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Space and astronomy news



JANUARY 31, 2014 BY DAVID DICKINSON

A green advertisement for SuperJob. The text is in Russian: "Новый сотрудник выйдет на работу уже завтра" (New employee starts work tomorrow), "НАЙТИ СОТРУДНИКОВ" (Find employees), and "SuperJob". There are small icons for information and close in the top right corner.

From Webcam to Planetcam: Planetary Imaging on the Cheap

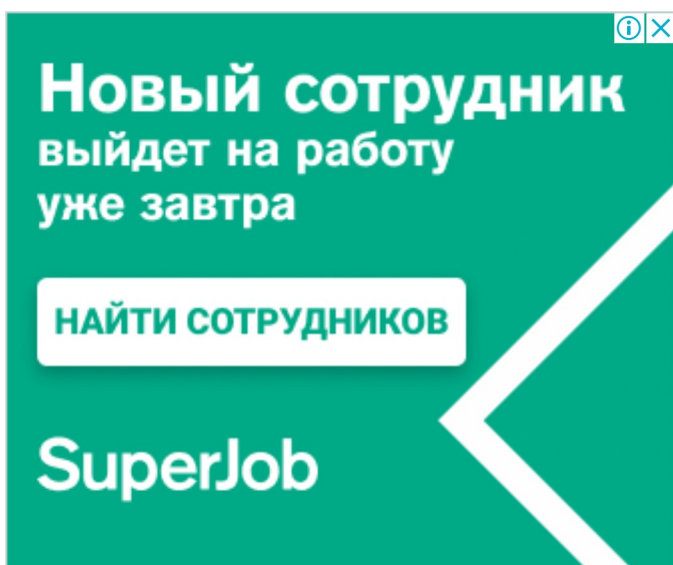
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People are often surprised at the fact that I'm simply using a converted off-the-shelf webcam modified to fit into the eyepiece-holder of a telescope, along with freeware programs to control the camera, stack, and clean up images. And while there are multi-thousand dollar rigs available commercially that yield images that would have been the envy of professional observatories even a decade ago, you may just find that you have the gear lying around to start doing planetary and lunar photography tonight.



OK, I'll admit: you do need a laptop and telescope, (things that we typically have "laying around" our house!) but these are the two priciest items on the list to get started. Living the vagabond life of a veteran, a teacher, and a freelance science writer assures that our preferred cameras for conversion are always in the double-digit dollar range.



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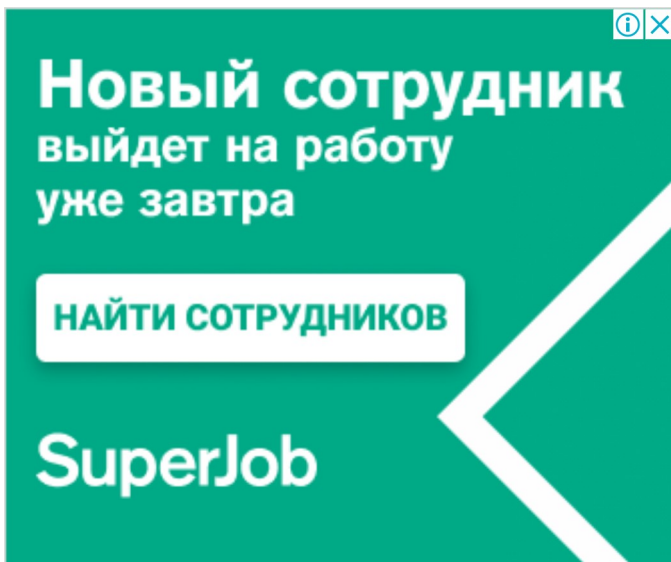
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Our first converted "Planetcam" installed on the 'scope.

But converted webcam imaging is not new. We first read about the underground movement over a decade ago. Back in the day, amateur astrophotographers were hacking their Phillips Vesta and ToUcam Pro webcams with stunning results. Celestron, Meade and Orion later caught up to the times and released their own commercial versions for planetary imaging some years later.

A few freeware installations and the modification of a Logitech 3000 that I bought on rebate for 50\$ later, and I was soon imaging planets that same night.



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astrophotography. The modification simply consists of removing the camera lens (don't do this with any camera that you don't want to gut and void the warranty) and attaching a standard 1 1/4" eyepiece barrel in its place using cement glue.

