

Basic Webcam Astrophotography

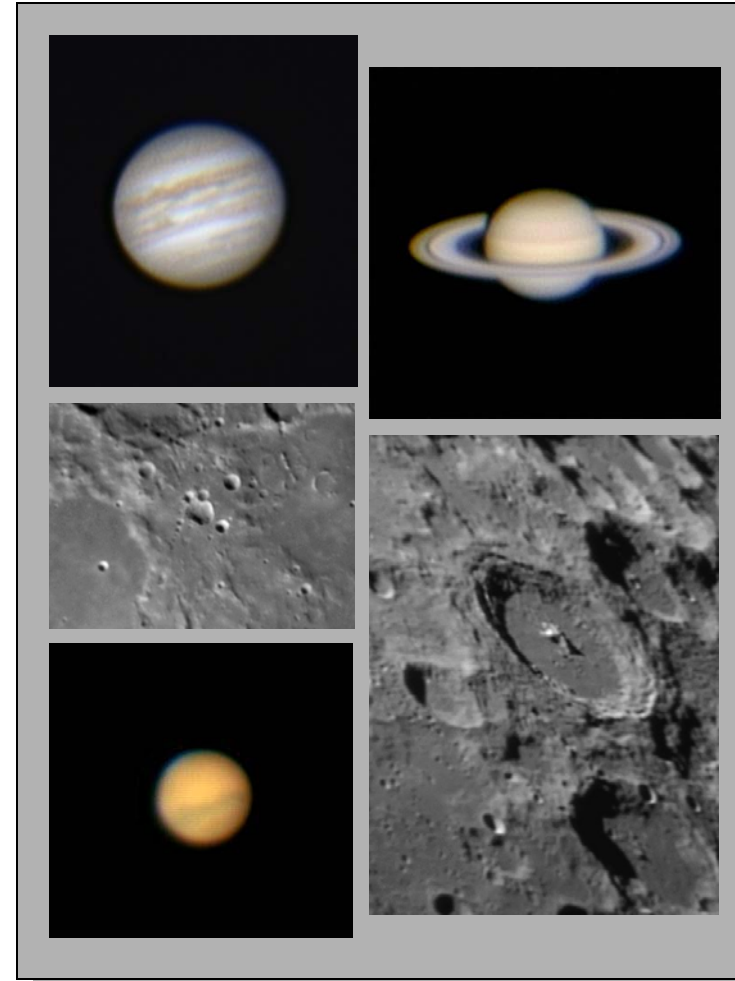
Rappahannock Astronomy Club
9 January 2008





Presentation Agenda

- Introduction
- Basic Tools
 - Telescopes
 - Webcams
 - Computers
 - Software
- Imaging Technique
- Image Showcase
- Conclusion





Introduction

- Webcam astrophotography is:
 - Easy
 - Inexpensive (kinda)
 - Fun
 - Anyone can do it with minimum skill
 - A great starting point to more advanced astrophotography





Basic Tools - Telescopes

- Refractors
- Schmidt-Cassegrains
- Newtonians
- Dobsonians



A motorized German equatorial mount is preferred, but an Alt-Az works too. Tip: Must be able to track in order to keep the object in the frame.

Basic Tools - Webcams

Webcams are easy to use, inexpensive, easily adapted to most telescopes. Here are some examples:



Philips ToUcam
Pro II (840k)



Philips ToUcam
Pro III (840k)

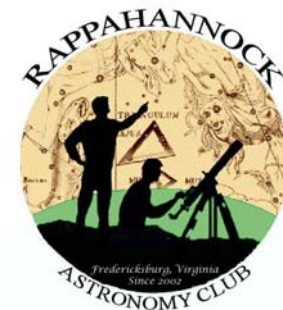
The CCD is a Sony HAD (Hole Accumulation Diode) ICX098BQ chip which is a 4.5mm diagonal (Type 1/4) interline CCD. The pixel size is 5.6um times 5.6um.



Basic Tools - Computers

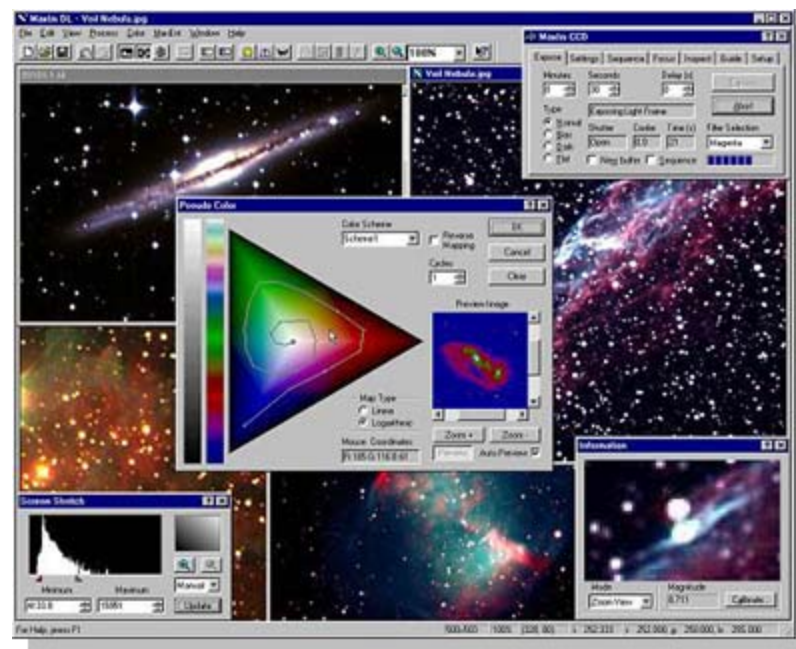


Just about any type computer can be used – even that old Pentium 4 desktop you stuck away in the closet.



Basic Tools - Software

- Proprietary SW that came with the camera
- Free downloadable, purpose built Astronomy software
 - Registax
 - K3CCDTools
- Astronomy imaging SW
 - MaximDL
 - CCDSoft
- Image processing software
 - Adobe Photoshop
 - Corel Paint Shop Pro



Imaging Technique

○ Image Capture

- Proprietary SW
- TOA130 (5.1")/G-11, polar aligned & tracking
- ToUcam Pro II
- 1104 frames

