



Webcam & LPI Imaging



David Haworth
<http://www.stargazing.net/david>
Copyright 2004



Philips 740 ToUcam & Meade LPI

Orion 80mm Refractor 400mm Focal Length



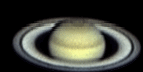
ToUcam



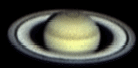
Meade LPI



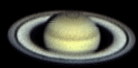
Agenda



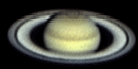
It is all about stacking



Camera Comparisons



Philips PCVC740K ToUcam



Meade Lunar Planetary Imager (LPI)

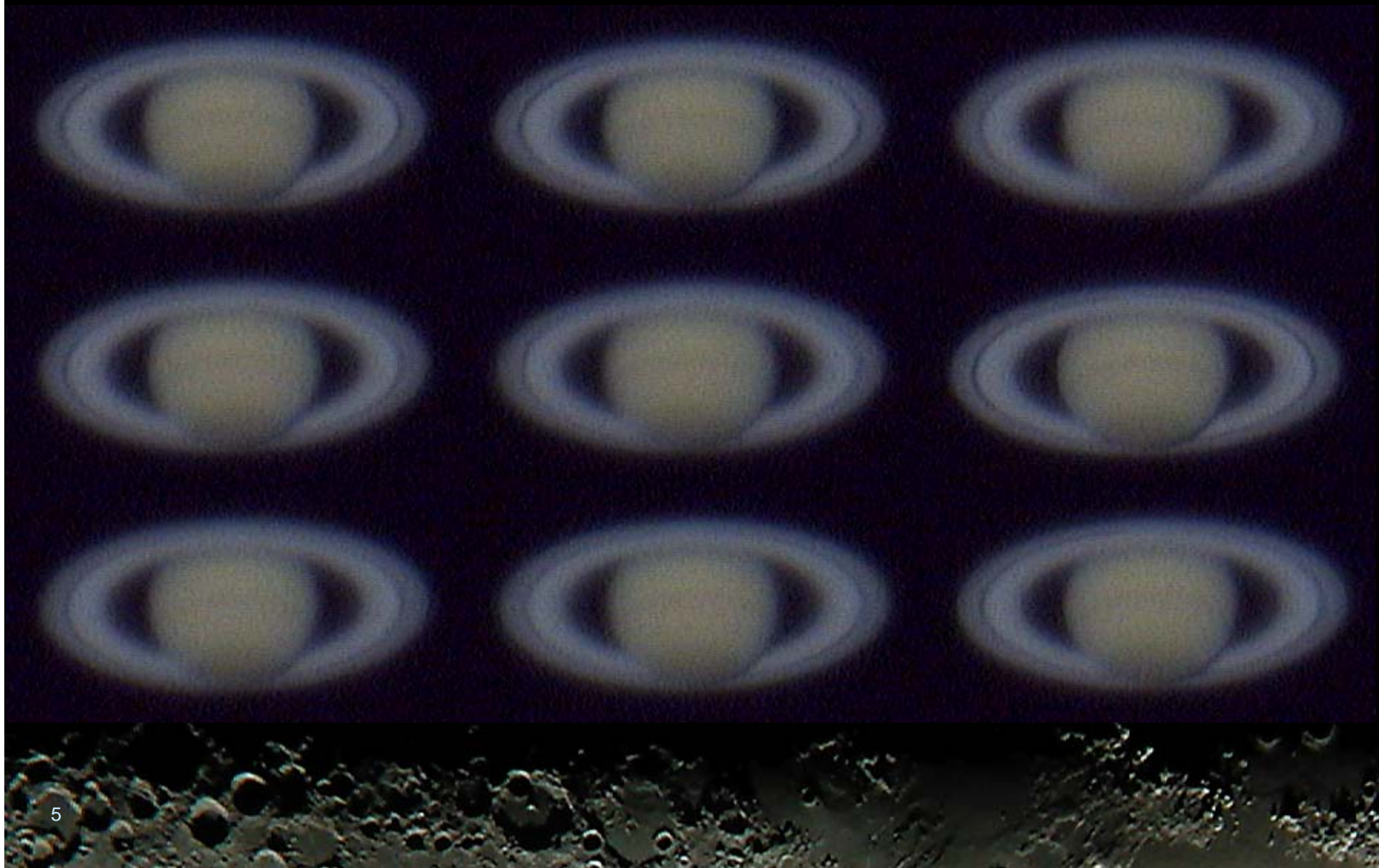
Webcam AVI Movie

Saturn ToUcam 740



First 9 Images of 1400 Images

ToUcam 740



1024 Images Stacked Out of 1400

Saturn ToUcam 740



Astroimaging Cameras Comparisons



35mm Film



ST-237 CCD



D70 Digital SLR



990 Digicam



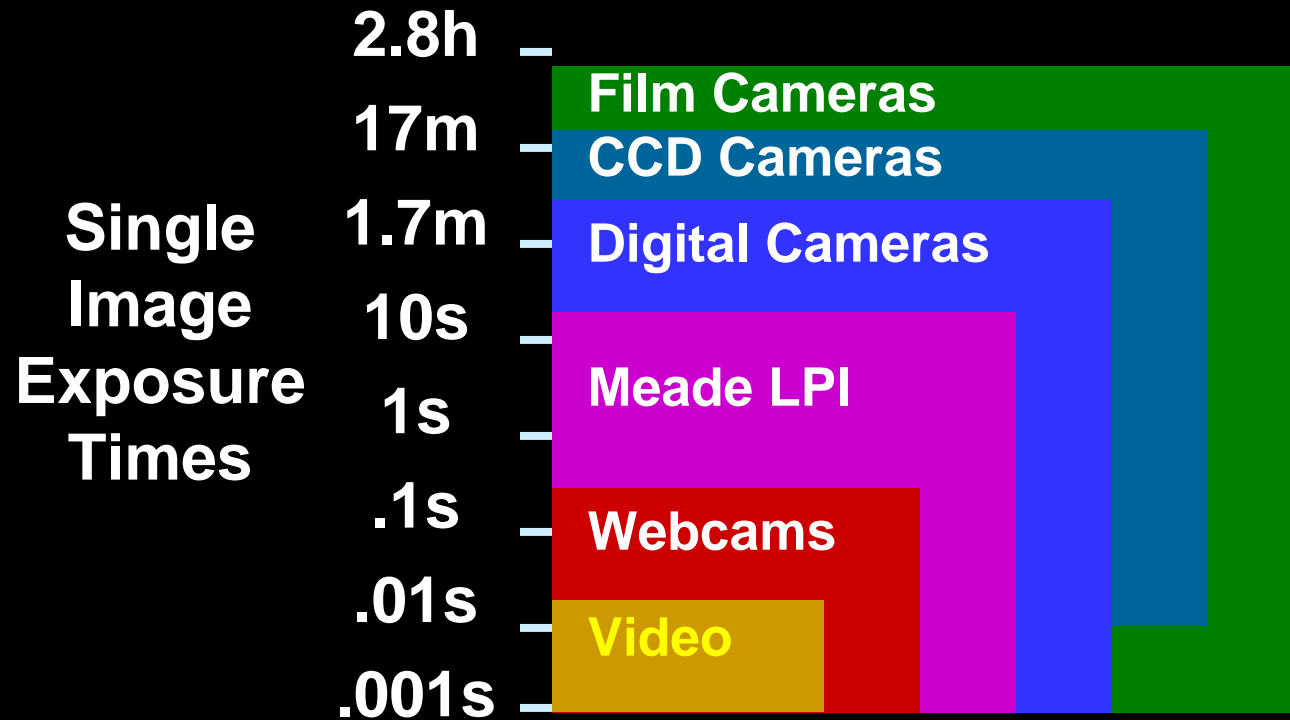
740 Webcams



Meade LPI

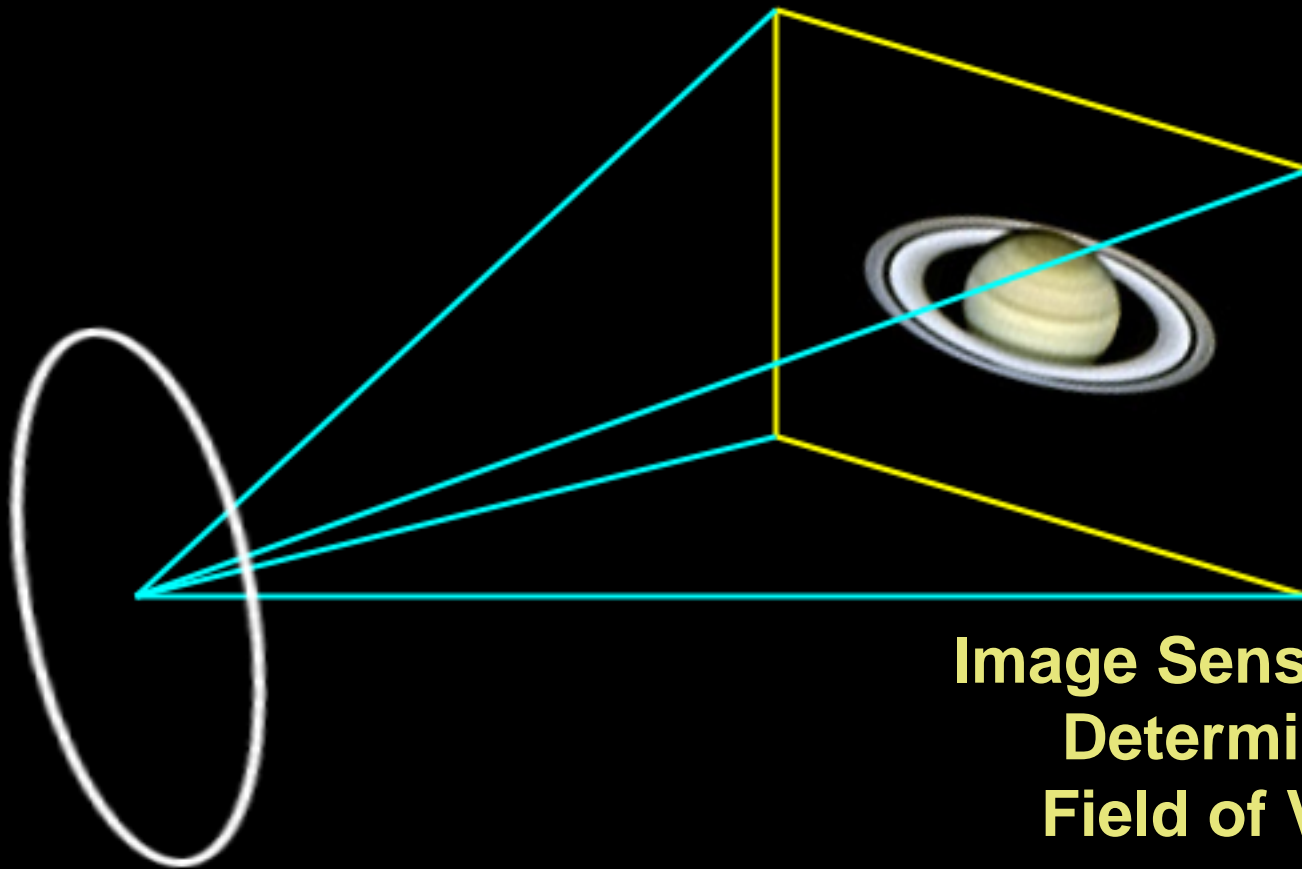
Camera Exposure Times

Video Cameras



Field of View (FOV)