For camera control, I use a program called K3CCDTools. This was freeware once upon a time, now the program costs \$50 to install. I still find it well worth using, though I've been turned on to some equally useful programs out there that are still free. (more on that in a bit).

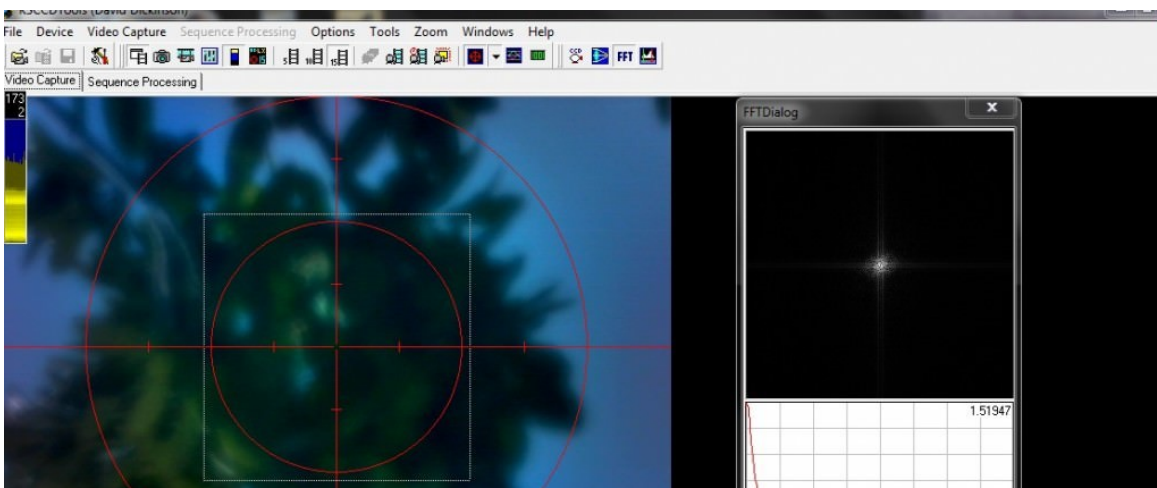
K3CCDTools will process your images from start to finish, but I find that Registax is great for post-image processing. Plus, you don't want to waste valuable scope time processing images: I do the maximum number of video captures in the field, and then tinker with them later on cloudy nights.



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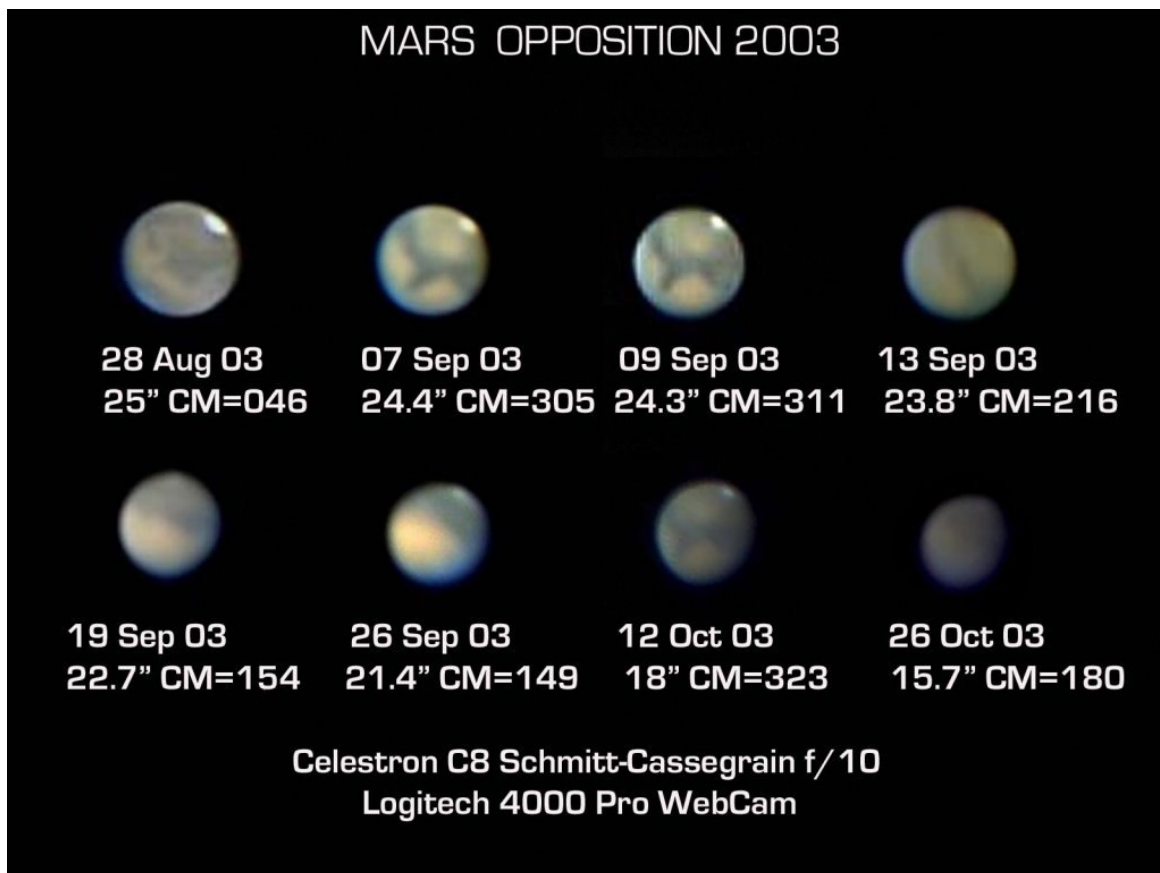
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A screen capture of K3CCD tools during a daytime alignment test. Note the focusing dialog (FFT) box to the right.