@ 5fps



Imaging Technique – File Select

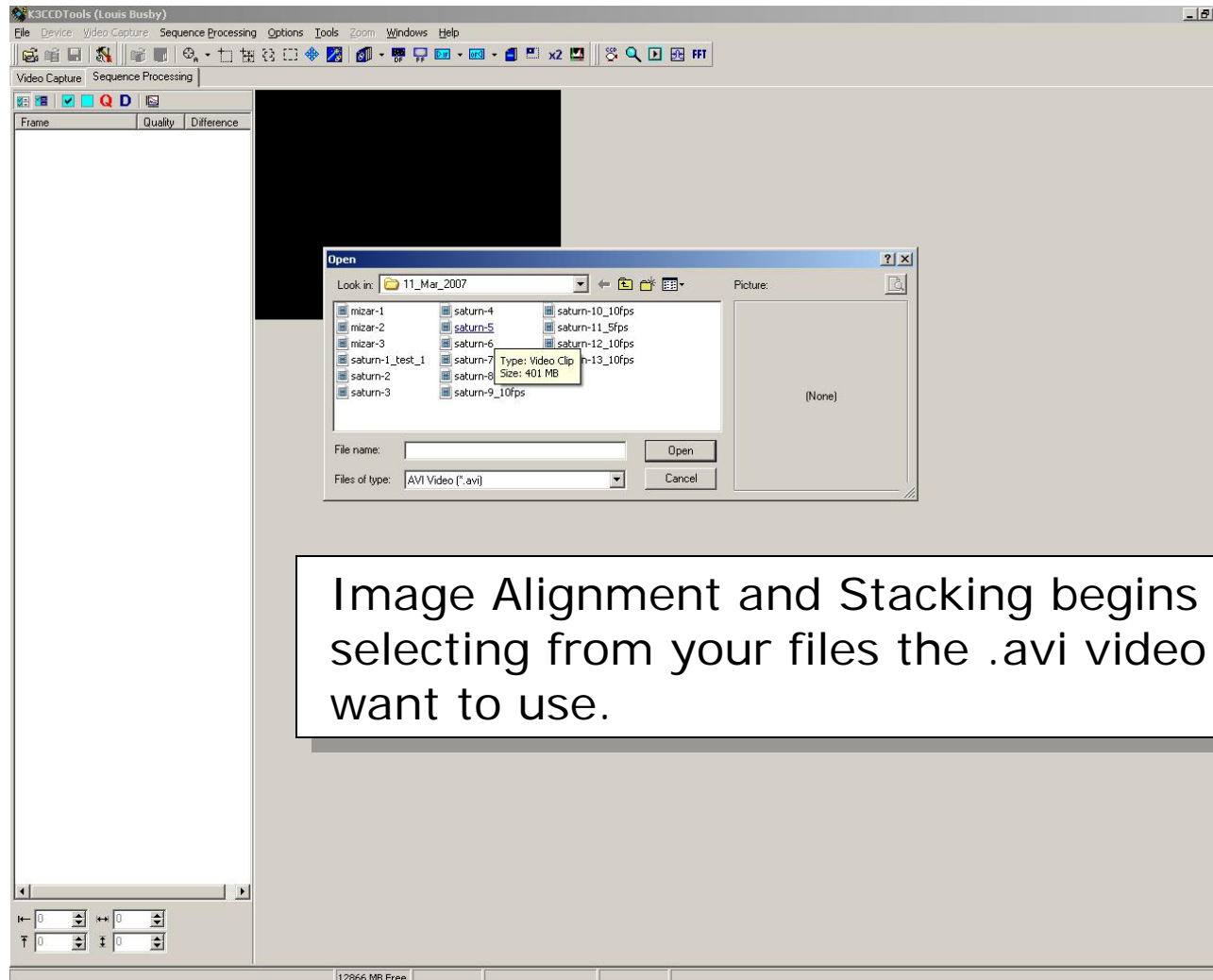
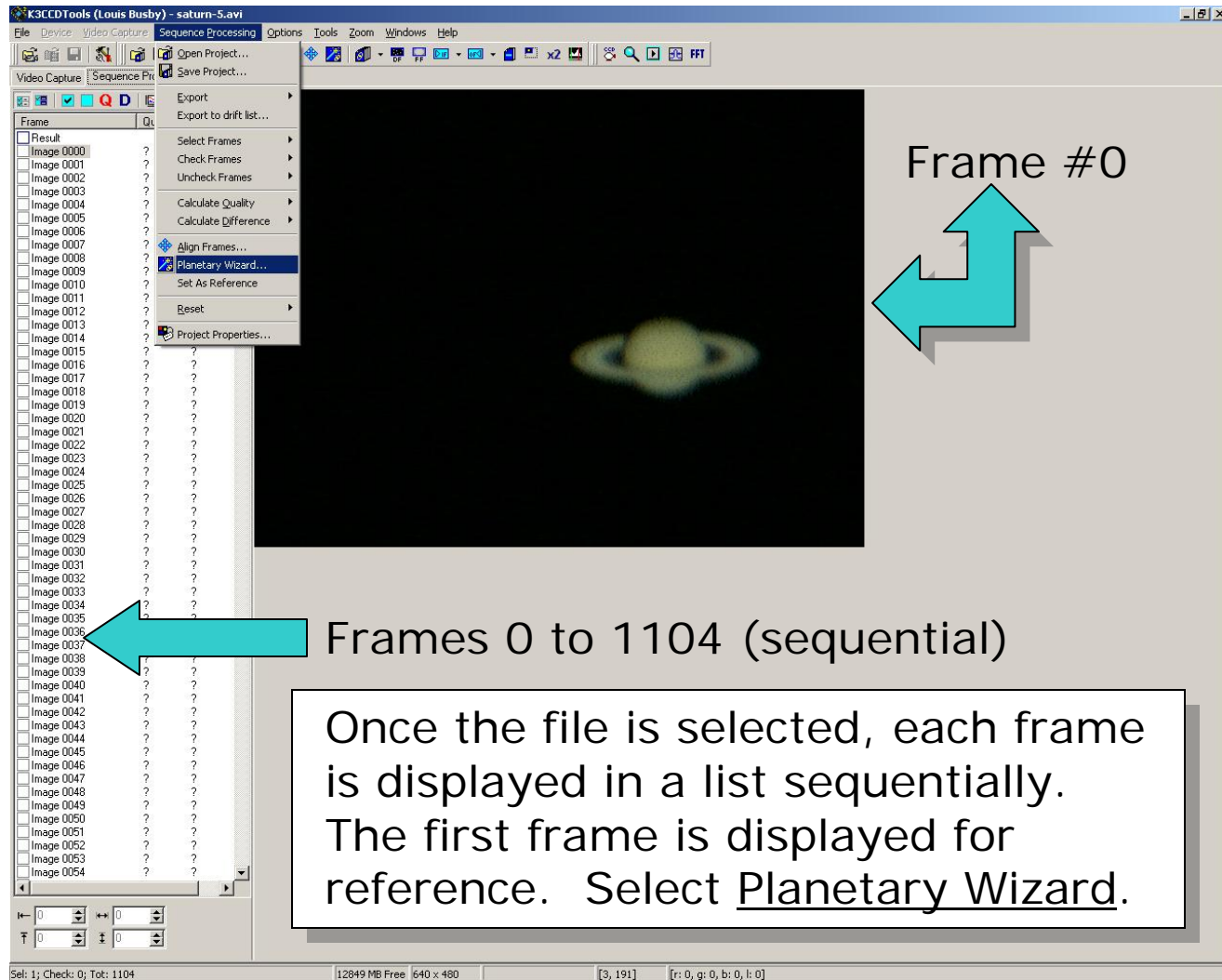


Image Alignment and Stacking begins by selecting from your files the .avi video you want to use.

Imaging Technique – Frame Display



The screenshot shows the K3CCDTools software interface. On the left, a list of frames from 'Image 0000' to 'Image 0054' is visible. A blue arrow points from the text 'Frames 0 to 1104 (sequential)' to this list. In the center, a preview window displays a blurry image of Saturn, with a blue arrow pointing to it from the text 'Frame #0'. A context menu is open over the preview window, with 'Planetary Wizard...' selected. At the bottom, a text box contains the following text:

Once the file is selected, each frame is displayed in a list sequentially. The first frame is displayed for reference. Select Planetary Wizard.