Focal Length Determines Image Size at Focal Plane

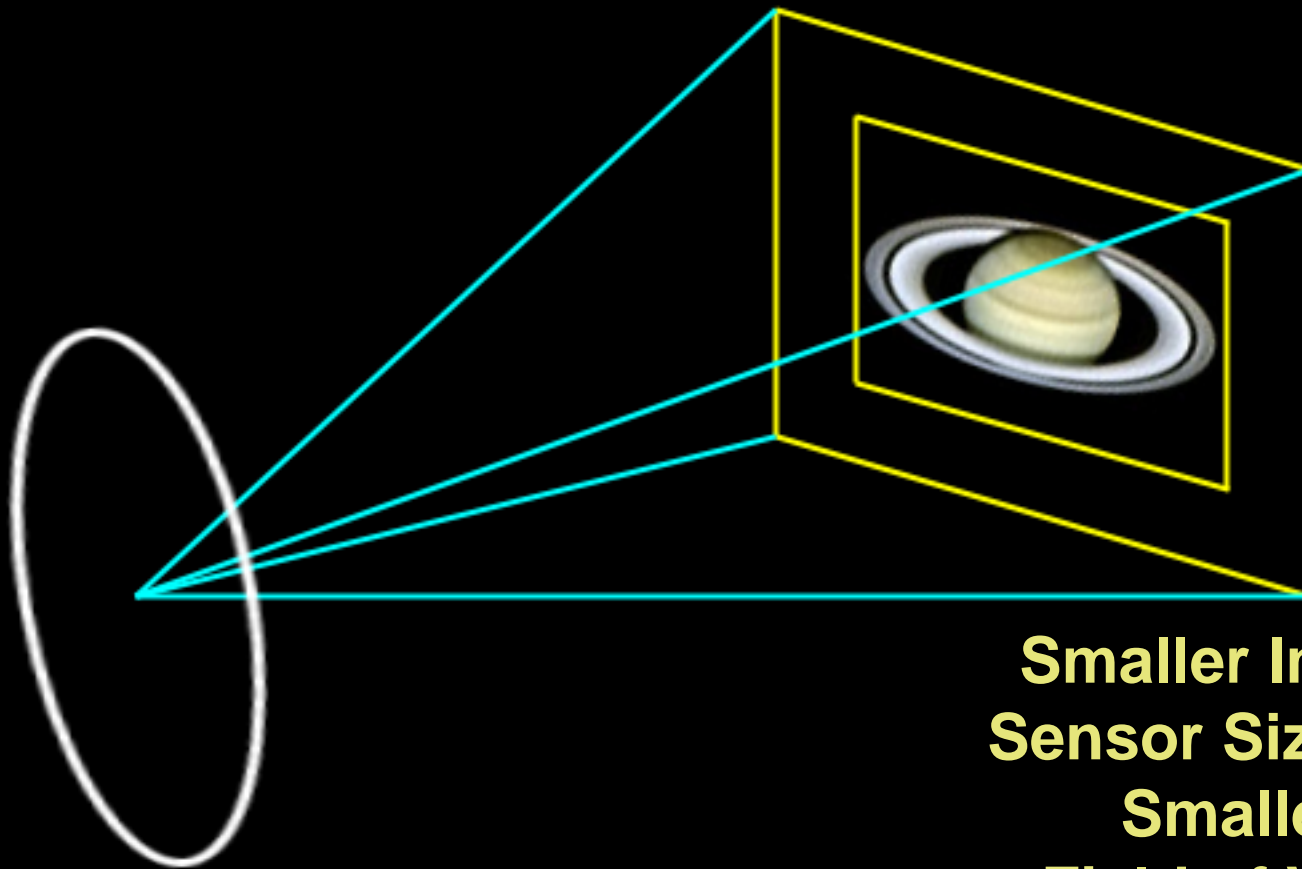


Telescope Lens

**Image Sensor Size
Determines
Field of View**

Field of View (FOV)

Focal Length Determines Image Size at Focal Plane



Telescope Lens

**Smaller Image
Sensor Size Has
Smaller
Field of View**

Cameras FOV Comparisons

Using Orion 80mm Refractor 400mm Focal Length



35mm Film



ST-237 CCD



D70 Digital SLR



990 Digicam



740 Webcams



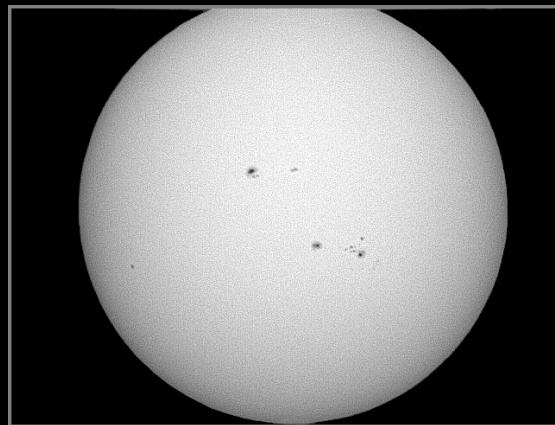
Meade LPI

Cameras FOV Comparisons

Using Orion 80mm Refractor 400mm Focal Length



35mm Film



ST-237 CCD



D70 Digital SLR



990 Digicam



740 Webcam



Meade LPI

Nikon D70 FOV

Using Orion 80mm Refractor 400mm Focal Length



Digital SLR
640 x 480
crop

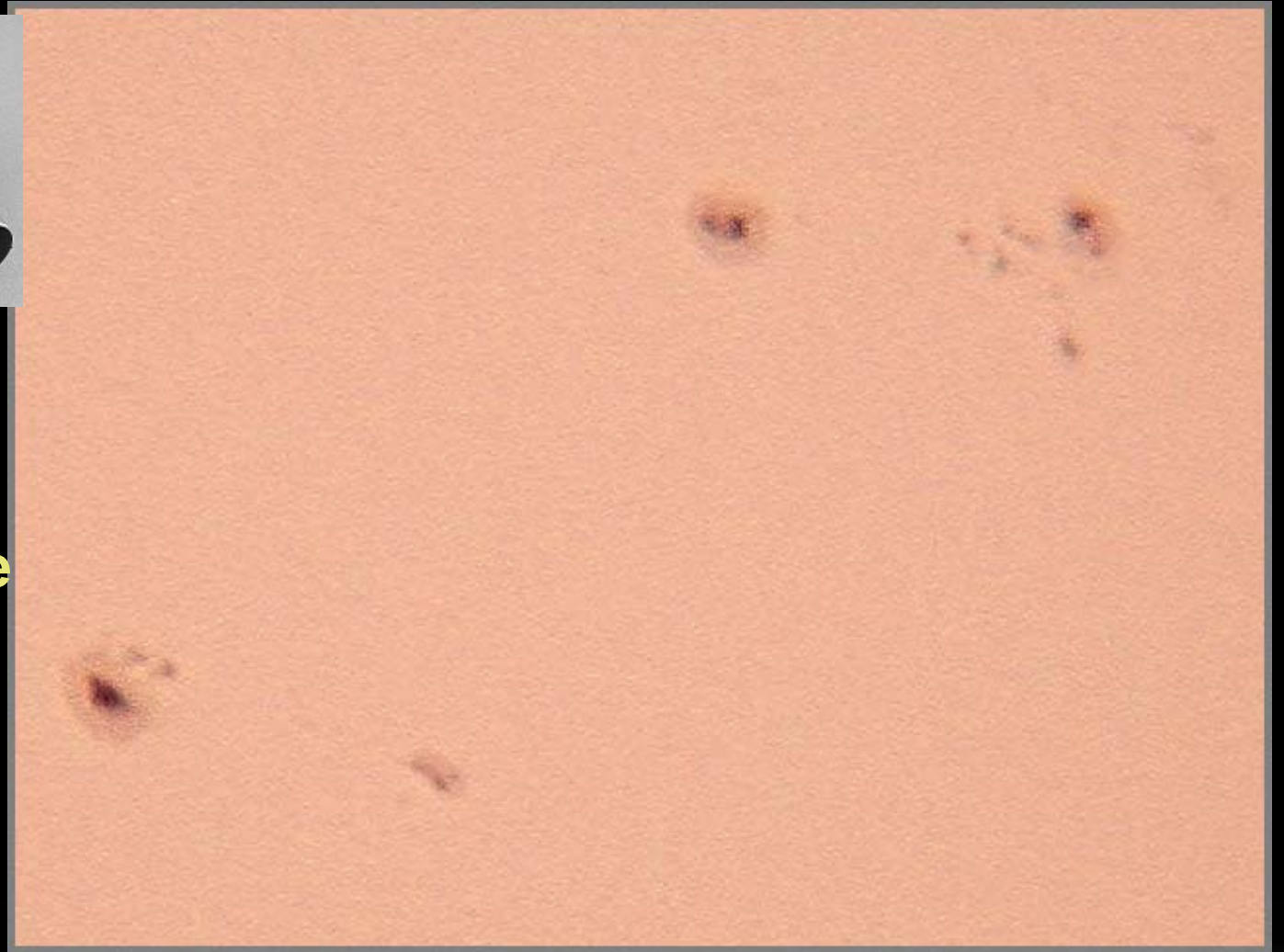


Nikon 990 FOV

Using Orion 80mm Refractor 400mm Focal Length



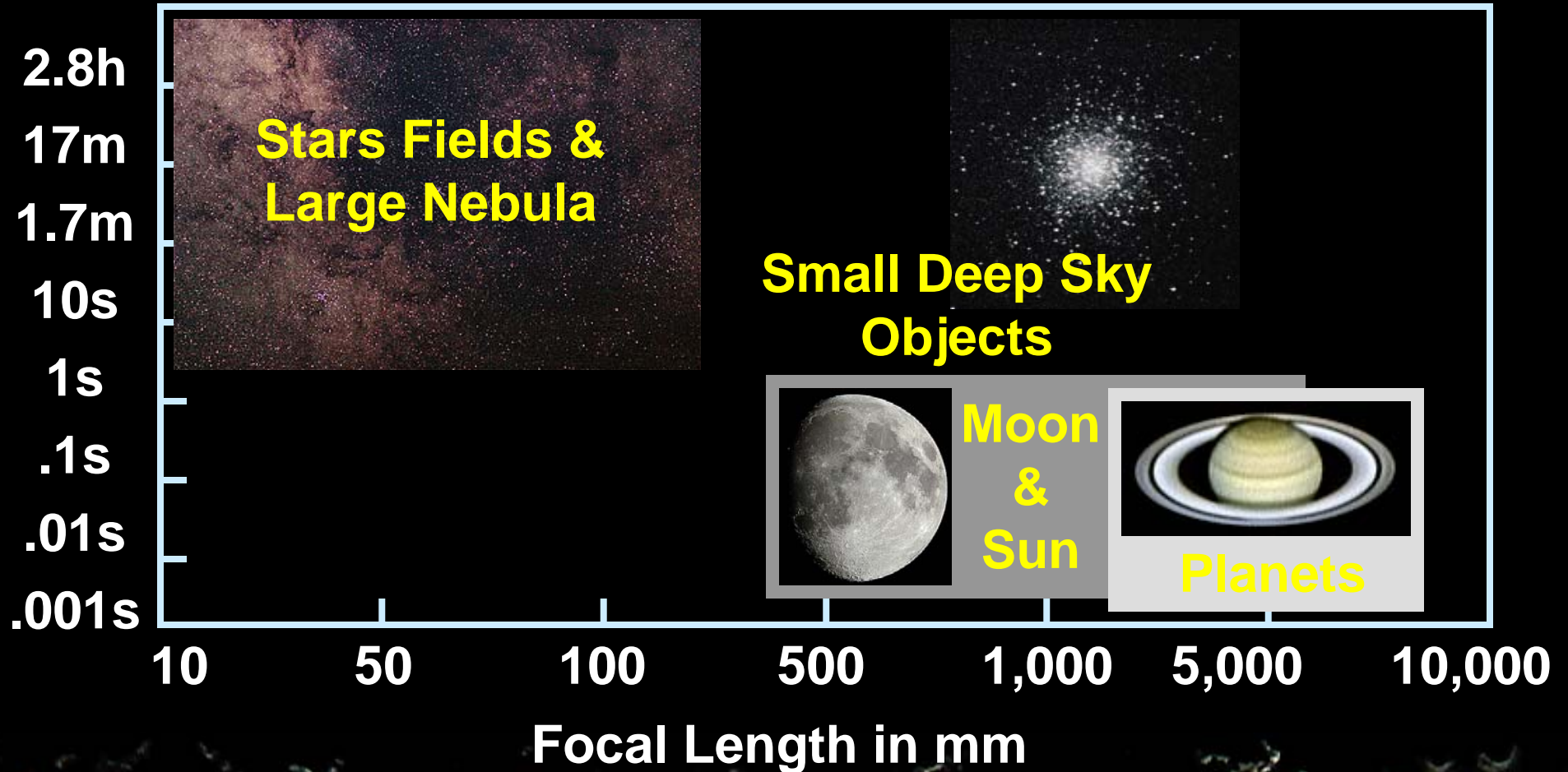
**Digicams
Nikon 990
afocal with
14mm eyepiece
640 x 480 crop**