Stacking video captures enables you to “grab” those brief moments of fine atmospheric seeing. Many astrophotographers will manually select the best frames from thousands one by one, but I’ll have to admit we’re often impatient and find the selection algorithm on Registax does an acceptable job of selecting the top 10% of images in a flash.

And like Photoshop, a college course could be taught around Registax. Don’t be intimidated, but do feel free to experiment! After stacking and optimizing, we find the true power in making the images “pop” often lies in the final step, known as wavelet processing. A round of sharpening and contrast boosting in Photoshop can also go a long way, just remember that the goal is to apply the minimum to get the job done, rather than looking unnatural and over-processed.



A photo mosaic of the historic Mars opposition of 2003.

At the eyepiece, the first target hurdle is object acquisition. A standard webcam can see after bright targets such as the Moon, the Sun (with the proper filter), planets and

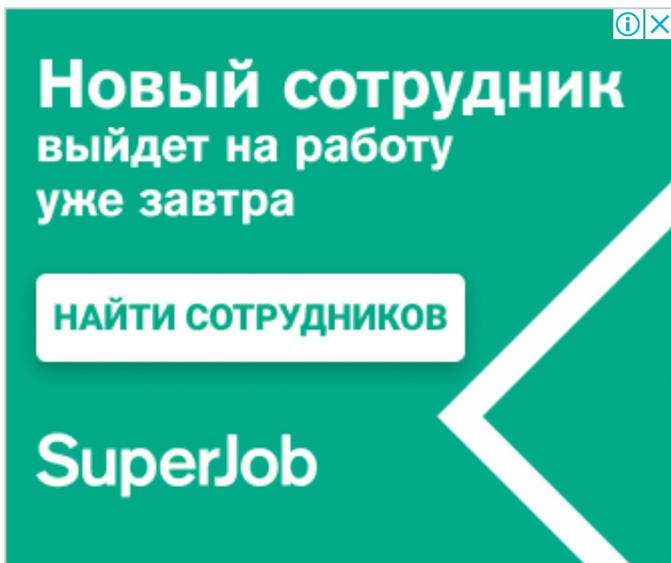
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Cassegrain typically yields a field of view about 10° on a side. You'll want to center the object in the eyepiece at the highest power possible, then plop the camera in place.



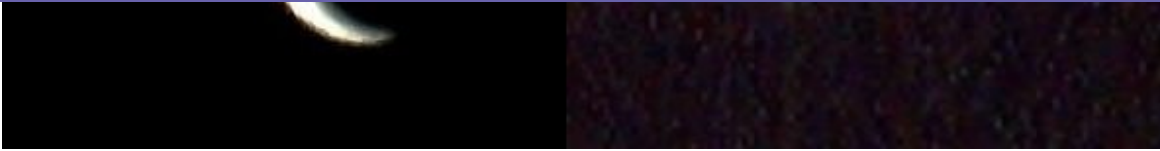
The next battle is centering and focusing the object on the screen. An out-of-focus planet scatters light: tweaking the focus back and forth sometimes reveals the silvery “doughnut” of the planet lurking just out of view.

