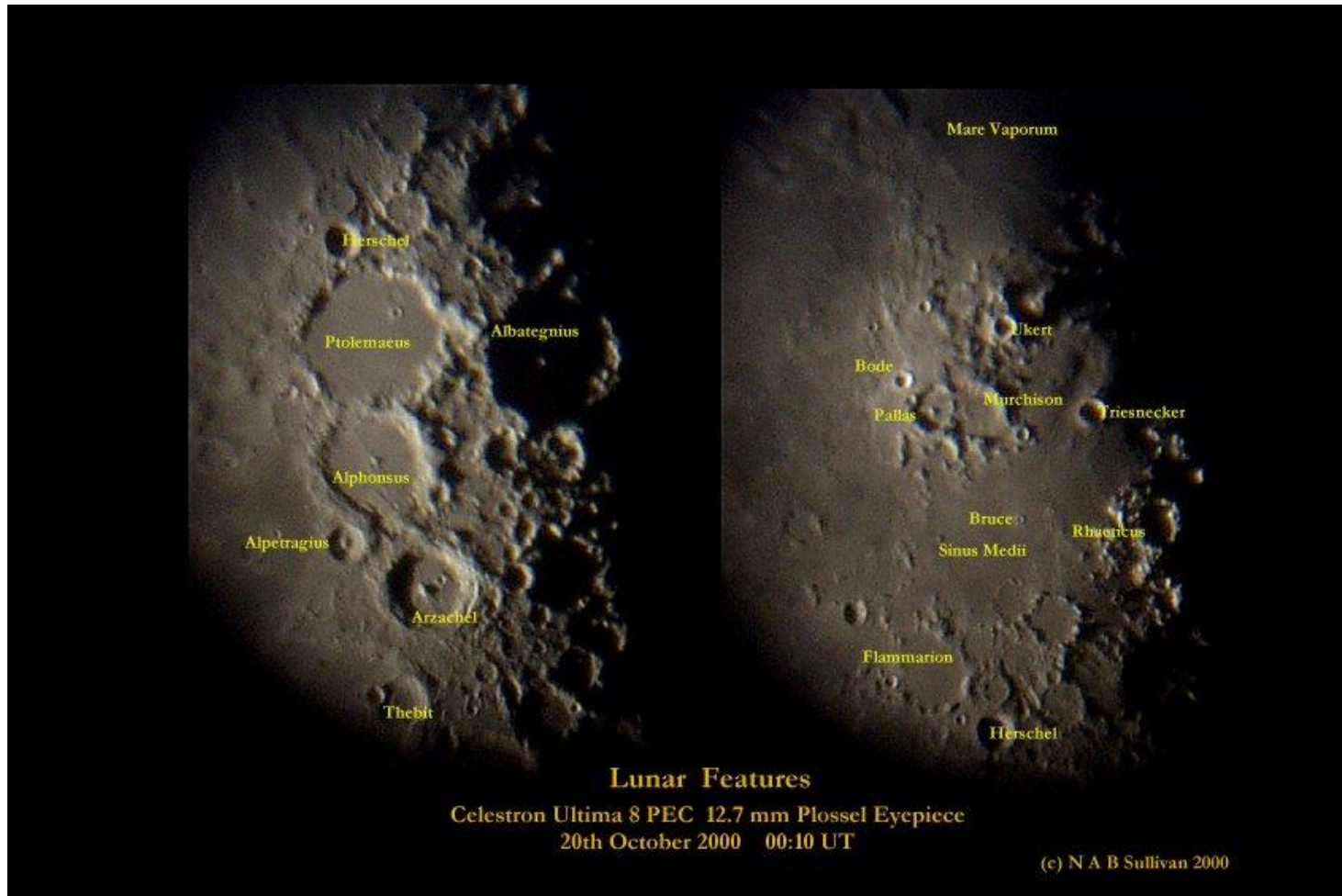


# Afocal Digital Photography...



Shots from Nick Sullivan

# Lunar Features



# Starlight Express MX916 CCD Camera...



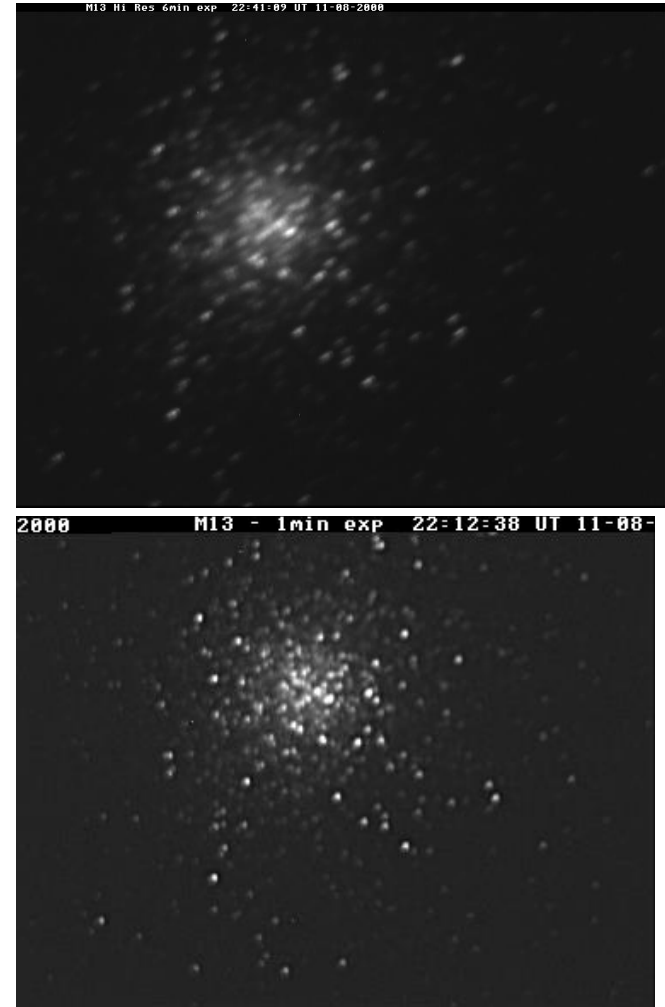
Shots from James Appleton

# M13 in Hercules

11 August 2000 21:13UT, Meade prime focus, 1 min exposure, Contrast stretch & unsharp masking,