Exposure vs. Focal Length

Focal Ratio is third parameter

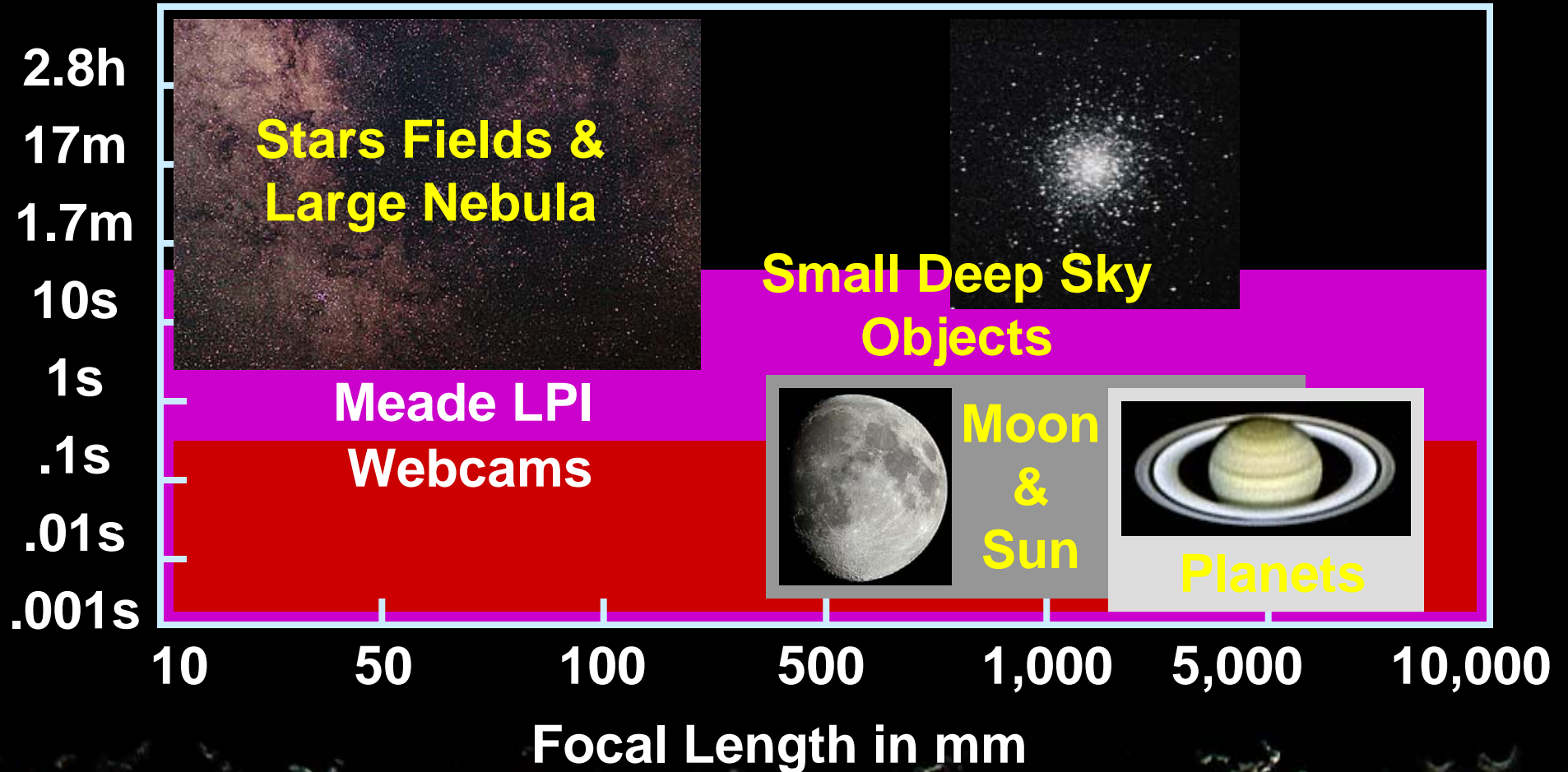
Exposure



Exposure vs. Focal Length

Short Exposure Cameras

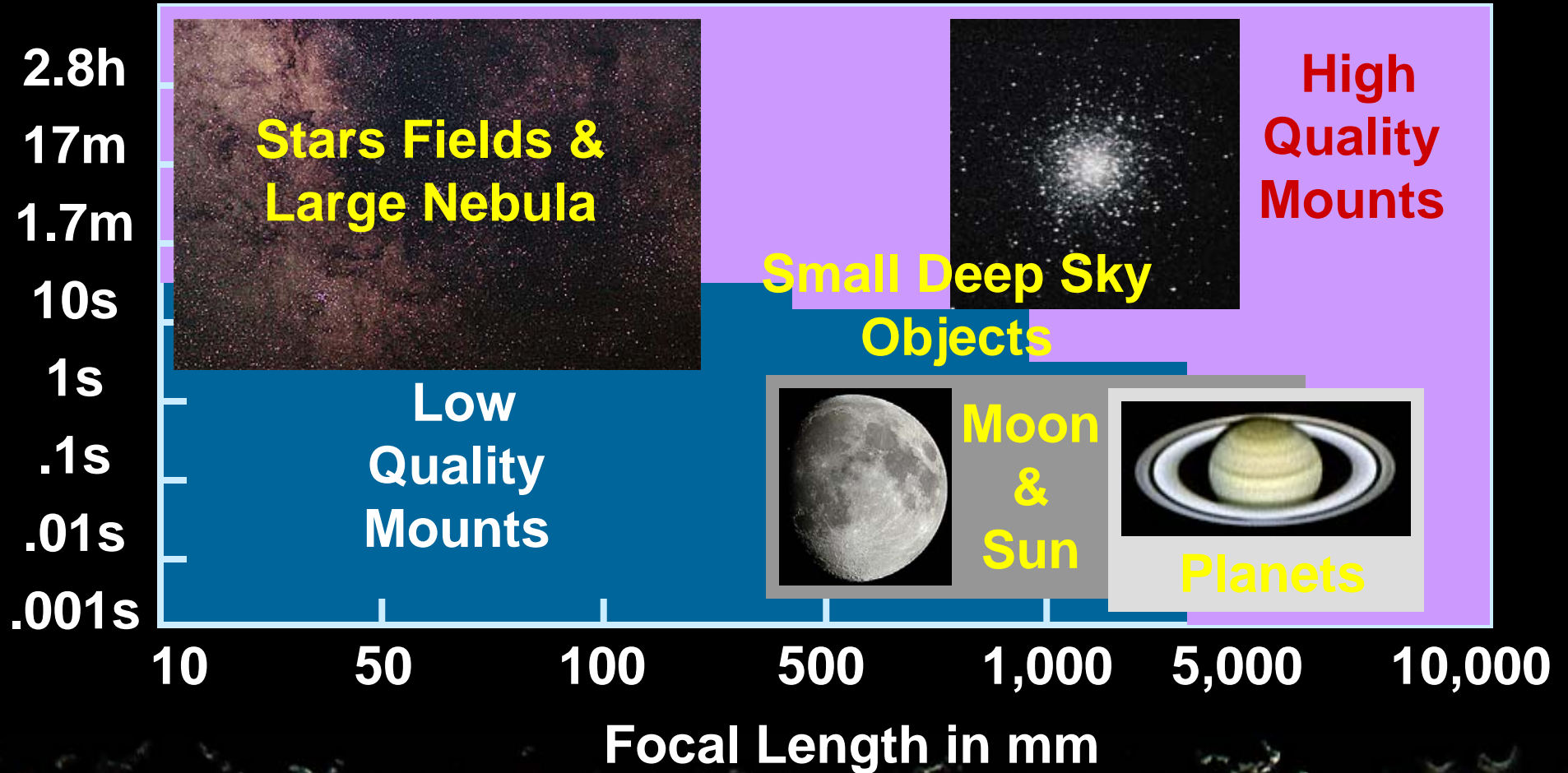
Exposure



Exposure vs. Focal Length

Mounts

Exposure



ToUcam Imaging

🪐 Advantages

🪐 Disadvantages

🪐 Hardware

🪐 Software



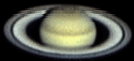

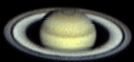
ToUcam PRO Advantages

Philips PCVC740K ToUcam PRO

- 🪐 Good for bright objects
 - 🪐 Moon, Sun & Planets
- 🪐 Acquire many images very quickly
- 🪐 Low cost if you have a laptop with USB

ToUcam PRO Advantages

Philips PCVC740K ToUcam PRO

-  No external power is needed
-  Smallest pixel size $5.6\mu\text{m}$
-  Small & light weight

ToUcam Imaging

☉ Advantages

☉ Disadvantages

☉ Hardware

☉ Software



ToUcam PRO Disadvantages

Philips PCVC740K ToUcam PRO

 Not good for deep sky objects

 Limited to short exposures

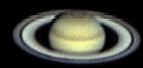
 Typical max 1/25 sec.

 Special max 1/5 sec. mode

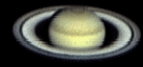
 640x480 size

ToUcam PRO Disadvantages

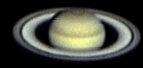
Philips PCVC740K ToUcam PRO



Typically images are noisy



AVI compression



Dropped frames

ToUcam PRO Disadvantages

Philips PCVC740K ToUcam PRO

- ☾ Light leaks through white plastic case when solar imaging
- ☾ Hard disk is filled quickly
 - ☾ 140 sec. = 620 MB AVI file

ToUcam Imaging

🌀 Advantages

🌀 Disadvantages

🌀 Hardware

🌀 Software



Orion Atlas 10 Reflector on G-11

254 mm aperture, f/4.7 focal ratio, 1200 mm focal length



Cooling the Mirror Before Imaging



Focusing

Diffraction Focusing



Beta Lyra Double Star 46"