From there, you'll want the object in as razor sharp a focus as possible. K3CCDTools has a great feature for this known as a Fine Focusing Tool (FFT). Some observers also using focusing masks, which can also be easily built — remember, were being cheapskates! — out of cardboard. Be sure those reflector mirrors are properly collimated as well.



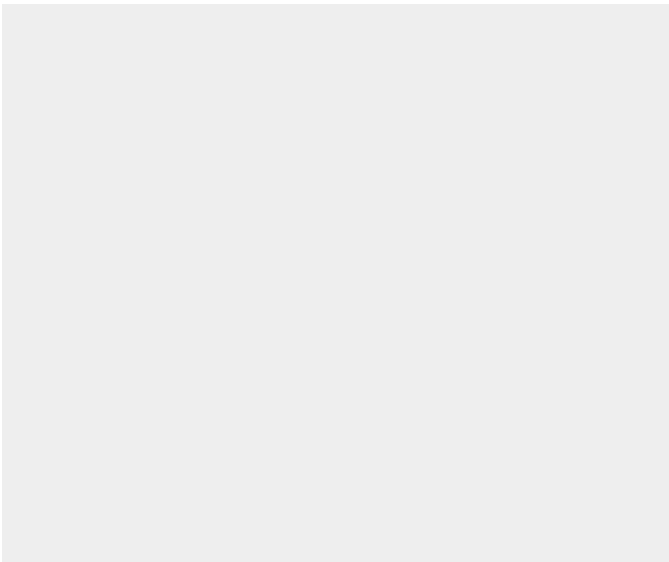
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Objects shot over the years (clockwise from the upper left): the close double star Porrima, Saturn, the International Space Station, and Venus.

Don't be surprised if the planet initially looks over-saturated. You'll want to access the manual controls of via the camera software to take the brightness, contrast and color saturation down to acceptable levels. I typically shoot at about 15 frames a second. Fun Fact: the "shutter speed" of the dark adapted "Mark 1 human eyeball" is generally quoted around $1/20^{\text{th}}$ of a second, slower than you'd think!



Note: all those thousands of frames of video go somewhere... be sure to occasionally clean them off your hard-drive, as it will swiftly fill up!

When you image makes a big difference as well. The best time to shoot an object is when it transits the local north-south meridian and is at its highest point above the horizon. The reason for this is that you're looking through the thinnest possible cross-section of the often turbulent atmosphere.

Universe Today reader Scott Chapman of Montpelier, Virginia also recently shared with us his exploits in planetary webcam imaging and his technique:

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A webcam image of the Mare Crisium region on the Moon. Credit-Scott Chapman

“Recently, while looking for an affordable basic telescope, to see if I really had any interest in astronomy, searches and reviews led me to purchase a 70mm refractor. The last thing on my mind was that I could expect to take any pictures of what I might see.

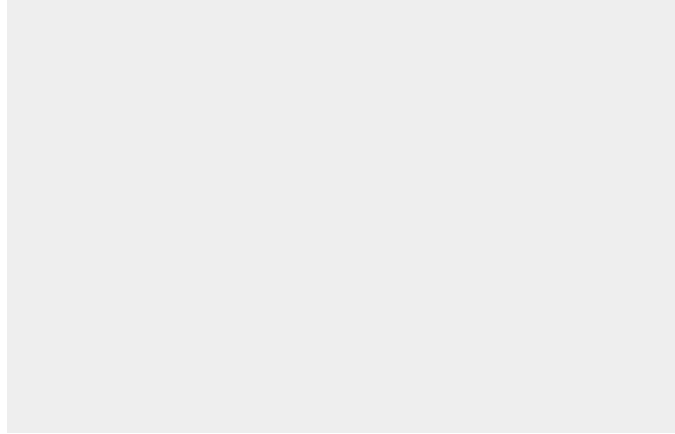
Previously, I had assumed that the only way to take even basic pictures of sky objects was with equipment that was way out of my price range. Imagine my surprise to learn that I could use a simple webcam that I already had sitting around!”