⌘ Tracking problem seen on unprocessed image

⌘ Ran Meade *Smart* procedure twice to improve polar alignment prior to taking image and processing



# Saturn

05 November 2000 00:30UT, Meade positive projection with 26mm eyepiece,  
min magnification, 0.01s exposure

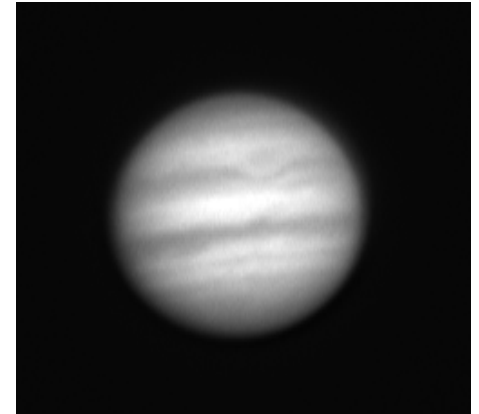
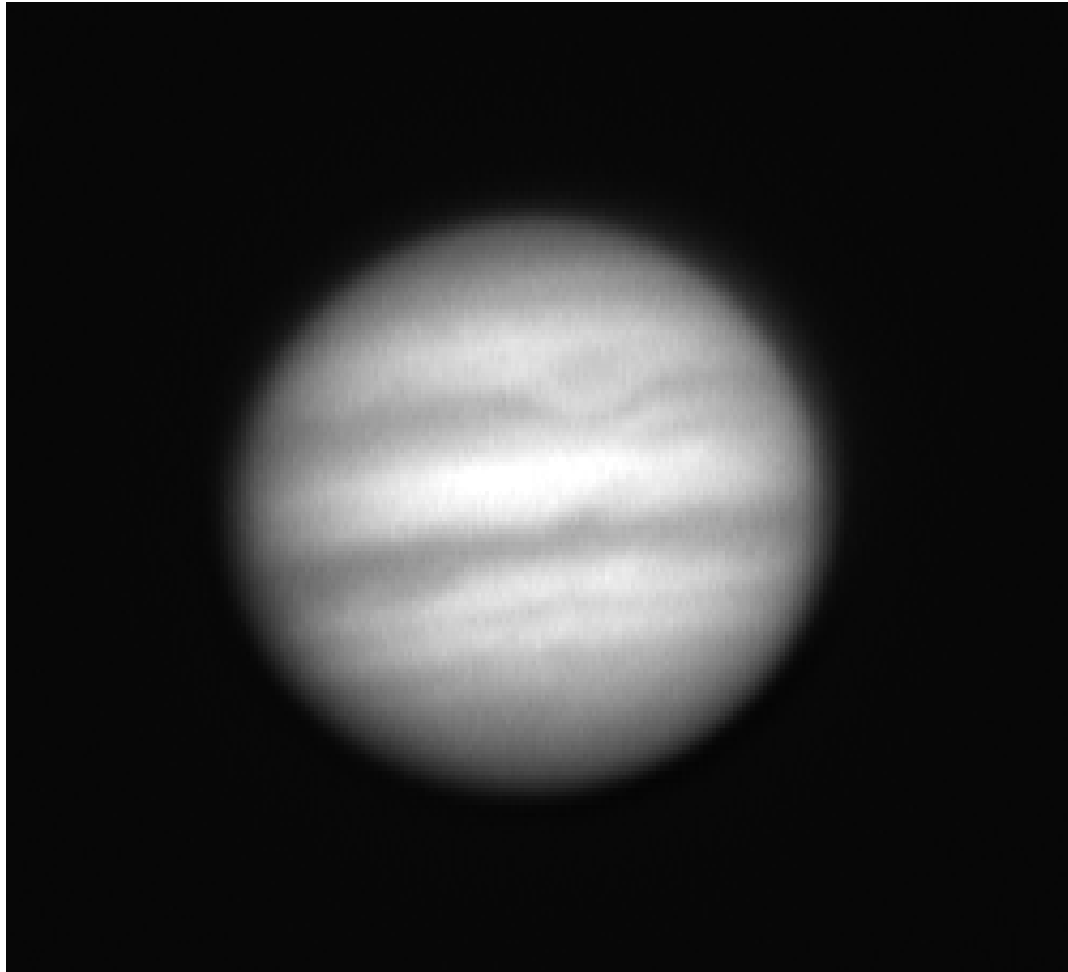
---