Diffraction Focusing



Finding the Planet

Cross Hairs Eyepiece



Solar Imaging



ToUcam Imaging

🌀 Advantages

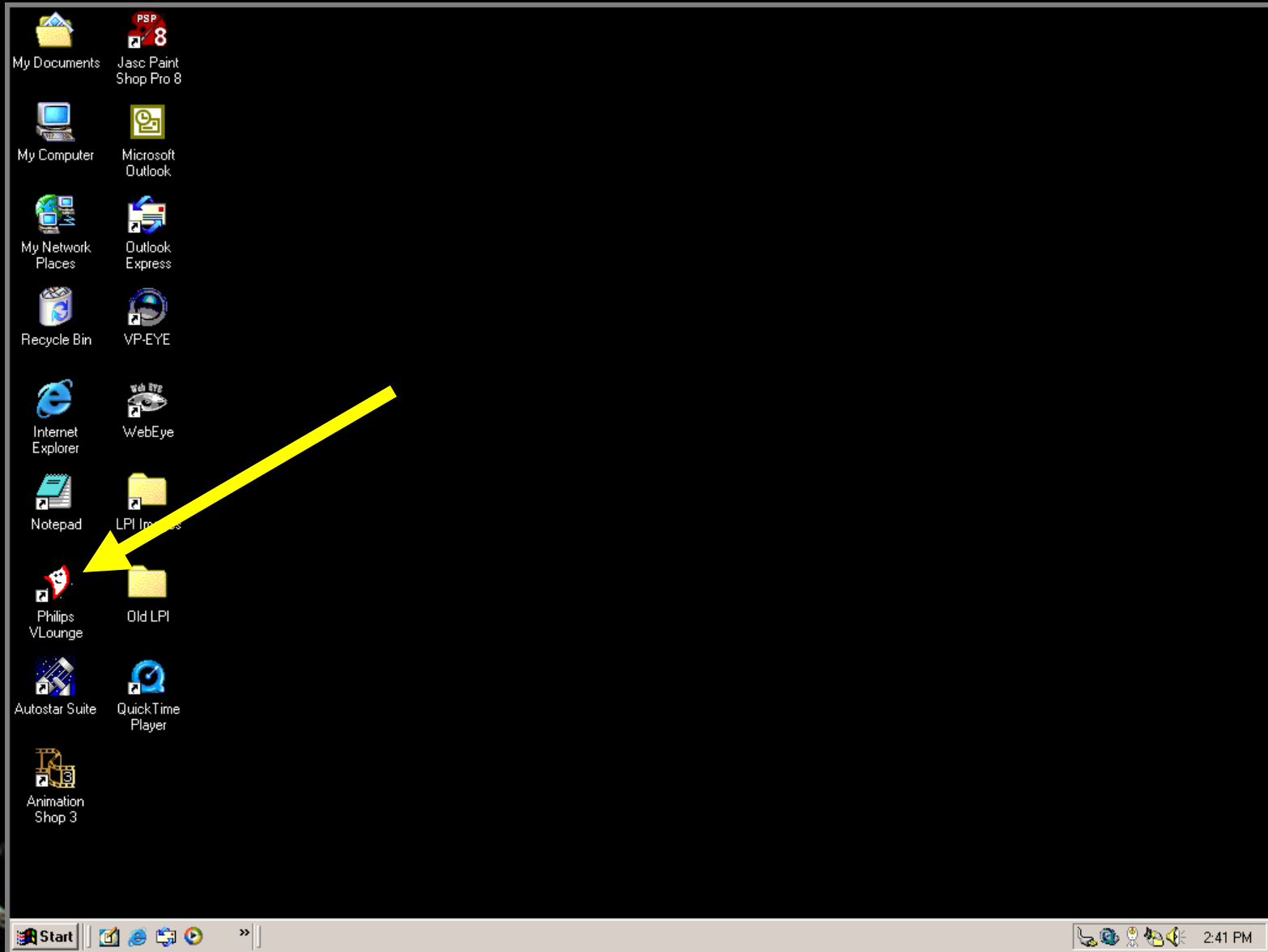
🌀 Disadvantages

🌀 Hardware

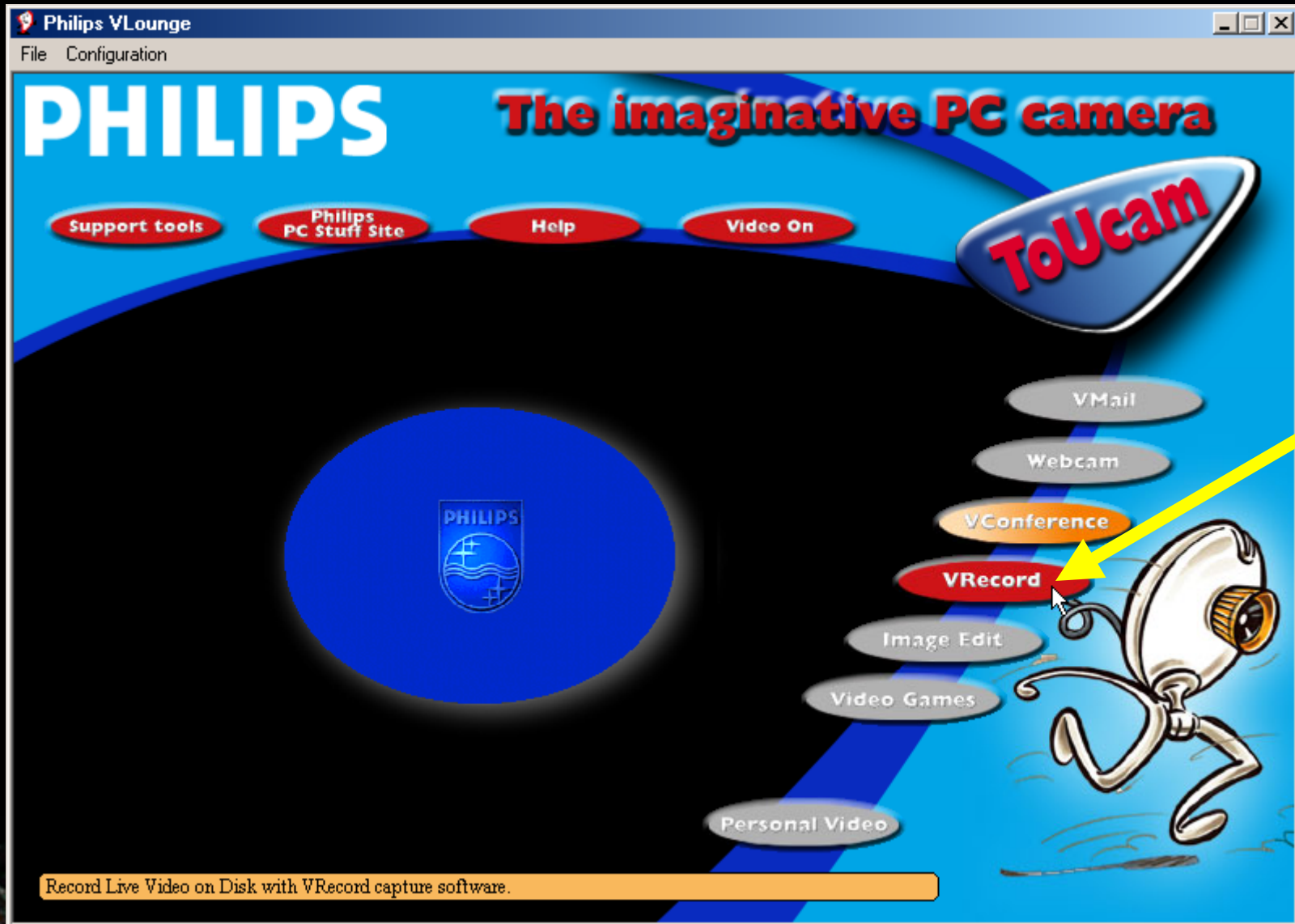
🌀 Software



ToUcam VLounge



ToUcam VLounge



Philips VLounge

File Configuration

PHILIPS

The imaginative PC camera

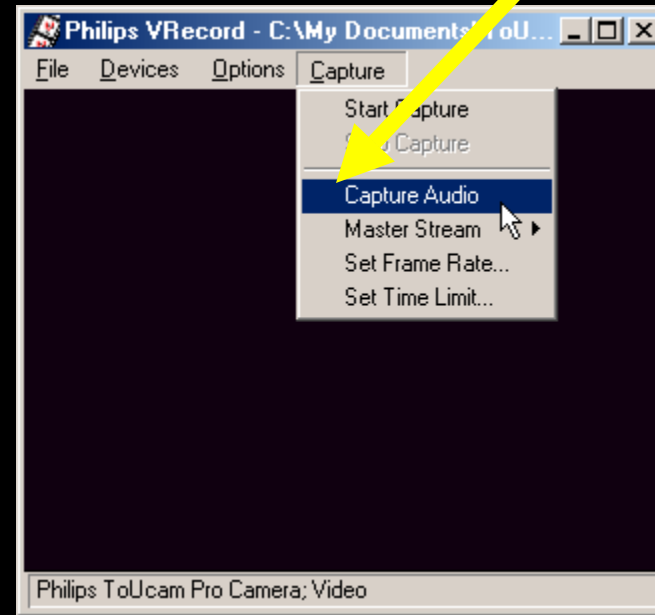
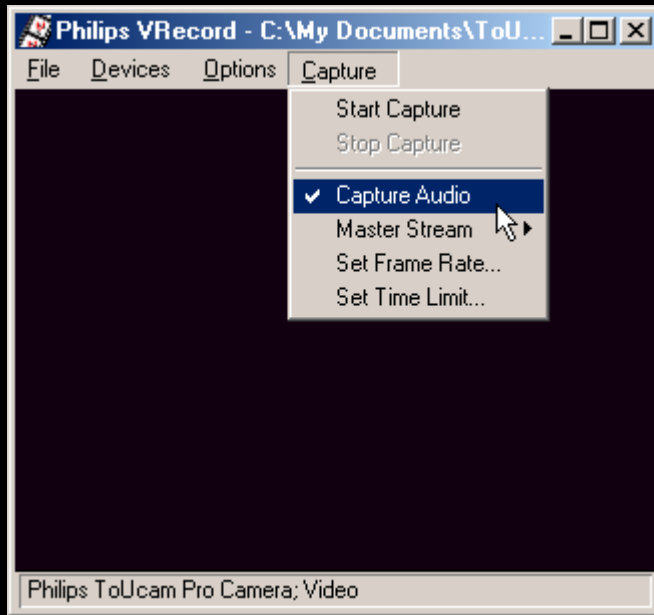
support tools Philips PC Stuff Site Help Video On

ToUcam

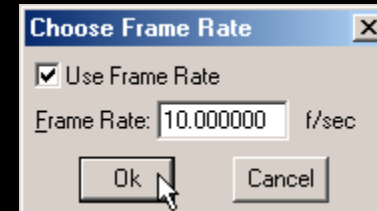
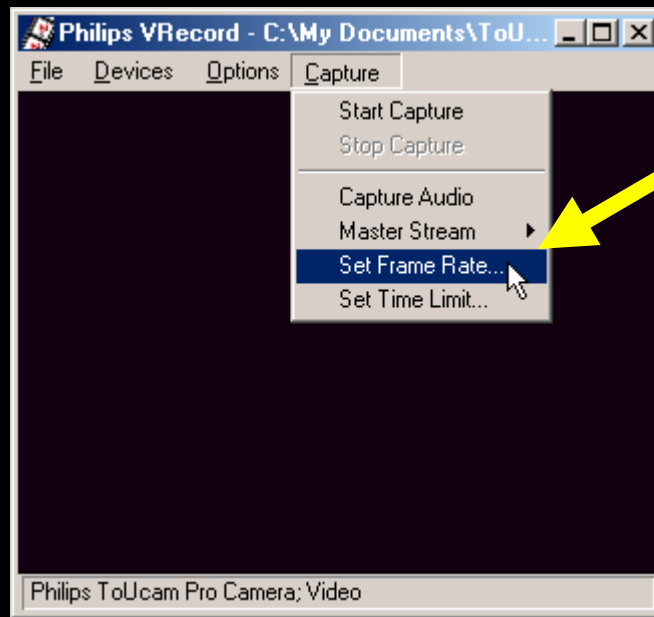
- VMail
- Webcam
- VConference
- VRecord**
- Image Edit
- Video Games
- Personal Video

Record Live Video on Disk with VRecord capture software.

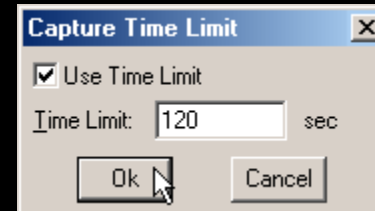
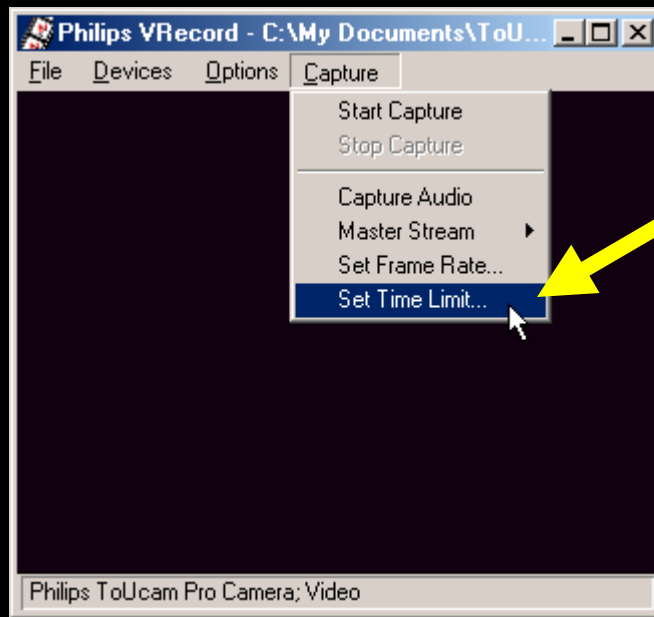
ToUcam VRecord



