



# REFLECTIONS AND

# REFRACTIONS

OF THE UNIVERSITY LOWBROW ASTRONOMERS

August 2004

## Upcoming Events

### August 2004

- **Saturday, August 7, 2004.** *May be cancelled if it's cloudy.* (Starting at Sunset.) Open House at Peach Mountain.
- **Saturday, August 13, 2004.** *May be cancelled if it's cloudy.* (Starting at Sunset.) Open House at Peach Mountain.
- **Saturday, September 4, 2004.** *May be cancelled if it's cloudy.* (Starting at Sunset.) Open House at Peach Mountain.
- **Friday, September 17, 2004.** (7:30PM). Monthly Club Meeting.
- **Saturday, September 18, 2004.** *May be cancelled if it's cloudy.* (Starting at Sunset.) Open House at Peach Mountain.

## Digital Imaging

by Doug Scobel

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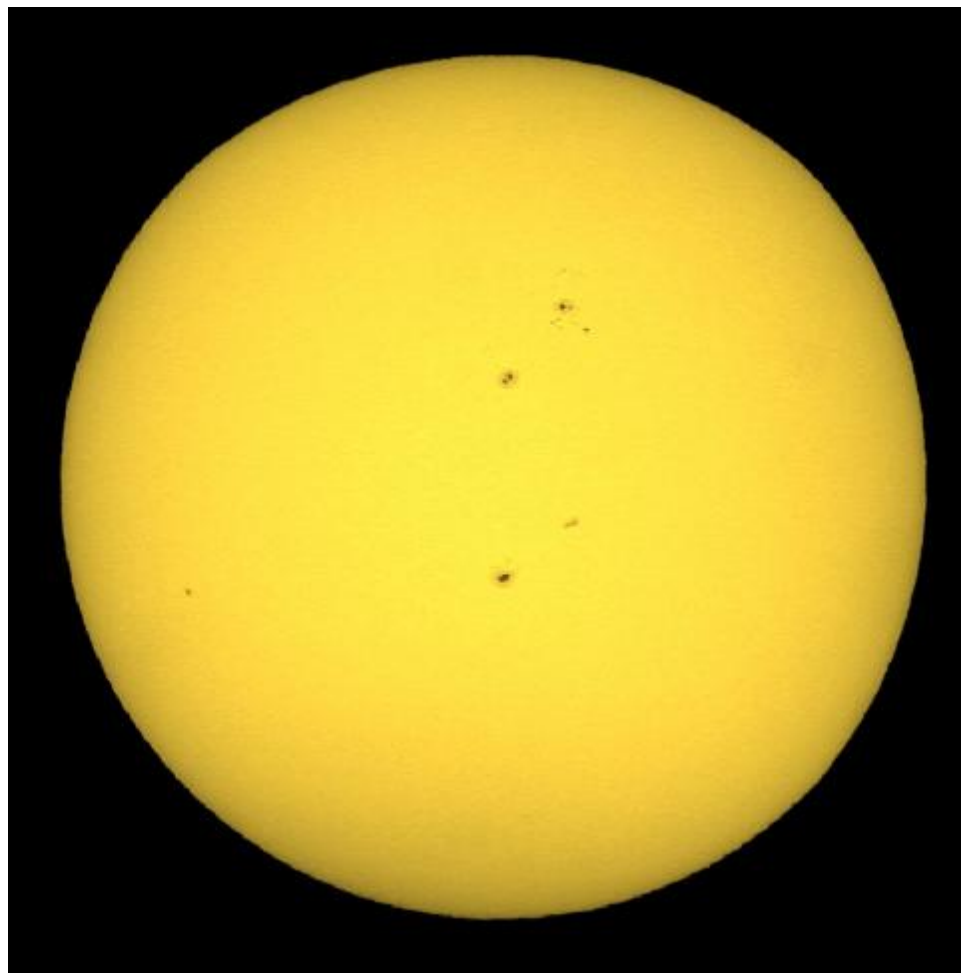
## A Film vs. Digital Footnote

by John Ryan

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# Digital Imaging The Lowbrow Way

*by Doug Scobel*



Have you ever looked at some of those amateur made digital images in *Sky and Telescope* magazine with a bit of envy in your heart? After all, it takes a lot of expensive equipment to take those kinds of pictures, doesn't it? At least that's what I thought until I actually tried it. What a surprise! I've found out that most anyone can take digital images (of certain subjects, anyway) that will make you look like an expert. And it won't cost you a couple mortgage payments to do it either!