At the bottom of the window, the status bar shows: Sel: 1; Check: 0; Tot: 1104; 12849 MB Free; 640 x 480; [3, 191]; [r: 0, g: 0, b: 0, i: 0]

Imaging Technique – Planetary Wizard

The screenshot displays the K3CCDTools software interface. The main window shows a sequence of frames being processed, with a central preview window displaying a blurred image of Saturn. A list of frames is visible on the left, ranging from Image 0000 to Image 0054. A dialog box titled "Planetary Wizard" is open, showing the "1. Select Planetary Wizard Mode" step. The dialog box includes instructions for selecting a mode (Normal, Semi Auto, or Full Auto) and buttons for "Back", "Next", and "Close".

Frame #0

Frames 0 to 1104 (sequential)

Planetary Wizard

1. Select Planetary Wizard Mode

Select Planetary Wizard working mode.
Normal mode enables manual settings of parameters.
Semi Auto mode automates several steps and requires less user intervention.
Auto mode can be used for fast preview of stacked result. It's "one-click" planetary stacking.
For Lunar and Sun pictures use Normal mode.

Planetary Wizard Mode:
 Normal Semi Auto Full Auto

Back Next Close

Set: 1; Check: 0; Tot: 1104 [12848 MB Free 640 x 480 [637, 449] [r: 0, g: 2, b: 0, l: 1]

Imaging Technique - Calculations

The screenshot shows the K3CCDTools software interface. The main window displays a video capture of Saturn. A 'Planetary Wizard' dialog box is open, showing step 2: 'Select Rough Alignment Area'. The dialog box contains instructions: 'Browse through the frames (by using the Frames List or Sequence Player) to find a frame where the object (feature) is well captured (needn't be the best frame). Specify the size of alignment area (FFT Size). It should cover either the object completely or some its contrast-rich part. If you expect large object movement across the screen, select a greater size. Then you can select a center point in the frame by clicking the feature.' The 'FFT Size' is set to 256. Below the instructions are 'Back', 'Next', and 'Close' buttons. An arrow points to the 'Next' button. A 'Calculating Center Points...' dialog box is also open, showing 'Image 661 of 1104' and a progress bar. The main window has a 'Frames List' on the left with columns for 'Frame', 'Quality', and 'Difference'. The status bar at the bottom shows 'Sel: 1; Check: 0; Tot: 1104', '12803 MB Free 640 x 480', '[430, 282]', and '[r: 131, g: 135, b: 81, l: 128]'. The title bar reads 'K3CCDTools (Louis Busby) - saturn-5.avi'.

2. Select Rough Alignment Area

Browse through the frames (by using the Frames List or Sequence Player) to find a frame where the object (feature) is well captured (needn't be the best frame). Specify the size of alignment area (FFT Size). It should cover either the object completely or some its contrast-rich part. If you expect large object movement across the screen, select a greater size. Then you can select a center point in the frame by clicking the feature.

FFT Size: 256

Back Next Close

Calculating Center Points...
Image 661 of 1104
Cancel

Selecting the FFT size and calculating center points facilitates accurate alignment and stacking later on.

Imaging Technique - Calculations

The screenshot displays the K3CCDTools interface with a list of 1104 frames on the left and a 'Planetary Wizard' dialog box on the right. The 'Calculating Frame Quality...' dialog is open, showing progress for image 360 of 828. A text box at the bottom explains the process.

Frame	Quality	Difference
Image 0000	?	-300016
Image 0001	?	-297300
Image 0002	?	-299531
Image 0003	?	-301814
Image 0004	?	-301131
Image 0005	?	-298589
Image 0006	?	-297176
Image 0007	?	-297388
Image 0008	?	-302580
Image 0009	?	-301804
Image 0010	?	-297061
Image 0011	?	-299447
Image 0012	?	-299523
Image 0013	?	-300685
Image 0014	?	-303677
Image 0015	?	-306262
Image 0016	?	-303704
Image 0017	?	-300371
Image 0018	?	-299422
Image 0019	?	-301364
Image 0020	?	-303046
Image 0021	?	-303612
Image 0022	?	-299326
Image 0023	?	-298413
Image 0024	?	-302802
Image 0025	?	-300621
Image 0026	?	-304366
Image 0027	?	-301184
Image 0028	?	-298559
Image 0029	?	-288865
Image 0030	?	-287430
Image 0031	?	-302130
Image 0032	?	-301389
Image 0033	?	-301953
Image 0034	?	-302328
Image 0035	?	-304292
Image 0036	?	-303687
Image 0037	?	-301595
Image 0038	?	-306367
Image 0039	?	-304401
Image 0040	?	-305830
Image 0041	?	-303628
Image 0042	?	-304900
Image 0043	?	-302991
Image 0044	?	-301945
Image 0045	?	-303979
Image 0046	?	-306057
Image 0047	?	-306733
Image 0048	?	-309526
Image 0049	?	-304547
Image 0050	?	-305301
Image 0051	?	-307197
Image 0052	?	-302988
Image 0053	?	-304741
Image 0054	?	-304718

4. Frame Quality Calculation

In this step the quality of each frame will be calculated (in specified line alignment area). At the end of calculation the frames will be sorted according to quality. Press 'Calc Frames Quality' button to start calculation.

Calculating Frame Quality...
Image 360 of 828

Calculating frame quality compares each of the 1104 frames and reorders the frame list best to worst. In this case the program has already selected 828 frames of the total 1104.

Sel: 1; Check: 828; Tot: 1104 12803 MB Free (640 x 480) [430, 282] [r: 131, g: 135, b: 81, l: 128]

Imaging Technique – Reference Frame

The screenshot shows the K3CCDTools software interface. On the left, a 'Frame' list is displayed with columns for 'Frame', 'Quality', and 'Difference'. The list is sorted by quality, with Image 0437 at the top. In the center, a preview window shows a ringed planet (Saturn). On the right, a 'Planetary Wizard' dialog box is open, titled '5. Select Reference Frame & Realign'. The dialog contains instructions: 'Now the frames are sorted according to quality. The top frame in Frames List has the best quality. It was automatically selected as reference frame. However, there may exist a frame with a little less details, but with better shape. Browse through a few top frames, to find the best frame for reference. Select it and press 'Set Reference and Realign' button.' Below the text are buttons for 'Set Reference and Realign', 'Back', 'Next', and 'Close'. A large cyan arrow points from the text box below to the 'Set Reference and Realign' button.

Frame #437

Frame list is now reordered from best to worst. You can now either accept the frame the program has picked for a reference or you can select a different frame as the reference frame.