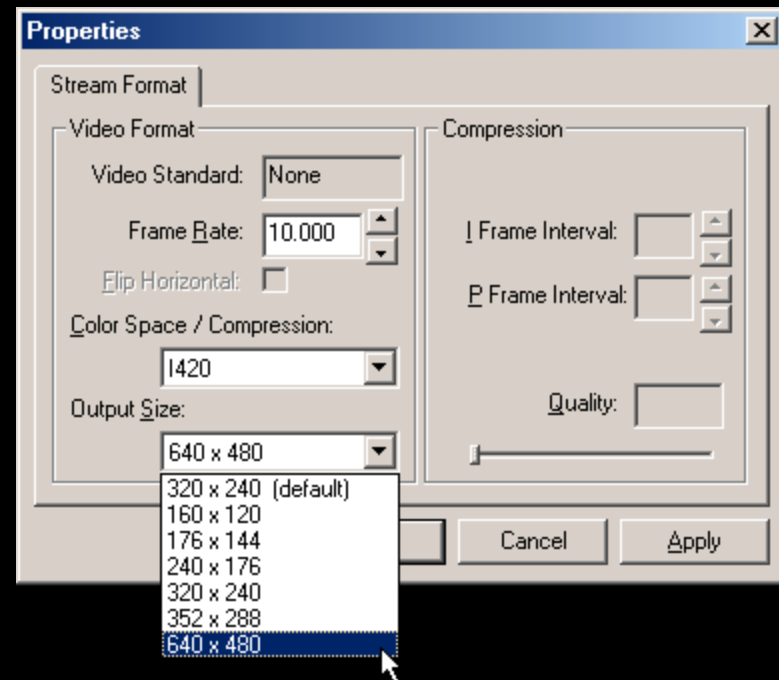
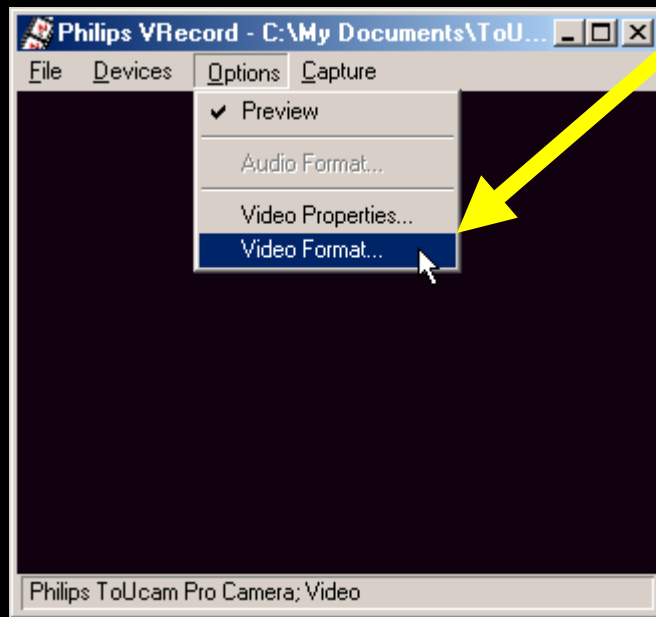
ToUcam VRecord