## **The Camera**

First off, you will need a digital camera. But what

kind? What features do you need? Well, virtually any modern point-and-shoot digital with at least two megapixels will work. But a couple of features are desirable. The first is that you want a camera with an internally threaded lens housing. The camera manufacturer puts the threads there to accept screw-in accessories, such as macro or telephoto lenses. But for astro-imaging, these threads also accept available screw-in eyepiece adapters that let you attach the camera firmly to the eyepiece. Another desirable feature is that you don't want the camera's lens to move in and out of its housing as it zooms. If it does, and you have the camera attached to an eyepiece, then

the two could collide, damaging one or the other, or both.

Other features, such as time exposures, self-timer, settable picture compression (i.e., resolution) settings, and others, while common, are nice but not essential.

Fortunately, there is just such a camera available, namely the Nikon Coolpix 800. It is no longer being produced, but they appear regularly in online auctions for under \$100.00. It has 2.1 megapixels, 28mm internal threads on the lens housing (and there are commercial eyepiece adapters available with 28mm threads), and a non-moving 2x optical zoom lens. Also, being a Nikon, it has a lot of features and takes very sharp pictures, considering that most of today's cameras are 3 megapixels and up. I got mine, a Nikon factory reconditioned unit, on eBay for under \$90.00, including shipping. The amazing thing is that this camera sold new two or three years ago for around \$300.00 or more! I also purchased a 128 megabyte memory card for it, to be able to store more images, since the camera came with only a 16 MB card.

### **The Telescope**

Virtually any telescope will do. All I've used so far is my 8-inch f/8 "Mars Scope", but others would be just as good. You simply put an eyepiece in the telescope, focus it by eye, and then position the camera's lens up to the eyepiece in place of the eye. This is referred to as afocal photography, because the light coming out of the telescope is in effect parallel light rays – you need your eye, or in this case the camera, to create an image.

### **The Eyepiece**

Here you have to be a little more selective. Eyepieces with a long eye relief (the distance between the eyepiece's eye lens and your eye to be able to see the entire field of view) work best. If the eye relief is too short, then you'll have a hard time getting the full field of view into the camera lens, an effect called vignetting.

You also should start with medium to low-power eyepieces. If you use too much magnification, then the image brightness will go down to the

point where exposure times get too long. Start out with a low power eyepiece, which will also likely have a long eye relief. You may have to experiment with your eyepiece arsenal to see which ones work best.

### **The Subject**

Now if you want to take long time exposures of faint deep sky objects, then this kind of setup probably isn't going to give you good results. But taking decent pictures of the sun (filtered, of course), and the moon is almost as easy as falling off a log. That's because with those subjects there's plenty of light available, and exposure times are more than fast enough, in the 1/60 to 1/250 second range. At that speed, holding the camera by hand will still give you a sharp picture much of the time, plus you won't need a telescope drive. Planets and bright stars will require longer exposure times, and probably some kind of telescope drive to counter the earth's rotation. Some point-and-shoots will allow exposures up to a few seconds, but not the minutes that would be needed for even fainter objects.

### **Taking Images**

The idea is to get the camera lens up to the eyepiece, where you would normally place your eye during visual observing. The easiest way is to hold the camera by hand. But you have to be careful to hold it parallel to the focal plane, and center it on the telescope's exit pupil. Most digitals have a viewing screen so that you can see exactly what is going to be recorded. Once you get it so that it looks right, gently press the shutter. Now when hand holding, the slightest motion while the picture is being taken can result in a blurry image, so you'll want to shoot "early and often". You'll probably end up with a bunch of throw-aways, but you should also get some keepers that are good and sharp, and well exposed. The Coolpix 800 has a function where you can hold the shutter button down, and the camera will take a number of images, and automatically select the sharpest one. I haven't tried this feature yet though.