Like many of us mere mortal budget astrophotographers, Scott’s goal was great images at low cost. He also shared with us the programs he uses;

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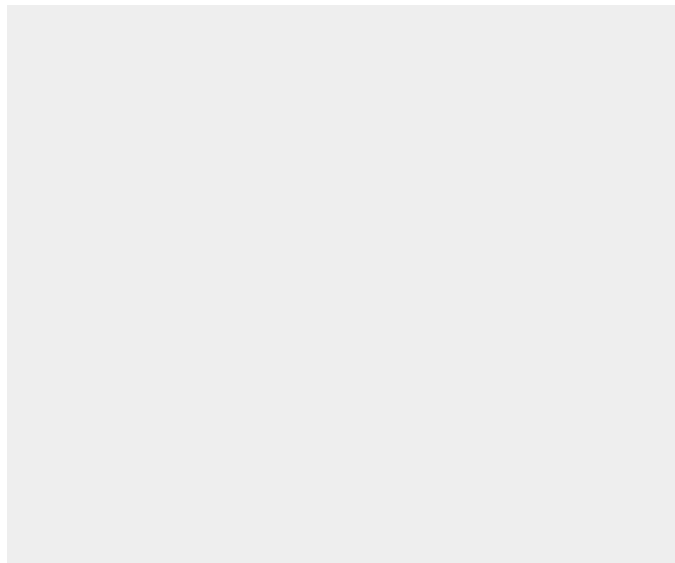
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-SharpCap2: For capturing .avi video files from the webcam connected to the telescope.

-VirtualDub: For shortening the .avi video.

-PIPP: For optimization of stacked images.



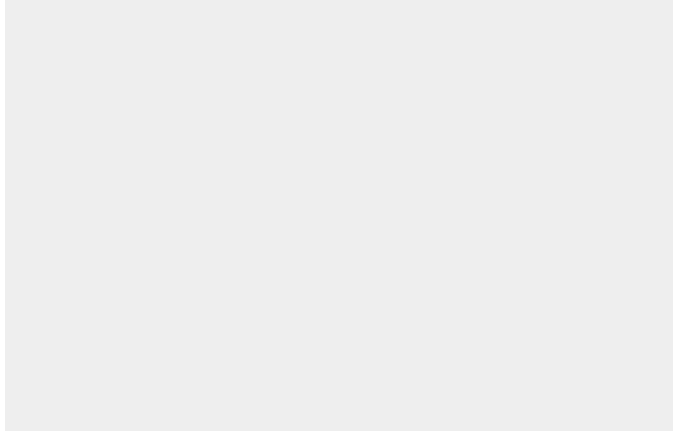
-AutoStakkert2: Selects and stacks the best frames into a single .tiff file using a simple 3-step process. Scott notes that its “MUCH easier for a beginner to use than Registax!”

-Registax6: The latest version of the software mentioned above.

-JPEGView: For final cropping and file conversion. (I sometimes also use ye ole Paint for this).

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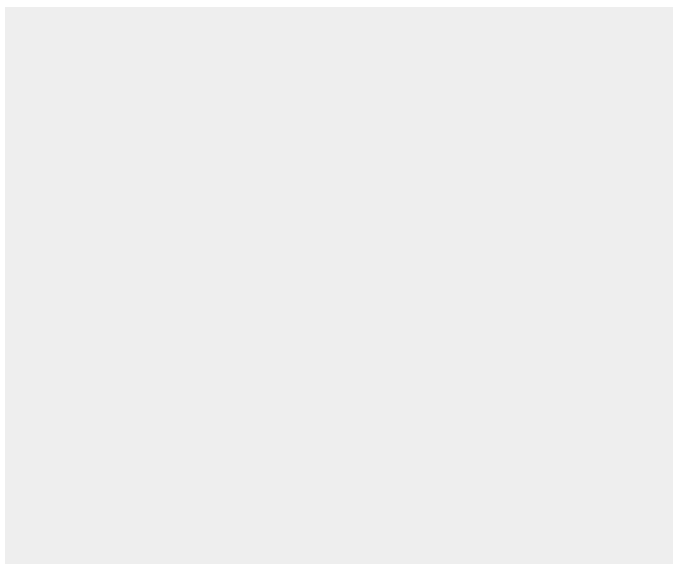
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Even after a decade of planetary imaging, some of these were new to us as well, a testament to just how far the technique has continued to evolve. Astrophotography and astronomy are lifelong pursuits, and we continue to learn new things every day.

The current camera I'm shooting with is a Logitech c270 that I call my "Wal-Mart 20\$ Blue Light Special." (Yes, I know that's Kmart!) Lots of discussion forums exist out there as well, including the QuickCam and Unconventional Imaging Astronomy Group ([QCUIAG](#)) on Yahoo!

Some observers have even taken to gutting and modifying their webcams entirely, adding in cooling fans, more sensitive chips, longer exposure times and more.



All great topics for a future post. Let us know of your trials and triumphs in webcam planetary photography!