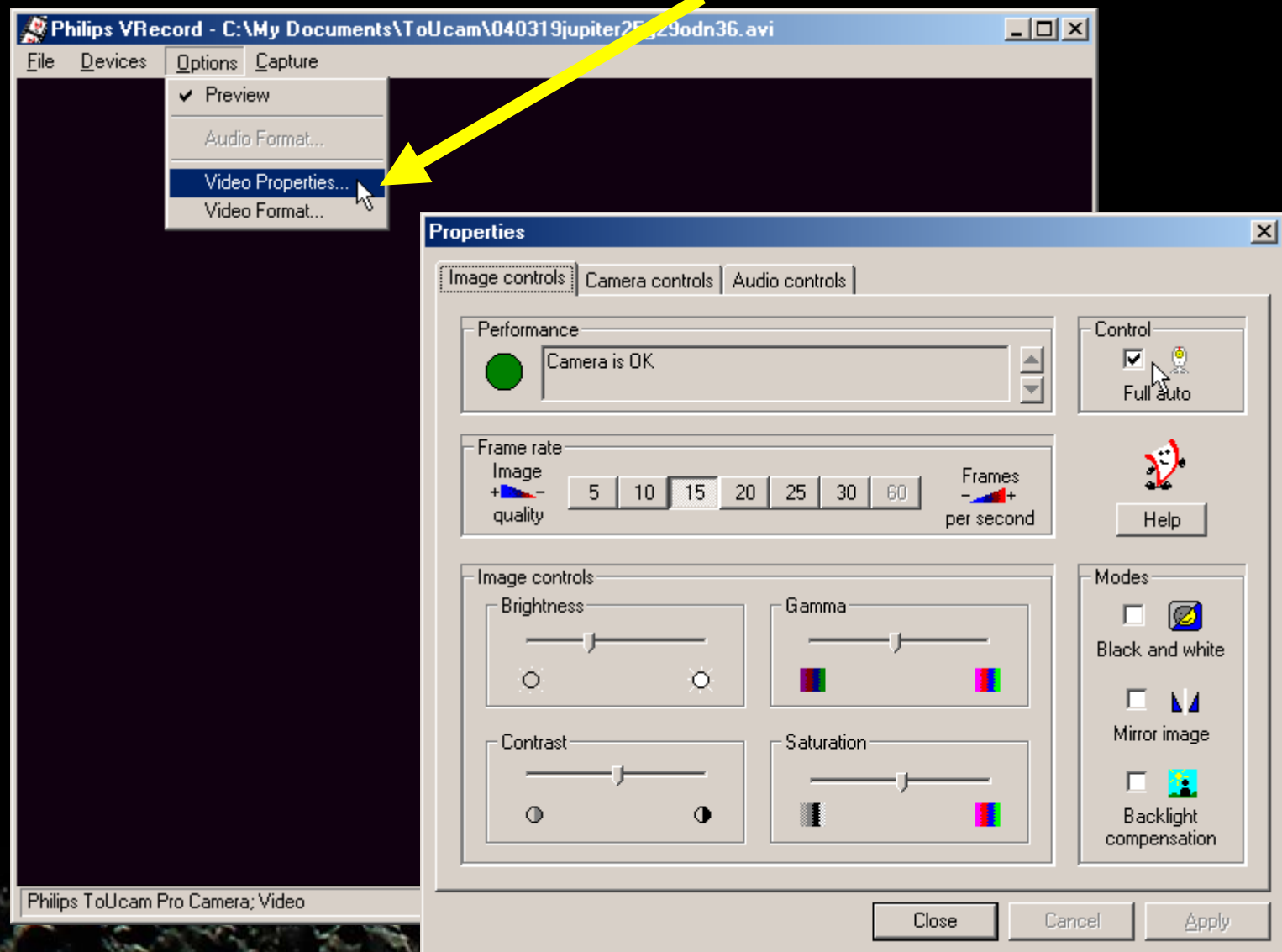
ToUcam VRecord



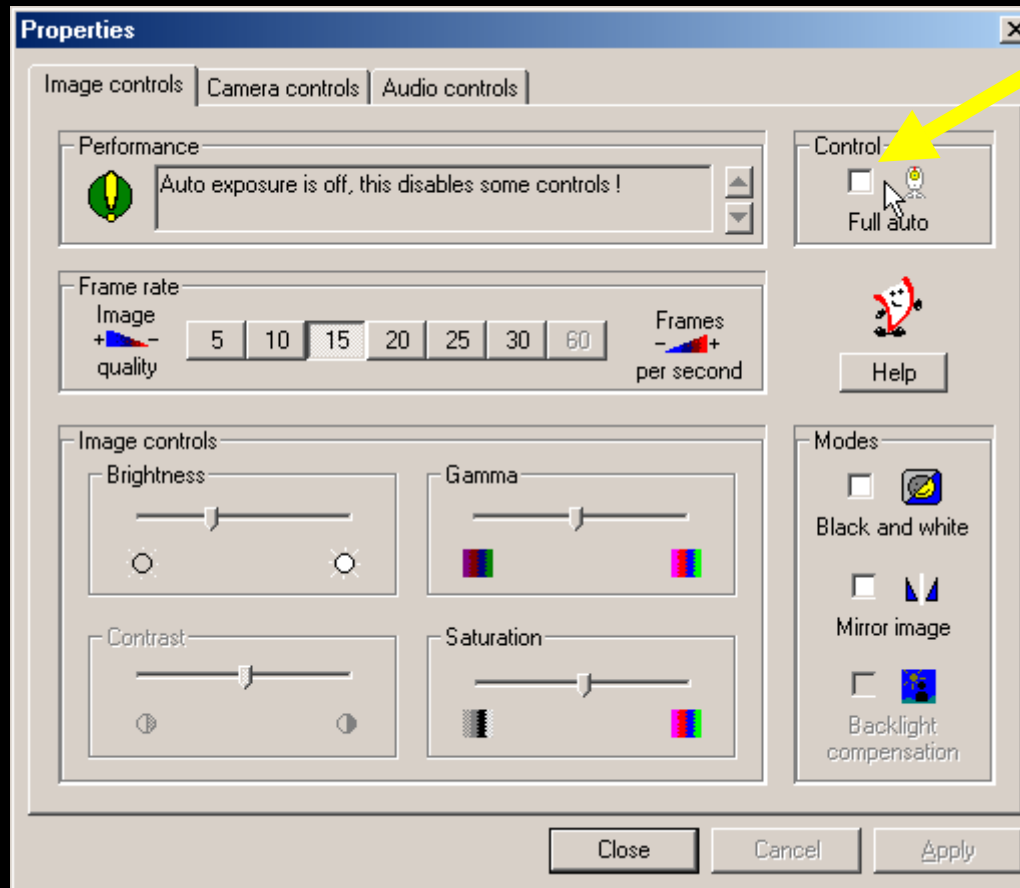
ToUcam VRecord



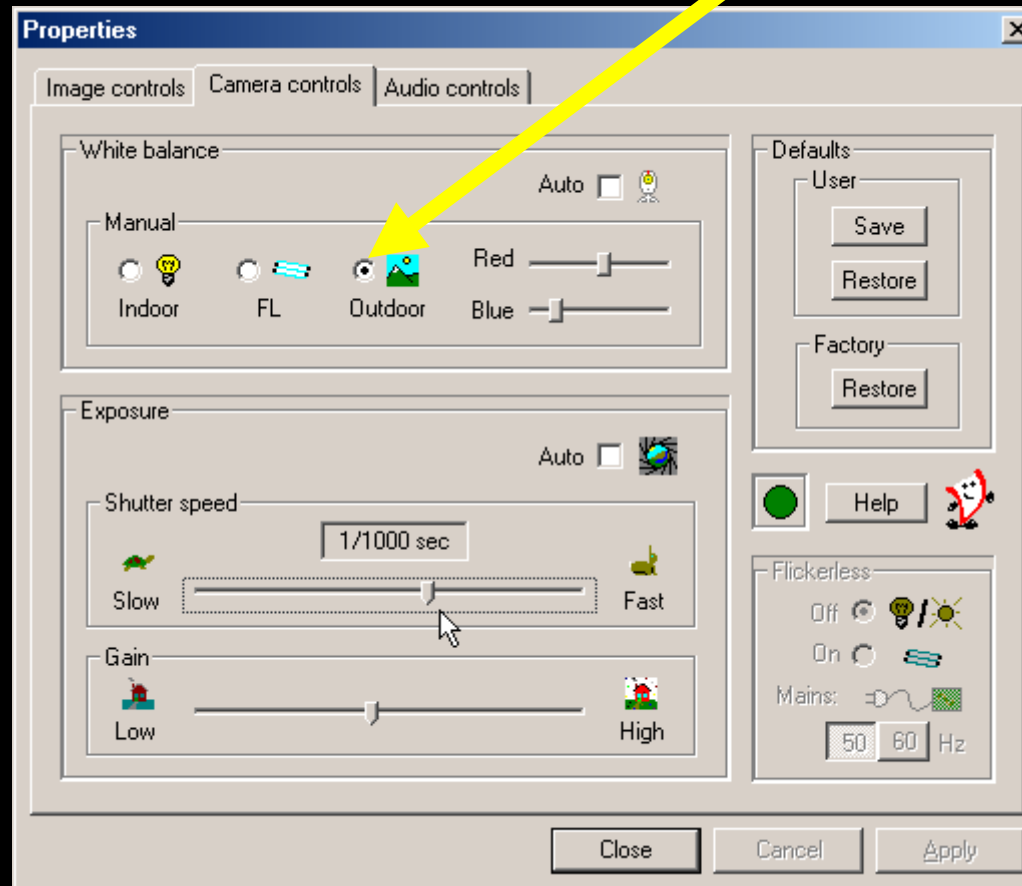
ToUcam VRecord



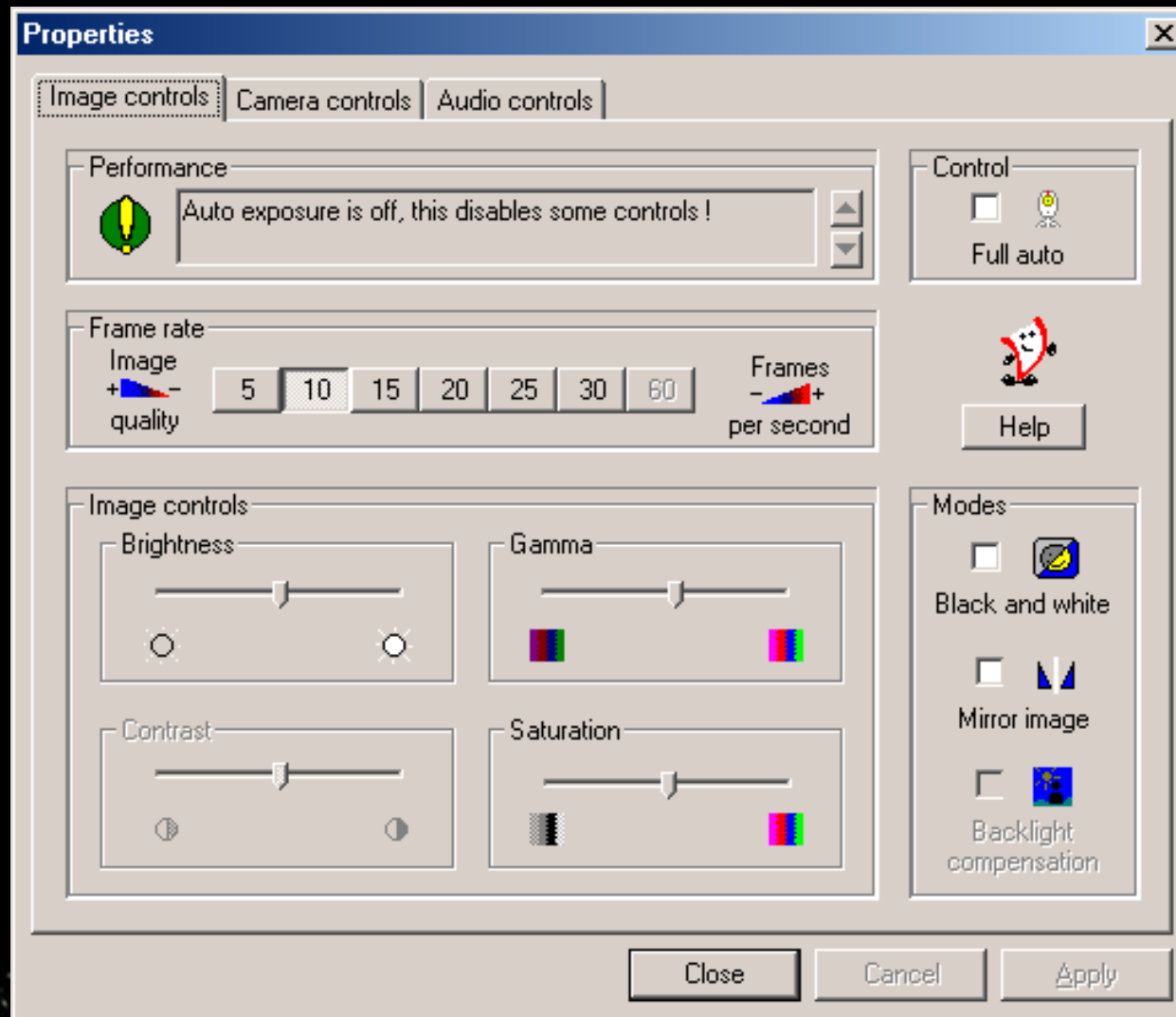
ToUcam VRecord



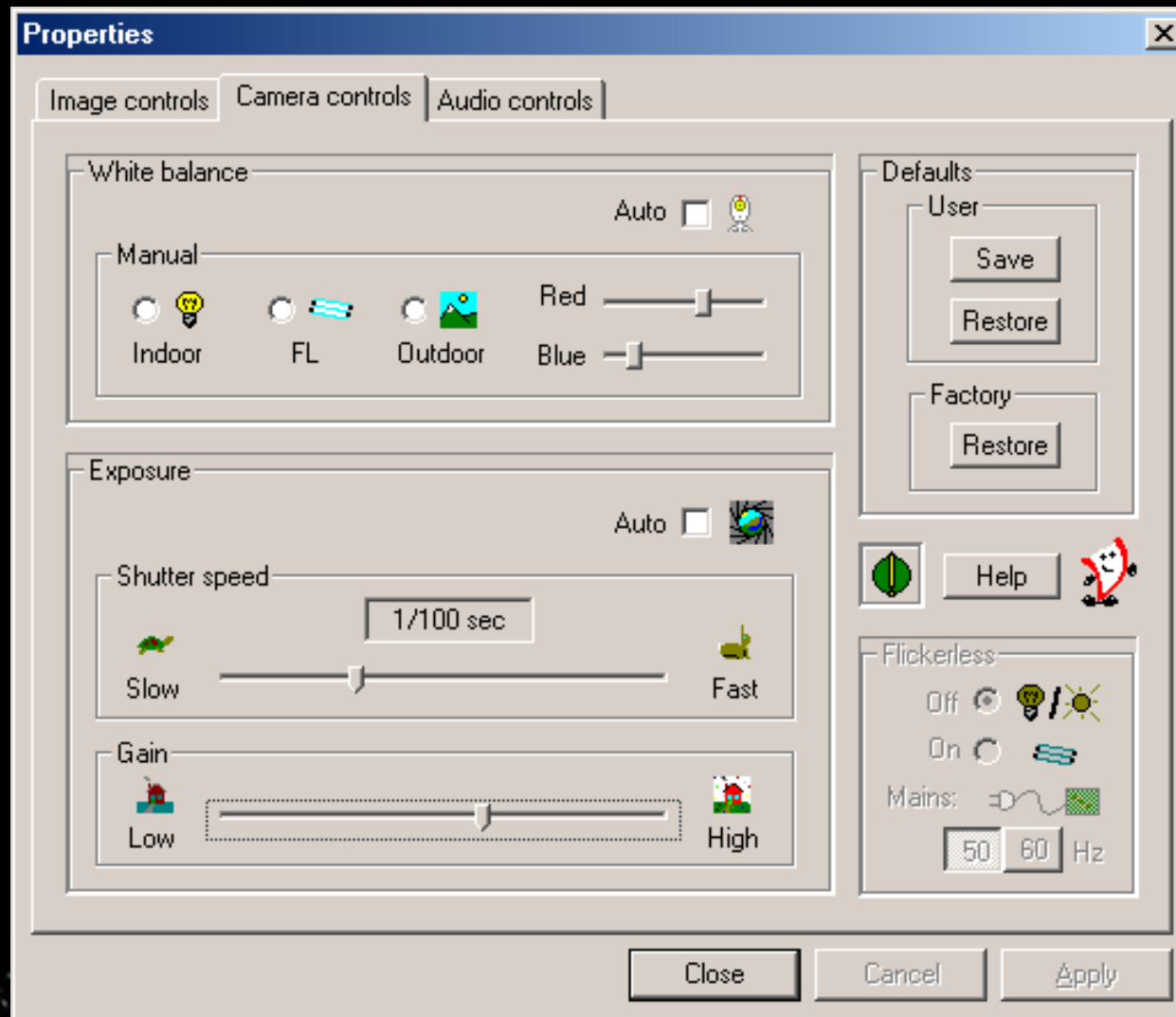
ToUcam VRecord



ToUcam VRecord



ToUcam VRecord



Saturn 1/19/2004

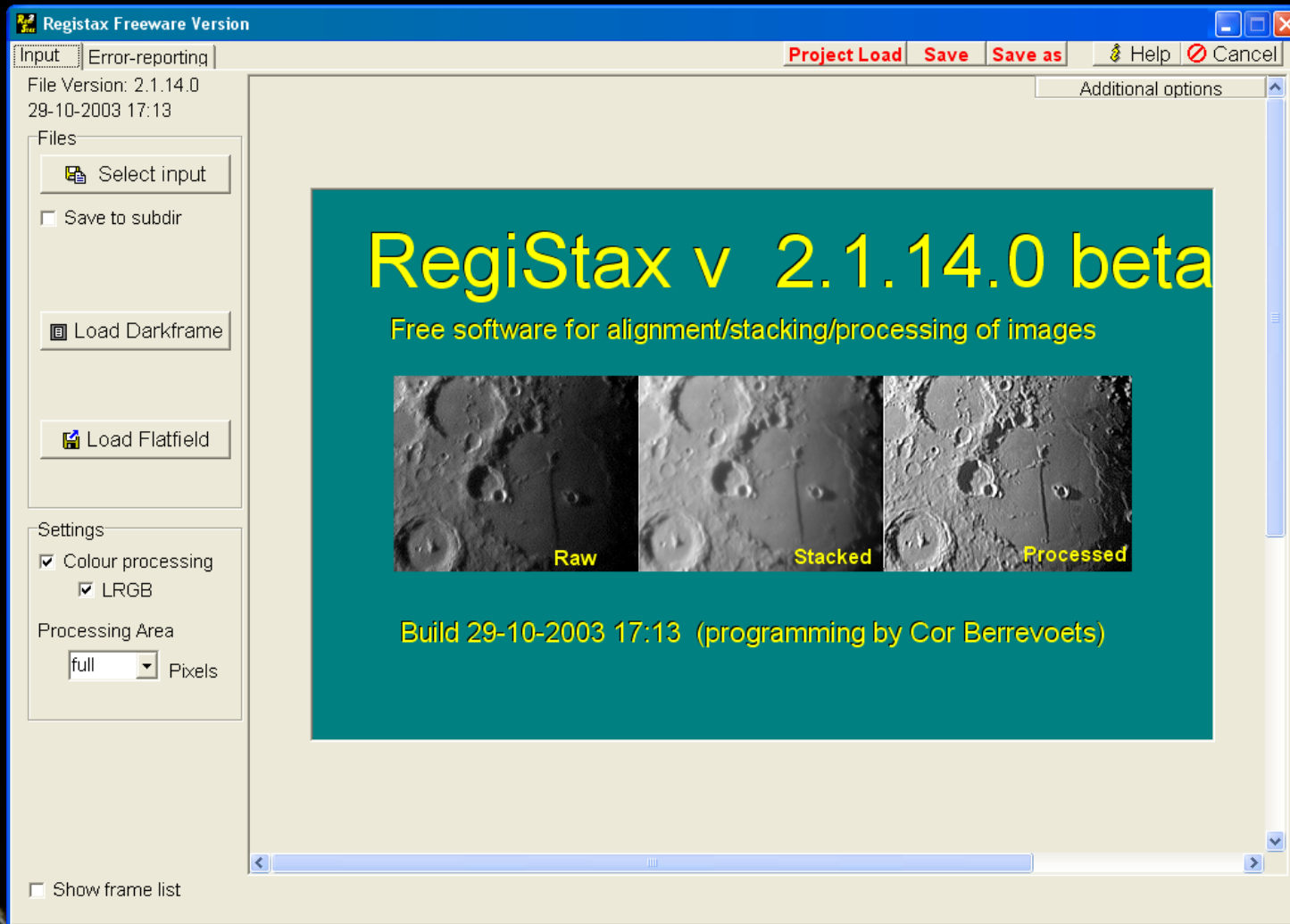
Orion Atlas 10 Reflector on G-11

Tele Vue 5x Powermate (effective $>f/23.5$, >6000 mm)