As I mentioned earlier, you can purchase adapters to attach the camera directly to the eyepiece. Most of them have a threaded ring that screws into the threads in the camera's

lens housing, and clamp onto the eyepiece, in effect making eyepiece and camera a single unit. For eyepieces that have a removable rubber eyecup, the adapter has set screws that clamp into the groove that the eyecup fits into. With others, the adapter simply clamps onto the eyepiece barrel with non-marring set screws. The nice thing about using an adapter is that alignment between eyepiece and camera lens is not an issue – it's automatic.

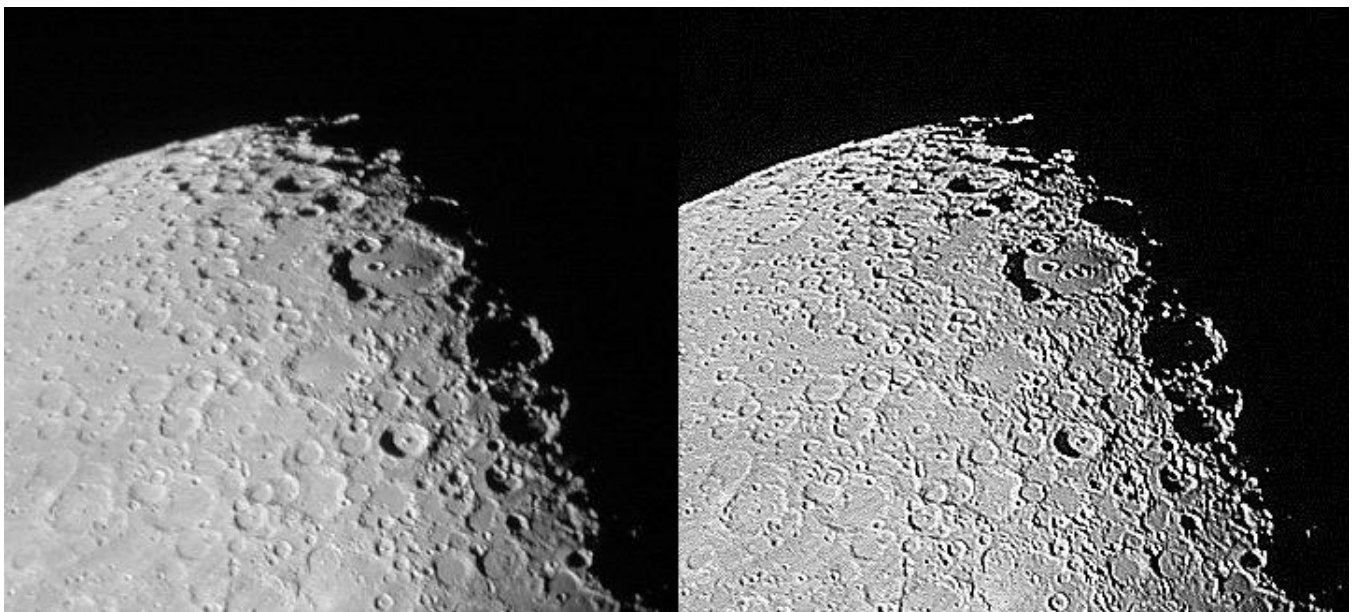
There are a number of companies that sell telescope-camera adapters. An outfit named ScopeTronix sells probably the best selection, letting you mate virtually any telescope to any camera. They even sell eyepieces with 28mm threads built in. No adapter is needed; you just screw the eyepiece directly into the camera's lens housing. TeleVue sells some camera adapters specifically for their eyepieces, for example an adapter designed for Radians. You can also find adapters that simply mount the camera to the telescope, with a couple articulated arms that let you position the camera in any orientation you wish. But with that kind of adapter it's up to you to get the camera properly aligned with the eyepiece.

Regardless of whether you are using an adapter or holding the camera by hand, there are a few camera settings to which to pay attention. For high contrast objects such as the moon or the sun, there's enough detail that you should be able to leave the camera in auto-focus and auto-exposure modes. If there is a way to turn off the camera's flash, then turn it off, as it

obviously won't do any good (duh!). Also, set the camera to its finest picture taking mode available, but remember that your camera's memory card capacity will dictate how many pictures you can take at a given resolution level. Still, it's best to capture as much detail as you can, because you can't create it later if it's not there. Speaking of detail, if you are using an adapter to mount the camera to the eyepiece, then there's less opportunity for blurring due to camera motion while the shutter is open. But pushing the shutter button could induce some camera shake, so use your camera's self-timer if it has one. That way your hands can be completely off while the image is being captured. Also, I've found that at least with my camera, I get the best results with the lens zoomed either all the way in or all the way out; intermediate positions tend to vignette. You may have to experiment some with zooming as well.