# Jupiter

05.11.00, Meade positive projection with 26mm eyepiece, max mag, 0.01s exposure, Contrast stretch and unsharp mask



# Part 3 - Conclusions



Megapixels not critical

Good quality zoom lens (vignetting)

Macro mode? Autofocus?

Manual control (Ap, Sh, Foc, ASA)

Long exposure e.g. 60 sec/Bulb

Integral dark frame subtraction

Self-timer or remote control (vibrations)

Tripod adapter

# Part 4 - Future Project Ideas...



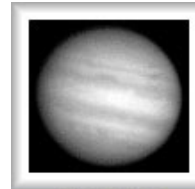
# Camera Adapter



# WebCam Astrophotography



QUICKCAM Astrophotography



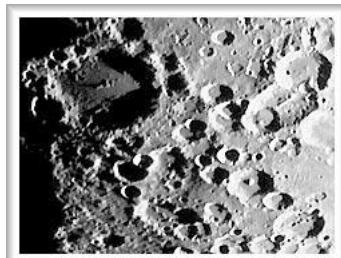
JUPITER



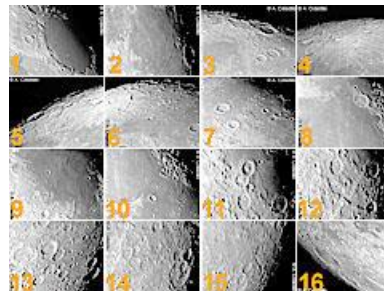
MARS



SATURN



MOON



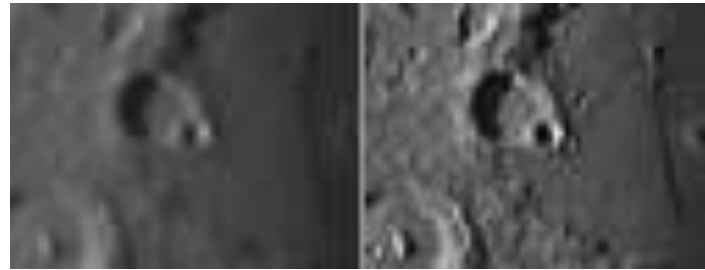


# AstroStack Software



- ⌘ Video imaging applications
- ⌘ Loads Windows AVI videos and BMP bitmaps. Saves result as 24 bit bitmap.
- ⌘ Align pictures manually or automatically
- ⌘ Apply unsharp mask, deconvolution (van Cittert and Lucy-Richardson routines), and convolution (edge detection, soften , sharpen) routines
- ⌘ Histogram functions: Bias and Gain, Lookup tables, CLAHE (Contrast Limited Adaptive Histogram Enhancement)
- ⌘ 133 MHz, 16 Mb minimum; 300 MHz, 32 Mb or better recommended

# Astrostack



# Discussion



⌘ Questions...?

⌘ Feedback...?

⌘ Ideas...?

⌘ Further practical sessions...?

⌘ Future Talk Suggestions

- Advanced film processing techniques
- Electronic image processing using the PC

# Unsharp Masking

---



Before



After