Cor Berrevoets RegiStax

<http://aberrator.astronomy.net/registax/>



Saturn 1/19/2004

RegiStax: 1024 Images Stacked a 2x



Saturn 1/19/2004

RegiStax: 1024 Images Stacked a 2x
Wavelet, Gamma, Brightness Processed



Saturn 1/19/2004

RegiStax: 1024 Images Stacked a 2x

Wavelet, Gamma, Brightness Processed

Photoshop: Unmask Sharpen, Color Balance, Resize to 1x



Saturn 1/19/2004

RegiStax: 1024 Images Stacked a 2x

Wavelet, Gamma, Brightness Processed

Photoshop: Unmask Sharpen, Color Balance, Resize to 1x

Resize to 0.5x, Unmask Sharpen,



Orion Atlas 10 Reflector on G-11

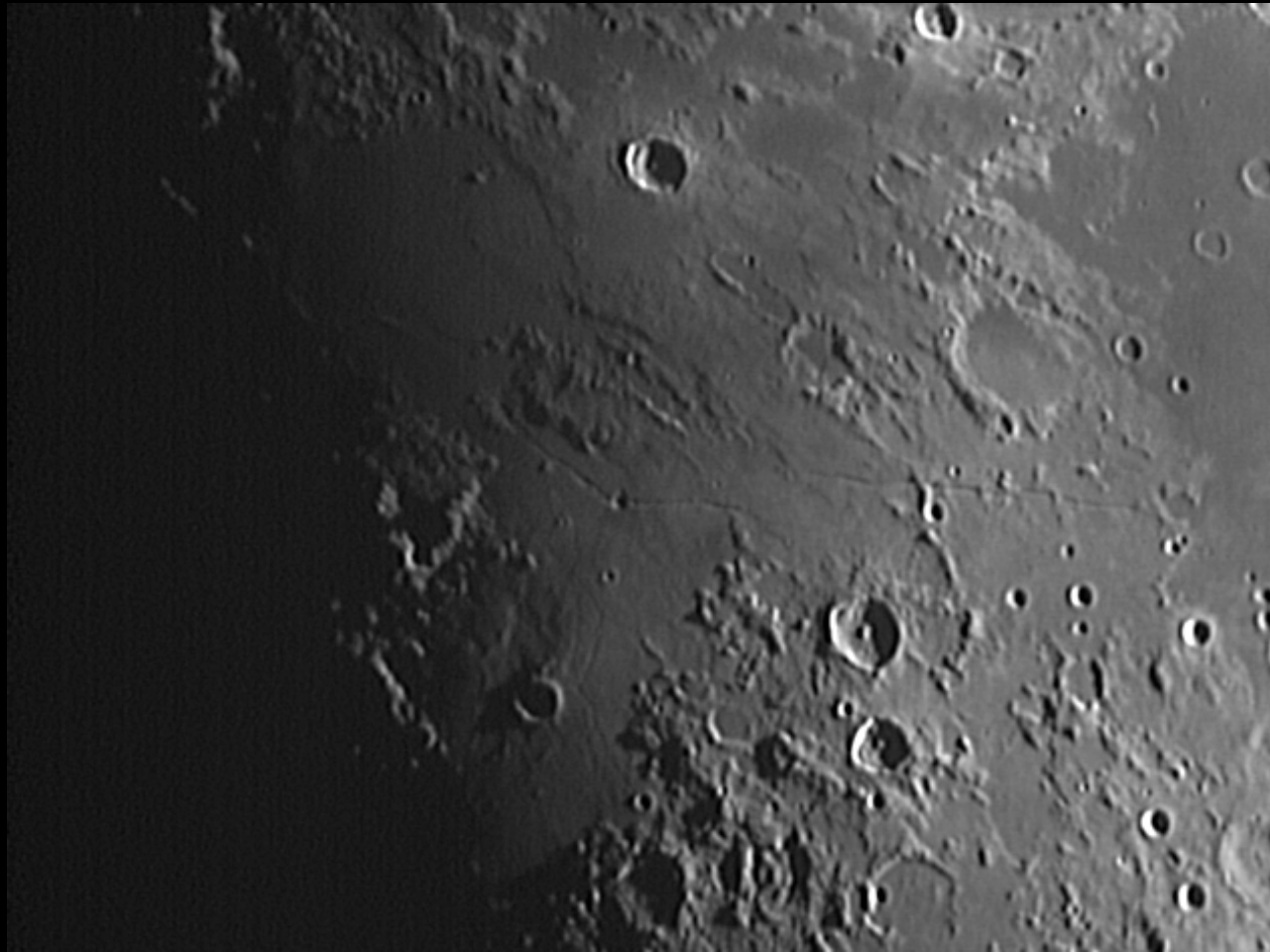
Tele Vue 5x Powermate (effective $>f/23.5$, >6000 mm)



Moon with Good Seeing



Moon ToUcam Image Processed



Sun ToUcam

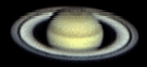
Using Orion 80mm Refractor 400mm Focal Length



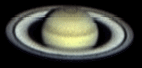
ToUcam
301 images
stacked



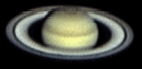
Meade Lunar Planetary Imager (LPI)



Advantages



Disadvantages



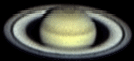


Software



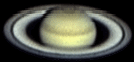


Meade LPI Advantages

- 🪐 Good for bright objects
 - 🪐 Moon, Sun & Planets
- 🪐 Real-time image processing
 - 🪐 Electronic eyepiece
 - 🪐 Selecting, stacking & sharpening

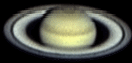
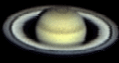
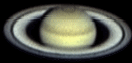
Meade LPI Advantages

-  Acquire many images quickly
-  Low cost if you have a laptop with USB
-  No external power is needed

Meade LPI Advantages

-  No compression
-  Small & light weight
-  Color balance is better than the 740 on Jupiter

Meade LPI Advantages

-  .001 to 16 seconds exposure
-  Some bright deep sky objects are possible
-  Save images in different formats

Meade Lunar Planetary Imager (LPI)

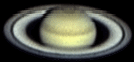
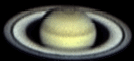
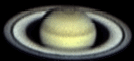
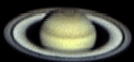
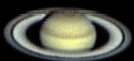
 Advantages

 Disadvantages

 Software



Meade LPI Disadvantages

-  Less sensitive to light than 740
-  No solar image mode
-  No color balance
-  Software crashes
-  640x480 size

Meade Lunar Planetary Imager (LPI)

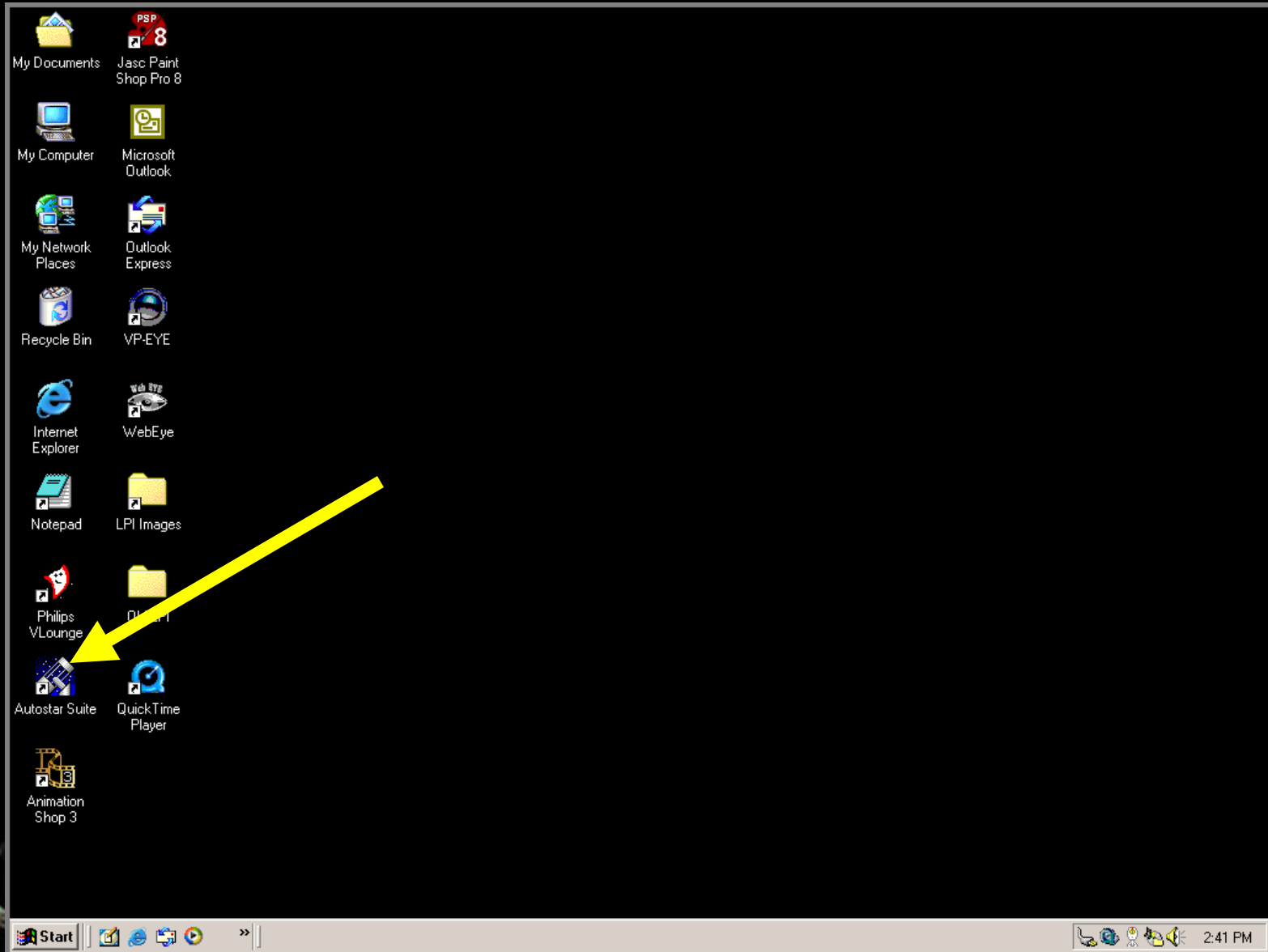
 Advantages

 Disadvantages

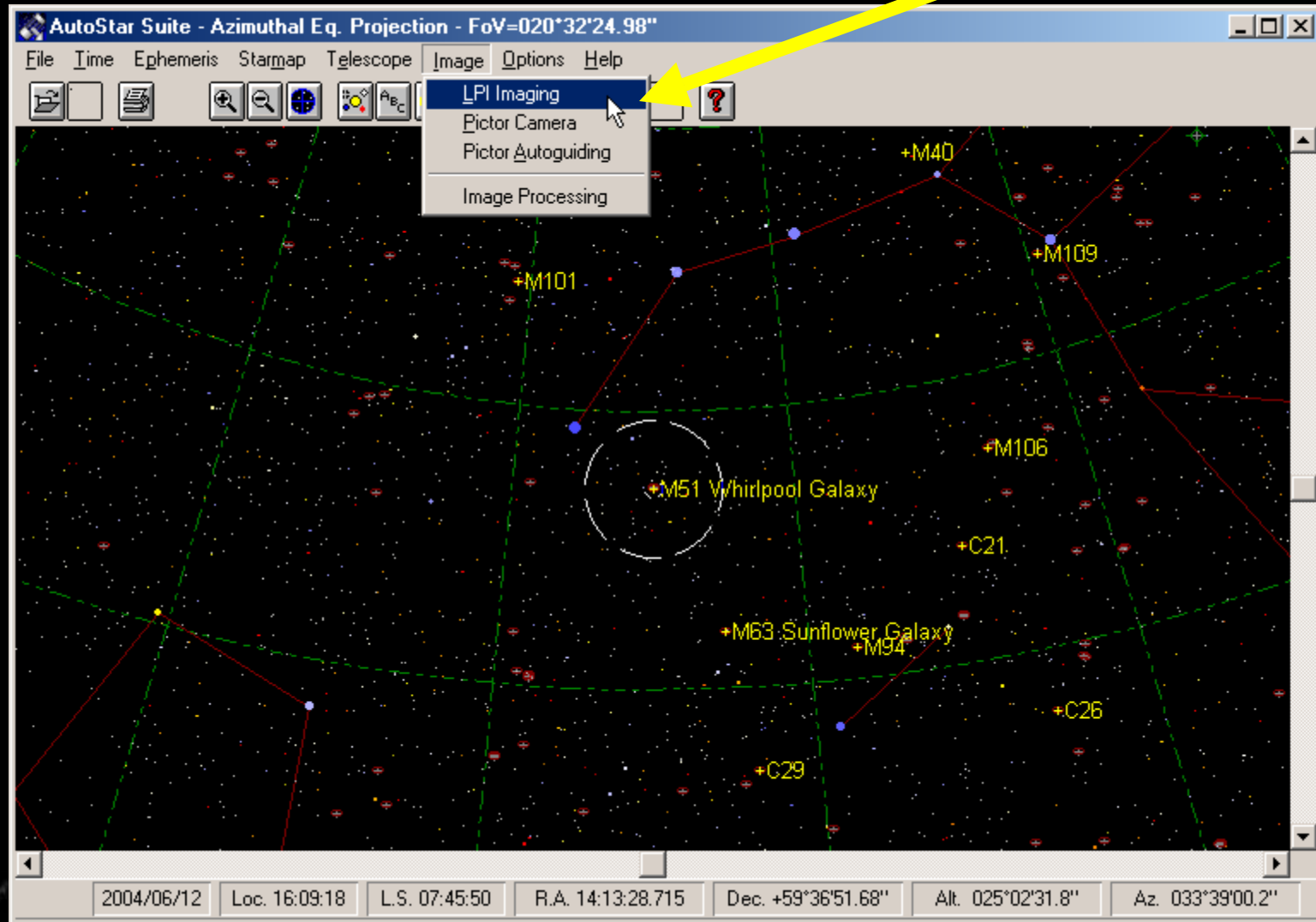
 Software



Meade LPI Autostar Suite



Meade LPI Imaging



Meade LPI Imaging

The screenshot displays the Meade LPI software interface. At the top, the title bar reads "Meade LPI". The interface is divided into several sections:

- Top Left:** Gain (100), Offset (52), Expose (0.004), Auto Adj, LIVE (checked), Dark Sub (done).
- Top Center:** "Take Pictures" and "Settings" tabs. The "Settings" tab is active, showing "Align&Combine" selected. Below it, "Kernel Filter" is empty, "Object" is "Terrestrial", "Min Quality %" is 70, "Evaluation Count" is 10, "Track" is unchecked, and "Combine" is checked.
- Top Right:** Object Name (Terrestrial), Save Every Image (unchecked), Start button, File Type (BMP).
- Menu Bar:** Stats, File, Help, Live, Terrestrial1, Terrestrial2, Aquire1-13, Aquire2-4, Terrestrial3-9, Terrestrial4-4, Terrestrial5.
- Left Panel:** Histogram (627.98), a green histogram plot, a slider from 49 to 255, Log (unchecked), ROI (unchecked), Magic Eye Focus (with left and right arrows), values 18.41 and 19.37, Avg (unchecked), and a Reset button.
- Main View:** A large window showing a live image of a 1957 Lincoln penny resting on a stack of sticks.
- Bottom:** Status bar showing "2 Images 6 Secs" and "94% Quality".

LPI Real-time Image Processing

The screenshot displays the Meade LPI software interface. The main window shows a real-time image of a 1957 Lincoln cent coin resting on a wooden log. The interface includes several control panels:

- Gain/Offset/Exposure:** Gain is set to 100, Offset to 52, and Expose to 0.004. There are checkboxes for Mono, LIVE, and Dark Sub (set to 'done').
- Settings:** Includes 'Align&Combine' and 'Kernel Filter' options. A table shows 'Min Quality %' at 70 and 'Evaluation Count' at 10. There are checkboxes for 'Track' and 'Combine'.
- Object Name/Type:** Object Name is 'Terrestrial' and File Type is 'BMP'. A 'Start' button is present.
- Stats:** A histogram shows a peak at 629.72. A scale bar ranges from 52 to 255. There are checkboxes for 'Log' and 'ROI'.
- Magic Eye Focus:** A slider is positioned between 19.14 and 20.37. There are 'Avg' and 'Reset' buttons.
- Bottom Bar:** Displays '10 Images 12 Secs' and '58% Quality'.

One Image versus Image Processing



One Image



LPI



One Image with Image Processing

One Image versus Image Processing



One Image



LPI



**22 Images stacked LPI
Processed at the
Telescope**

One Image versus Image Processing



LPI

22 Images stacked
LPI Processed

22 Images stacked LPI
Processed, RegiStax Wavelet

One Image versus Image Processing



**22 Images stacked
LPI Processed**



LPI



**22 Images stacked LPI
Processed, RegiStax
Wavelet, Photoshop**

One Image versus Image Processing



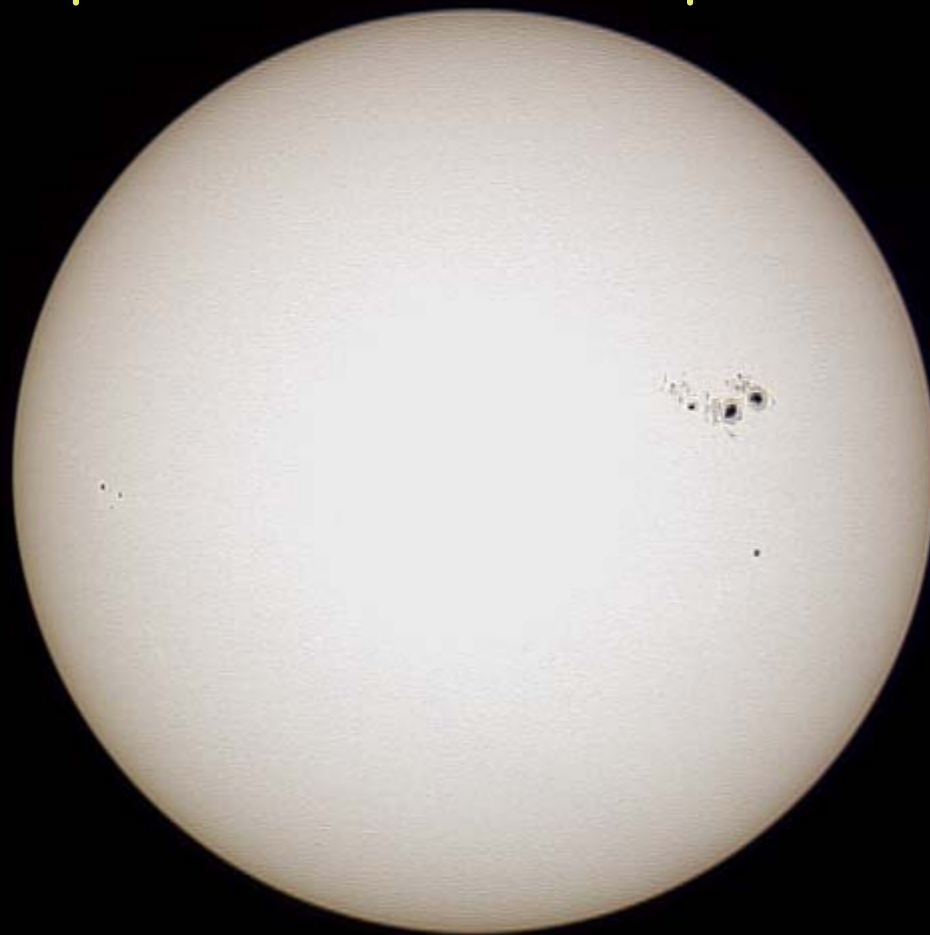
LPI

One Image with
Image Processing

22 Images stacked LPI
Processed, RegiStax
Wavelet, Photoshop

Sun 7/25/2004

Photoshop Version CS, unsharp mask and crop



LPI Images 4/26/2004

Argonaut™ 150mm Maksutov-Cassegrain & 2X Barlow



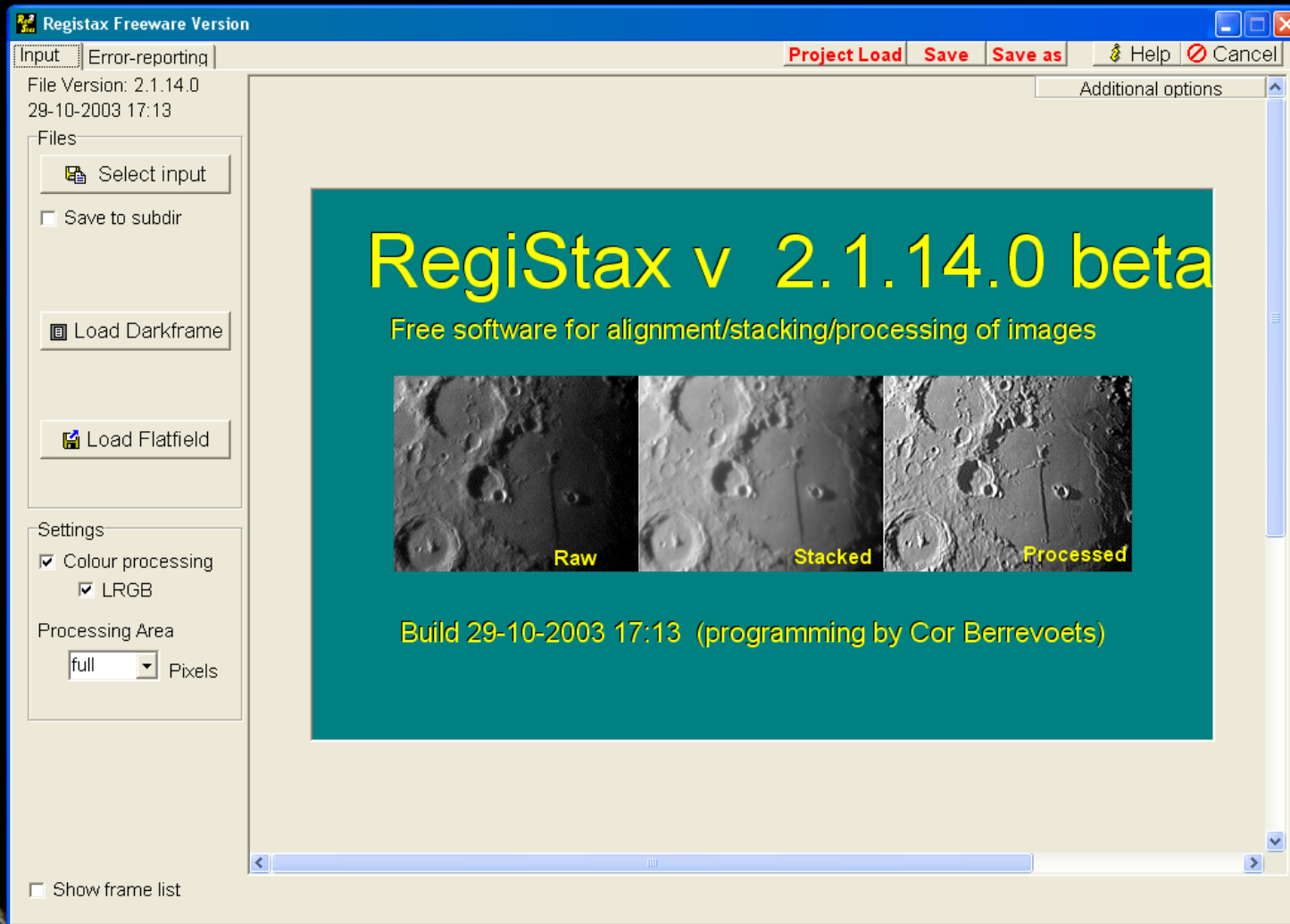
Moon 5/1/2004

Orion Argonaut™ 150mm Maksutov-Cassegrain on EQ-3
Tele Vue 2x Barlow (effective $>f/24$, >3600 mm)



Cor Berrevoets RegiStax

<http://aberrator.astronomy.net/registax/>



Moon 5/1/2004

Registax Version 2.1.14.0 beta, wavelett processed



Moon Clavius Craterlets 5/1/2004

Photoshop Version CS, unsharp mask, levels, and crop



Jupiter & Moons

Orion Argonaut™ 150mm Maksutov-Cassegrain telescope



Webcam & LPI Imaging

	Cost	Availability	Time to use
740	\$93 + \$75 IRF \$20 Adp.	Not available, Replaced by 840	Less than 5 minutes
LPI	\$150	Sean's Astronomy Shop	Ready to use

Webcam & LPI Imaging

	Advantages	Disadvantages
740	Good light sensitivity, Smallest pixels, ready to use adapters	Large AVI files, long image processing time
LPI	Real-time image processing, good color balance, electronic eyepiece	Less light sensitive, software crashes

Astroimaging Information

www.stargazing.net/david/

Observational Astronomy - Microsoft Internet Explorer

File Edit View Favorites Tools Help

<<PREVIOUS - HOME - CONTENTS - NEXT>>
(USE FRAMES - USE NO FRAMES) - NEW

Observational Astronomy

David Haworth

Amateur observational astronomy is the unlimited hobby of learning and observing the universe. Observational astronomy is the experience of learning about astronomical objects and then observing them or observing astronomical objects and then learning about them. This Web site contains resources to learn about observing skills that are used in amateur observational astronomy.

Four major types of [amateur observing](#):

- Observing with your [unaided eyes](#) without optical aids
- Observing with [binoculars](#)
- Observing with [telescopes](#)
- Observing with [cameras](#) that use film and CCD technologies

Each type of observing is based on learning how to use different types of observing equipment. The learning and fun never stops in observational astronomy and each type of observing provides new observing and learning.