Frame	Quality	Difference
Image 0437	68606	-308155
Image 0372	68502	-306144
Image 0652	68204	-306831
Image 0654	68132	-307201
Image 0722	68101	-307395
Image 0320	67895	-307756
Image 0657	67848	-304600
Image 0651	67817	-307009
Image 0461	67800	-304487
Image 0390	67799	-304374
Image 0656	67747	-305406
Image 0653	67731	-305895
Image 0771	67699	-304372
Image 0384	67683	-306243
Image 0488	67680	-306741
Image 0394	67675	-305747
Image 0650	67666	-304962
Image 0707	67578	-306213
Image 0748	67565	-305297
Image 0674	67562	-307023
Image 0672	67548	-306202
Image 0643	67540	-306221
Image 0373	67478	-304425
Image 0536	67380	-305133
Image 0721	67328	-306852
Image 0459	67328	-305579
Image 0673	67313	-305440
Image 0539	67313	-304668
Image 0762	67303	-306066
Image 0051	67292	-306589
Image 0371	67286	-307197
Image 0715	67259	-306065
Image 0491	67250	-306451
Image 0481	67213	-305313
Image 0708	67205	-305984
Image 0062	67201	-305487
Image 0352	67195	-303275
Image 0385	67192	-306434
Image 0622	67191	-306109
Image 0706	67140	-304940
Image 0467	67115	-307660
Image 0367	67112	-305501
Image 0680	67092	-305976
Image 0335	67086	-304633
Image 0727	67077	-307044
Image 0410	67062	-306101
Image 0801	66988	-306155
Image 0765	66977	-305276
Image 0492	66967	-305705
Image 0040	66963	-306785
Image 0328	66962	-305830
Image 0658	66947	-306990
Image 0429	66929	-304460
Image 0064	66928	-304226
	66924	-303720

Set: 1; Check: 628; Tot: 1104 | 12802 MB Free | 640 x 480 | [430, 282] | [r: 131, g: 135, b: 81, l: 128]

Imaging Technique – Pick Best Frames

The screenshot shows the K3CCDTools software interface. On the left, a 'Frame' list displays columns for 'Frame', 'Quality', and 'Difference'. The 'Image 0000' frame is highlighted in green, indicating it is the current frame. A central window shows a blurred image of a planet's ring system. On the right, the 'Planetary Wizard' dialog box is open, showing step 5: 'Select Reference Frame & Realign'. The dialog text explains that frames are sorted by quality and that the top frame is automatically selected as the reference frame. A 'Set Reference and Realign' button is visible.

Frame	Quality	Difference
Image 0250	60543	-300349
Image 0200	60534	-299833
Image 0130	60496	-297914
Image 0006	60398	-297176
Image 0086	60366	-299146
Image 0023	60341	-298413
Image 0191	60337	-299590
Image 0201	60303	-298824
Image 0616	60301	-299259
Image 0002	60285	-299531
Image 0243	60275	-299133
Image 0270	60167	-300130
Image 0227	60165	-299586
Image 0195	60039	-297905
Image 0187	59872	-297781
Image 0580	59777	-297020
Image 0282	59746	-296510
Image 0559	59718	-298752
Image 0189	59565	-299482
Image 0005	59505	-298589
Image 0199	59379	-299170
Image 0001	59365	-297300
Image 0290	59202	-299297
Image 0000	59186	-300016
Image 0007	59154	-297388
Image 0244	59111	-296377
Image 0278	59086	-297399
Image 0010	59084	-297061
Image 0188	58896	-298095
Image 0192	58863	-298709
Image 0291	58795	-298247
Image 0202	58602	-299243
Image 0289	58556	-295847
Image 0198	58396	-297449
Image 0252	58001	-296083
Image 0030	53167	-287430
Image 0102	11032	-298865

Planetary Wizard

5. Select Reference Frame & Realign

Now the frames are sorted according to quality. The top frame in Frames List has the best quality. It was automatically selected as reference frame. However, there may exist a frame with a little less details, but with better shape. Browse through a few top frames, to find the best frame for reference. Select it and press 'Set Reference and Realign' button.

Set Reference and Realign

Back Next Close

Last frame in the sequence is the worst.

Now's a good time in the processing sequence to select and throw out the worst frames. This could result in spending hours to days removing the bad frames depending how many frames were captured.

File Device Video Capture Sequence Processing Options Tools Zoom Windows Help

Video Capture Sequence Processing

Frame Quality Difference

Image 0: View

Image 0: Sort

Image 0: Select Frames

Image 0: Check Frames

Image 0: Uncheck Frames

Image 0: Calculate Quality

Image 0: Calculate Difference

Image 0: Align Frames...

Image 0: Set Reference

All Frames

Selected Frames

Dropped Frames

Not Centered Frames

285 255

158 255

Sel: 1; Check: 828; Tot: 1104

12802 MB Free 640 x 480

[0, 151] [r: 0, g: 3, b: 0, l: 2]

Imaging Technique – Pick Best Frames

The screenshot shows the K3CCDTools software interface. On the left, a list of frames is displayed with columns for Frame, Quality, and Difference. The top frame in the list is Image 0449 with a quality of 66764 and a difference of -306142. The central image shows a blurred view of Saturn. On the right, the 'Planetary Wizard' dialog box is open, titled '5. Select Reference Frame & Realign'. It contains instructions: 'Now the frames are sorted according to quality. The top frame in Frames List has the best quality. It was automatically selected as reference frame. However, there may exist a frame with a little less details, but with better shape. Browse through a few top frames, to find the best frame for reference. Select it and press 'Set Reference and Realign' button.' Below the text are buttons for 'Set Reference and Realign', 'Back', 'Next', and 'Close'. A large cyan arrow points from the text box at the bottom towards the 'Next' button. Below the arrow, the text 'Frame #437' is displayed. At the bottom of the software window, a status bar shows 'Sel: 0; Check: 101; Tot: 1104', '12802 MB Free [640 x 480]', '[124, 479]', and '[r: 0, g: 1, b: 0, l: 1]'. A text box at the bottom of the screenshot contains the following text:

For illustration purposes, I've selected only the first 100 highest quality frames. All the rest are thrown out and are not included in the aligning and stacking process.

Imaging Technique – Pick Best Frames

The screenshot shows the K3CCDTools interface. On the left is a list of frames with columns for Frame, Quality, and Difference. The central window displays a blurred image of Saturn. The 'Planetary Wizard' dialog box is open to step 6, 'Select Best Frames', which offers manual selection or automatic selection based on a quality graph. A callout box with an arrow points to the 'Best 100 selected.' text, explaining that the program can automatically select the best frames.

6. Select Best Frames

Select best frames. You can do it manually by unchecking worse frames or automatically by using quality graph or by selecting the best N frames.

After pressing Next button the fine alignment will be calculated.

Automatic Best Frames Selection:

Percentual # Best # 100

Best 100 selected.

The program can select the best frames for you if you don't want to select them manually.