### Post Processing

After you take some photos, then you'll probably want to process them a little before showing them off. There are a number of software packages that let you spruce up your images a little. Nearly all have a way to sharpen them up, and/or adjust the brightness and contrast, and/or adjust the color. Be careful not to overdo the sharpening, though, as it makes the image look worse in many cases. Too much added detail looks artificial, because, well, it *is* artificial. Add just enough to bring out the detail without making it look fake. The picture below shows a good sharpness level (left), and too much added sharpness (right).





The number of such image processing programs precludes me listing them all here. I use an old shareware version of Paint Shop Pro with good results. Photoshop is another good package, but is a little more pricey.

Here's what I do with my images. First I remove the red and blue channels, leaving just the green. This removes any red or blue fringes due to any chromatic aberration. Then I convert the green image to grayscale, which will leave it too dark. I then adjust the brightness and contrast to make it look "normal" again, and then add just a little sharpening. With the moon, as a final step I'll usually add about 10% red and 5% green to make it look a little more natural than just a plain gray. The sun can be left gray, but some folks

think it looks better if it's yellow.

Also, there are inexpensive packages that will let you stack multiple images of the same subject. This method reduces noise and increases the amount of detail in the final image. I've not tried stacking yet, but used in conjunction with the multiple image capability of the Coolpix 800 it might provide sharper images. I'll have to try it sometime.

#### **Give It a Try**

So give it a try. You'll be surprised at you easily you can get excellent pictures of the sun and the moon, without costing you an arm and a leg. And isn't that the Lowbrow way?



# A Digital vs. Film Footnote

*by John Ryan*

Astrophotography, like most other areas of photography, is currently undergoing a major shift towards digital imaging.

The past year has seen a remarkable drop in price for many digital cameras. Cameras which cost \$3000 two years ago are now available for under \$1000, putting excellent technology within the reach of many users. Concurrent with the increasing availability of digital technology has been a decrease in the availability of film technology. Not only are very few new film products being brought to market, but both camera manufacturing and film processing have been scaled back. Kodak, a name synonymous with film, has laid off tens of thousands of employees and closed dozens of professional processing labs. At the end of August only seven of more than 20 Kodak professional labs will still be open.

Digital cameras don't do too much more than film cameras, but they create images that can be edited on a computer. Photographs taken with slide film can't be changed in their native state. Often multiple digital images can be layered or stacked to form a composite image with more detail than would have been attainable with film. And there's no chemical mess or lengthy wait with digital processing.

Film photography still trumps digital photography when it comes to long time exposures. Digital cameras are susceptible to 'noise,' the process of random information appearing on the imaging chip. Over time this 'noise' builds up and overwhelms any detail in the image. It's highly probable that a dusk to dawn time exposure taken with a digital camera would yield a completely white frame because so much noise had built up. Another impediment to taking long exposures is the capacity of digital camera batteries. Single Lens Reflex film cameras use little or no electricity to hold the shutter open, but digital cameras require electricity to power the camera through the duration of the exposure. Most batteries don't last more than a few hours.

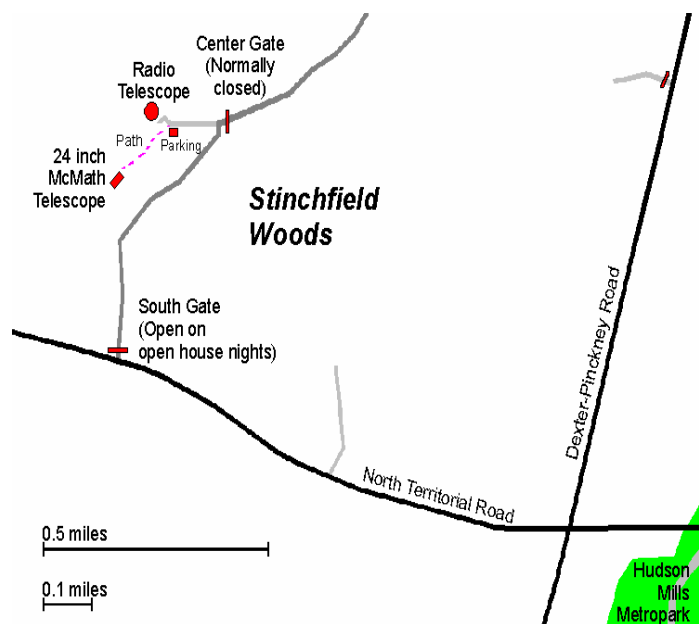
With the rapid rise of digital imaging, it is questionable how much longer film photography will still be a viable process. Some photographers prefer using film because they don't want to deal with the extra steps involved in editing or printing their images. Some fields—astrophotography, for one—still require film for making some images. As digital technology improves and continues to be more affordable, film purchasing and processing costs are likely to rise. One thing's for sure—with so many photographers making the switch to digital, the price of used film cameras will certainly fall.