Frame	Quality	Difference
Image 0437	68806	-308155
Image 0372	68502	-306144
Image 0652	68204	-306831
Image 0654	68132	-307201
Image 0722	68101	-307395
Image 0320	67895	-307756
Image 0657	67848	-304600
Image 0651	67817	-307009
Image 0461	67800	-304487
Image 0469	67789	-304974
Image 0380	67747	-305406
Image 0656	67731	-305855
Image 0653	67699	-304372
Image 0771	67683	-306243
Image 0384	67680	-306741
Image 0488	67675	-305747
Image 0394	67666	-304952
Image 0650	67578	-306213
Image 0707	67565	-305297
Image 0748	67562	-307023
Image 0674	67548	-306202
Image 0672	67540	-306221
Image 0643	67478	-304425
Image 0373	67380	-305133
Image 0636	67328	-306852
Image 0721	67328	-305579
Image 0459	67313	-305440
Image 0673	67313	-304568
Image 0539	67303	-306066
Image 0762	67292	-306589
Image 0051	67286	-307197
Image 0371	67259	-306065
Image 0715	67250	-306451
Image 0491	67213	-305313
Image 0481	67205	-305984
Image 0708	67201	-305487
Image 0362	67195	-303275
Image 0352	67192	-306434
Image 0385	67191	-306109
Image 0622	67140	-304940
Image 0706	67115	-307660
Image 0467	67112	-309501
Image 0367	67092	-305876
Image 0680	67086	-304633
Image 0335	67077	-307044
Image 0727	67062	-306101
Image 0410	66988	-306155
Image 0801	66977	-305276
Image 0765	66967	-305705
Image 0492	66963	-306785
Image 0040	66962	-305830
Image 0328	66947	-306990
Image 0658	66929	-304460
Image 0429	66928	-304226
Image 0064	66924	-303720

Quality & Difference Graph

Q >= 96.9% D <= 100% Frames to stack: 100

Sel: 0; Check: 662; Tot: 1104 12801 MB Free 640 x 480 [610, 464] [r: 0, g: 0, b: 0, l: 0]

Imaging Technique – Fine Alignment

The screenshot shows the K3CCDTools software interface. The main window displays a list of frames on the left, a central image of Saturn, and a 'Planetary Wizard' dialog box on the right. The 'Planetary Wizard' dialog is titled '7. Fine Alignment' and contains the following text: 'In this step the final fine alignment will be made. You can choose 2X mode for even better result. To do that, press 'Fine Alignment' button.' Below the text are two buttons: 'Fine Alignment' and 'Use 2X Mode'. The 'Use 2X Mode' checkbox is currently unchecked. An arrow points to this checkbox. Below the dialog are 'Back', 'Next', and 'Close' buttons. In the center of the main window, a smaller dialog box titled 'Automatic Aligning Frames...' is visible, showing 'Image 47 of 100' and a progress bar. At the bottom of the main window, a 'Quality & Difference Graph' window is open, displaying a graph with a blue line representing quality and a red line representing difference. The graph shows a significant drop in quality and increase in difference at the end of the frame sequence. Below the graph, the text 'Q >= 96.9% D <= 100%' and 'Frames to stack: 100' is visible. The status bar at the bottom of the software shows 'Sel: 0; Check: 100; Tot: 1104', '12800 MB Free 640 x 480', '[610, 464]', and '[r: 0, g: 0, b: 0, l: 0]'. The status bar also includes a 'Cancel' button.

Frame	Quality	Difference
Image 0437	68606	0
Image 0372	68502	15436
Image 0652	68204	15989
Image 0654	68132	15557
Image 0722	68101	15944
Image 0320	67895	16599
Image 0657	67848	15551
Image 0651	67817	14587
Image 0461	67800	14704
Image 0469	67789	15000
Image 0380	67747	15414
Image 0656	67731	16340
Image 0653	67659	15158
Image 0771	67583	16698
Image 0384	67680	14826
Image 0488	67675	14692
Image 0394	67666	15388
Image 0650	67578	15240
Image 0707	67565	16094
Image 0748	67562	15541
Image 0674	67548	16341
Image 0672	67540	15622
Image 0643	67478	15230
Image 0373	67380	15349
Image 0536	67328	15293
Image 0721	67328	16495
Image 0459	67313	15107
Image 0673	67313	15997
Image 0539	67303	14396
Image 0762	67292	16109
Image 0051	67286	15731
Image 0371	67259	15184
Image 0715	67250	16271
Image 0491	67213	14461
Image 0481	67205	15462
Image 0708	67201	16581
Image 0062	67195	15621
Image 0362	67192	17470
Image 0385	67191	14872
Image 0622	67140	15879
Image 0706	67115	15461
Image 0467	67112	14570
Image 0367	67092	15499
Image 0680	67086	15792
Image 0335	67077	15686
Image 0727	67062	16963
Image 0410	66988	14767
Image 0801	66977	15764
Image 0765	66967	16399
Image 0492	66963	14375
Image 0040	66962	15948
Image 0328	66947	16429
Image 0658	66929	15869
Image 0429	66928	14754
Image 0064	66924	16249

Here we're doing a fine alignment of our selected frames. If you wish you can select the 2X box to double the size of the final image.

Imaging Technique – Stacking Frames

The screenshot shows the K3CCDTools software interface. The main window displays a list of frames with columns for Frame, Quality, and Difference. A central image of Saturn is shown with a selection rectangle. A 'Calculating Result Image...' dialog box is open, showing progress for 'Image 48 of 100'. The 'Planetary Wizard' dialog box is also open, with the 'Maximize' button highlighted by an arrow. The 'Maximize' button is used to include the entire frame in the result.

Planetary Wizard

8. Select Result Rectangle & Stack

Select result rectangle. It determines how the result will look. It can be larger or smaller than rectangle used in previous steps.

Use 'Select result rectangle' or 'Select fixed sized result rectangle' tool buttons for this purpose.

You can maximize the result rectangle by pressing 'Maximize' button.

After selection of result area, press the 'Stack Frames' button.

Buttons: Stack Frames, Maximize, Back, Next, Close

Calculating Result Image...

Image 48 of 100

Buttons: Cancel

Quality & Difference Graph

Q >= 96.9% D <= 100% Frames to stack: 100

Bottom status bar: Last Operation: 12.000 s | 12800 MB Free | 640 x 480 | [632, 466] | [r: 0, g: 0, b: 0, l: 0]

The rectangle drawn around Saturn is the original FFT rectangle. You can leave it as is or you can select Maximize to include the entire frame.

Imaging Technique – Final Result

K3CCDTools (Louis Busby) - saturn-5.avi

File Device Video Capture Sequence Processing Options Tools Zoom Windows Help

Video Capture Sequence Processing

Frame	Quality	Difference
Result		
Image 0437	68506	0
Image 0372	68502	15436
Image 0652	68204	15989
Image 0654	68132	15557
Image 0722	68101	15944
Image 0320	67895	16599
Image 0657	67848	15551
Image 0651	67817	14587
Image 0461	67800	14704
Image 0469	67789	15000
Image 0380	67747	15414
Image 0656	67731	16340
Image 0653	67659	15158
Image 0771	67603	16698
Image 0384	67680	14826
Image 0488	67675	14692
Image 0394	67666	15388
Image 0650	67578	15240
Image 0707	67565	16094
Image 0748	67562	15541
Image 0674	67548	16341
Image 0672	67540	15622
Image 0643	67478	15230
Image 0373	67380	15349
Image 0536	67328	15293
Image 0721	67328	16455
Image 0459	67313	15107
Image 0673	67313	15997
Image 0539	67303	14396
Image 0762	67292	16109
Image 0051	67286	15731
Image 0371	67259	15184
Image 0715	67250	16271
Image 0491	67213	14461
Image 0481	67205	15462
Image 0708	67201	16581
Image 0062	67195	15621
Image 0352	67192	17470
Image 0385	67191	14872
Image 0622	67140	15879
Image 0706	67115	15461
Image 0467	67112	14570
Image 0367	67092	15499
Image 0680	67086	15792
Image 0335	67077	15686
Image 0727	67062	16963
Image 0410	66988	14767
Image 0801	66977	15784
Image 0765	66967	16399
Image 0492	66963	14375
Image 0040	66962	15948
Image 0328	66947	16429
Image 0658	66929	15869
Image 0429	66928	14754
Image 0064	66924	16249

Planetary Wizard

9. Final Result

Congratulations! Result is completed.
You can do final adjustments with Histogram settings and you can save result to BMP, PNG, TIF, JPG or FIT file.

Back Next Close

Histogram

Channels

Channel: All

Mix: 0.00

Mag: 255.00

Use Histogram

Update Gamma: 1.00

Unsharp Mask

Radius: 1

Threshold: 0.0

Strength: 100

Quality & Difference Graph

Q >= 96.9% D <= 100% Frames to stack: 100

Sel: 1; Check: 100; Tot: 1104

12799 MB Free 640 x 480

[465, 354] [r: 0, g: 0, b: 0, l: 0]

Here's the final result. You can now make adjustments using the Histogram.

Imaging Technique - Adjustments

The screenshot displays the K3CCDTools software interface. The main window shows a list of frames on the left, a central image of Saturn, and several adjustment panels. The 'Histogram' panel is highlighted, showing 'Unsharp Mask' settings with a radius of 11, threshold of 0.0, and strength of 100. The 'Quality & Difference Graph' panel shows a graph of image quality over time. A 'Planetary Wizard' dialog box is open on the right, showing the 'Final Result' of the processing.

Planetary Wizard - Final Result

Congratulations! Result is completed.
You can do final adjustments with Histogram settings and you can save result to BMP, PNG, TIF, JPG or FIT file.

Histogram Panel:

- Channels: [Color Channels]
- Channel: Y
- Mix: 18.00
- Mag: 268.00
- Gamma: 1.00
- Unsharp Mask
- Radius: 11
- Threshold: 0.0
- Strength: 100
- Use Histogram
- Update

Quality & Difference Graph Panel:

Q >= 96.9% D <= 100% Frames to stack: 100

Planetary Wizard Panel:

9. Final Result

Back Next Close

Bottom status bar: Sel: 1; Check: 100; Tot: 1104 | 12799 MB Free | 640 x 480 | [565, 478] | [r: 0, g: 0, b: 0, l: 0]

You can make some adjustments using the histogram controls. Here we've increased sharpness and adjusted color balance.

Imaging Technique – Saving the File

The screenshot displays the K3CCDTools software interface. The main window shows a sequence of images being processed, with a central preview window displaying a Saturn image. A 'Planetary Wizard' dialog box is open, showing a 'Final Result' screen with a small preview of the Saturn image and buttons for 'Back', 'Next', and 'Close'. A 'Histogram' dialog box is also open, showing a histogram of the image data and various adjustment options like 'Channels', 'Min', 'Max', 'Gamma', and 'Unsharp Mask'. A 'Save As' dialog box is open, showing a list of files in the '31_Dec_07' folder and a 'Save' button. The 'Save As' dialog box is set to save the file as 'saturn-5' in the 'TIFF Files' format.

Planetary Wizard

9. Final Result

Congratulations! Result is completed.
You can do final adjustments with Histogram settings and you can save result to BMP, PNG, TIF, JPG or FIT file.

Back Next Close

Channels: Y
Min: 18.00
Max: 268.00
Gamma: 1.00

Unsharp Mask
Radius: 11
Threshold: 0.0
Strength: 100

Save As

Save in: 31_Dec_07

File name: saturn-5

Save as type: TIFF Files

Save Cancel

TIFF Files
Bilmaps (*.bmp)
JPG Files
PNG Files
PNG 16 Files
TIFF Files
TIFF 16 Files
FIT (16bit, signed)
FIT (16bit, unsigned)
FIT (32bit)

Sel: 1; Check: 100; Tot: 1104 | 12799 MB Free | 640 x 480 | [19, 5] | [r: 3, g: 164, b: 2, i: 97]

You can now save your image by selecting File, Save As.

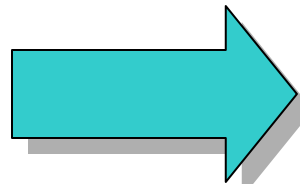
If desired you can further improve image quality by using an image processing program like Adobe Photoshop.

Imaging Technique – Image Refining

This



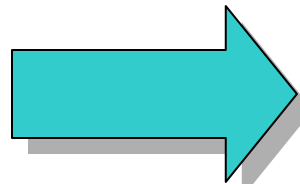
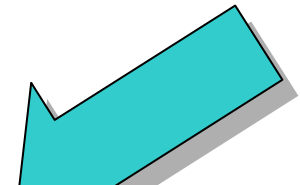
To this



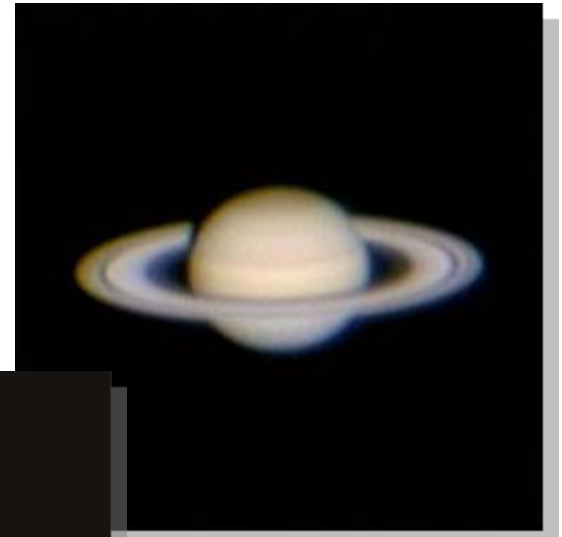
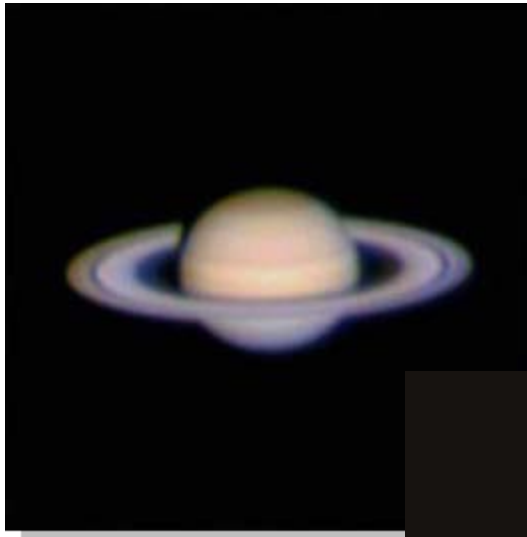
To this



To this



Imaging Technique – Image Refining



To This!!!