## About the University Lowbrow Astronomers

The University Lowbrow Astronomers is a club of Astronomy enthusiasts which meets on the third Friday of each month in the University of Michigan's Physics and Astronomy building (Dennison Hall, Room 130 or 807). Meetings begin at 7:30 PM and are open to the public. Public star parties are held twice a month at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinckney Road; further directions at the end of the newsletter) on Saturdays before and after the new Moon. The party may be canceled if it's cloudy or very cold at sunset. For further information call (734) 480-4514.

## Places and Times

Dennison Hall, also known as The University of Michigan's Physics and Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. It is found in Ann Arbor on Church Street about one block north of South University Avenue. The meeting is held in room 130. Monthly meetings of the Lowbrows are held on the 3rd Friday of each month at 7:30 PM. During the summer months, and when weather permits, a club observing session at Peach Mountain will follow the meeting.



Peach Mountain Observatory is the home of The University of Michigan's 25 meter radio telescope as well as the University's McMath 24 inch telescope which is maintained by the Lowbrows. The observatory is located northwest of Dexter. The entrance is on North Territorial Road, 1.1 miles west of Dexter-Pinckney Road. A small maize-and-blue sign marks the gate. Follow the gravel road one mile to a parking area near the radio telescopes. Walk along the path between the two fenced in areas (about 300 feet) to reach the McMath telescope building.

## Public Star Parties

Public Open House/Star Parties are held on the Saturday before and after each new Moon at the Peach Mountain Observatory. Star Parties are canceled if the sky is cloudy at sunset or the temperature is below 10 degrees F. Call 4332-9132 for a recorded message on the afternoon of a scheduled Star Party to check on the status. Many members bring their telescopes and visitors are welcome to do likewise. Peach Mountain is home to millions of hungry mosquitoes - bring insect repellent, and it does get cold at night so dress warmly!

Amateur Telescope Making Group meets monthly, with the location rotating among member's houses. See the calendar on the front cover page for the time and location of next meeting.

## Membership

Membership dues in the University Lowbrow Astronomers are \$20 per year for individuals or families, and \$12 per year for students and seniors (age 55/+). This entitles you to the monthly REFLECTIONS newsletter and the use of the 24" McMath telescope (after some training). Dues can be paid at the monthly meeting or by mail to this address:

Kathy Hillig  
7654 W. Ellsworth Road  
Ann Arbor, MI 48103

## Magazines

Members of the University Lowbrow Astronomers can get a discount on these magazine subscriptions:  
Sky and Telescope: \$32.95 / year  
Astronomy: \$29.00 / year

For more information contact the club Treasurer. Members renewing subscriptions are reminded to send your renewal notice along with your check when applying through the club Treasurer. Make the check payable to "University Lowbrow Astronomers".

## Newsletter Contributions

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call or Email to Newsletter Editor at: John Ryan (734) 662-4188 [allegheny@mac.com](mailto:allegheny@mac.com) to discuss length and format. Announcements and articles are due by the first Friday of each month.

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**Lowbrow's Home Page**  
<http://www.umich.edu/~lowbrows/>



*A digital image captured by Doug Scobel. For more information on how you, too, can create similar images, turn to page 2.*



UNIVERSITY LOWBROW  
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Lowbrow's WWW Home Page:  
[www.umich.edu/~lowbrows/](http://www.umich.edu/~lowbrows/)

Check your membership expiration date on the mailing label.