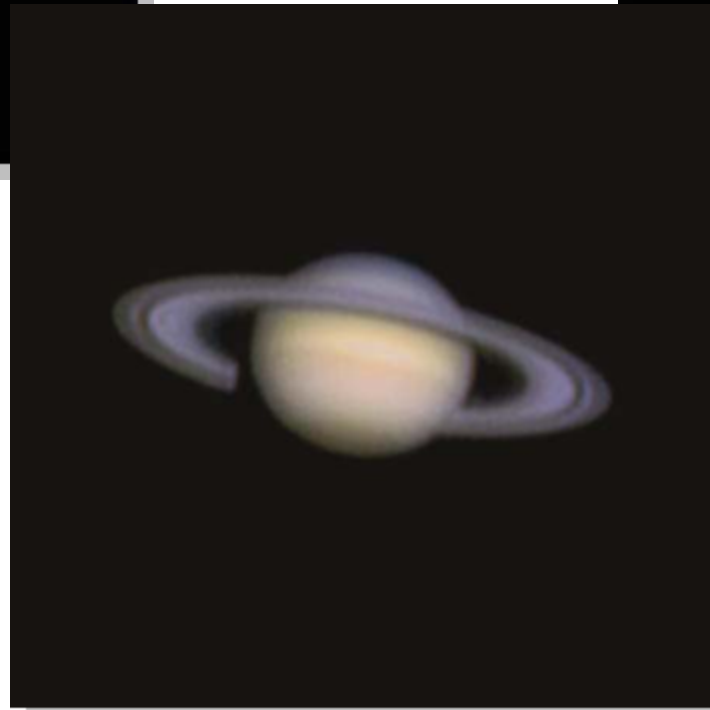
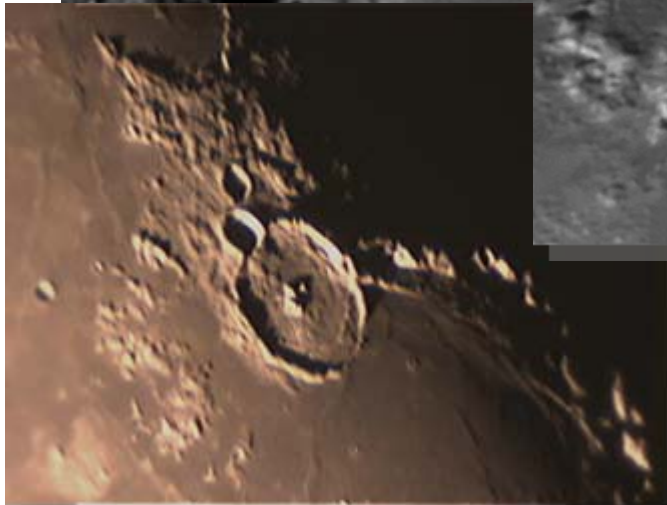
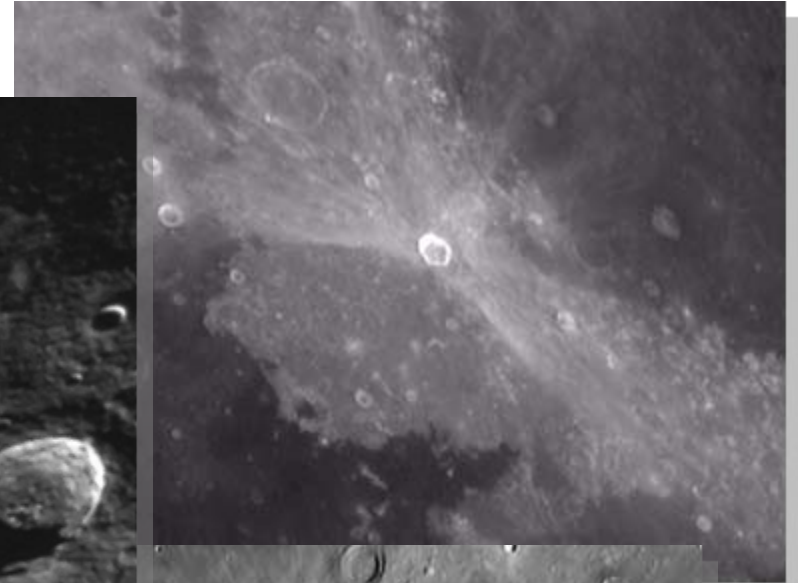
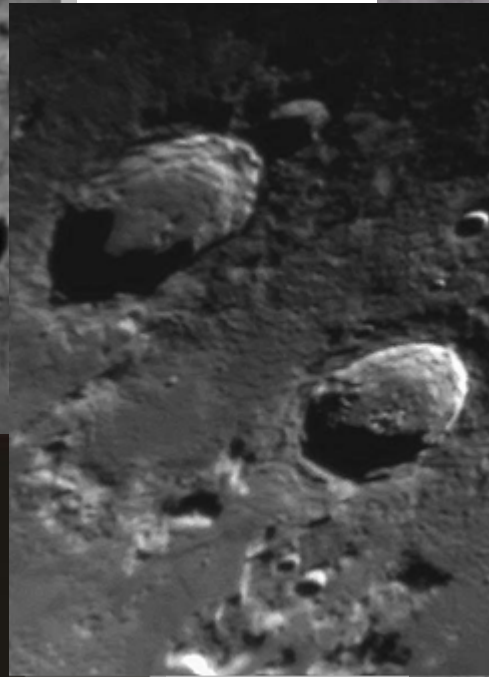
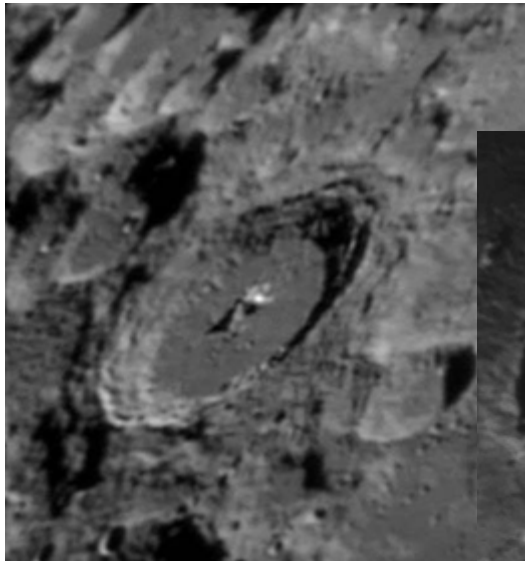




Image Showcase - Moon



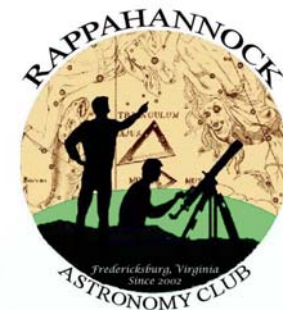


Image Showcase - Mars

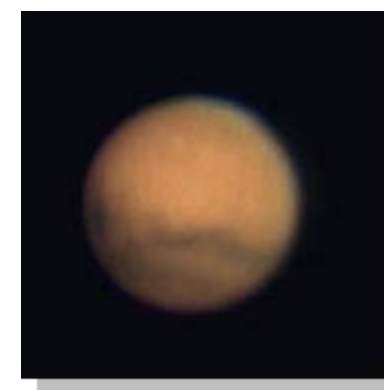
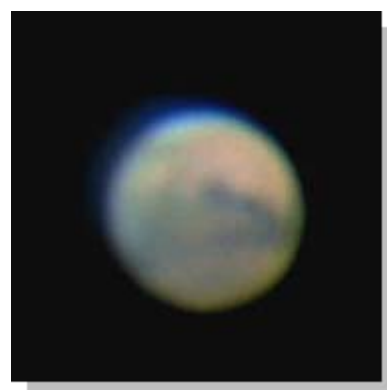
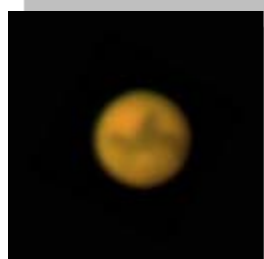
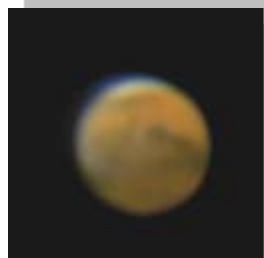


Image Showcase - Saturn

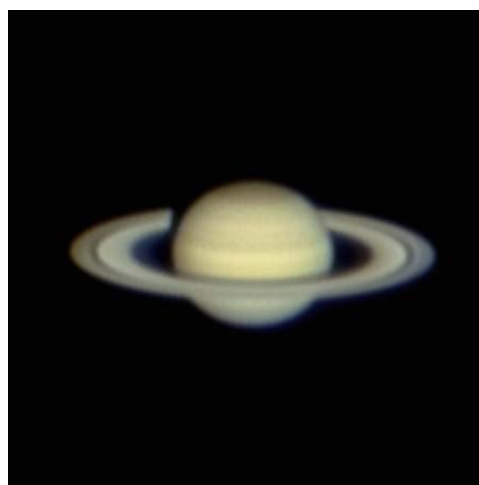
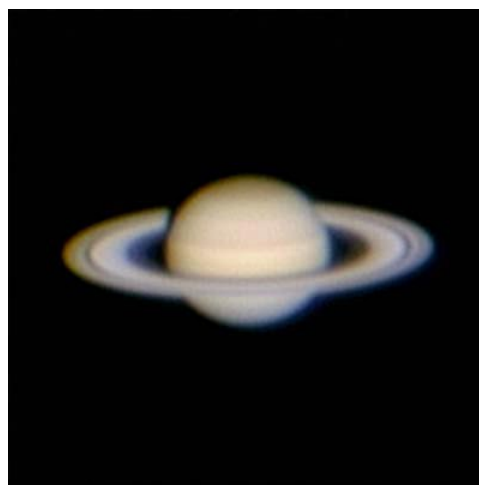
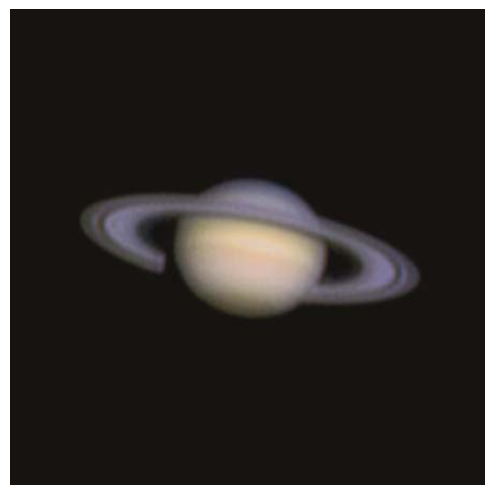


Image Showcase - Jupiter



Image Showcase – Other Images

Mizar A/B

Mizar in Ursa Major
Visual Magnitude: 2.227
Spectral Type: A2V
Multiple Star System: Yes



The Moon

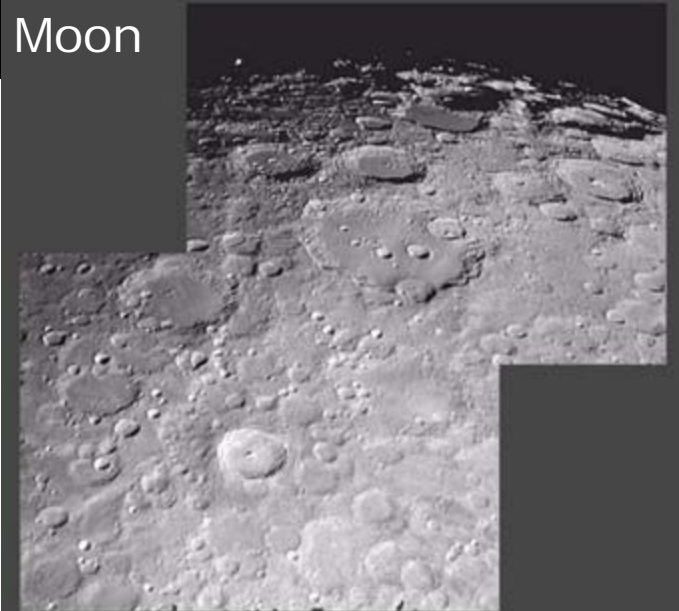


Venus

The Sun



Uranus

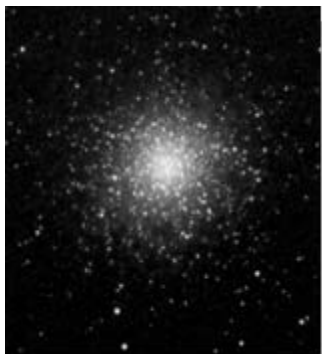


Conclusion

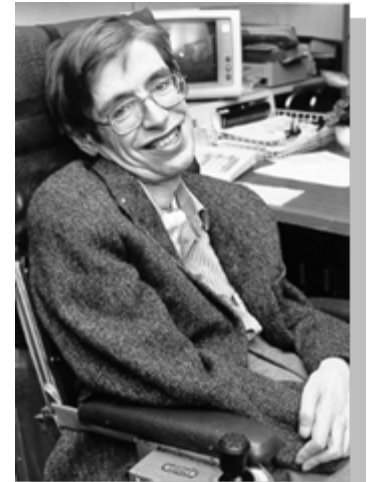
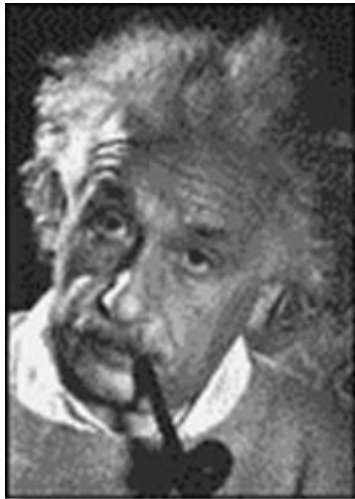
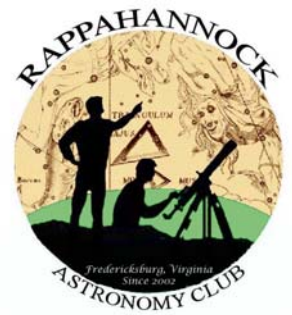


○ Webcam astrophotography is:

- Easy
- Inexpensive (kinda)
- Fun
- Anyone can do it with minimum skill
- **A great starting point to more advanced astrophotography**



Questions???



"Do you feel lucky punk? Go ahead, make my day."