



Spring 2003: No. 1

PULSAR

THE NEWSLETTER OF THE KITCHENER-WATERLOO CENTRE OF THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

Taking Your *First* Astrophoto

All you need is a manual camera, a tripod, and clear skies!

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In this Issue:

Taking Your First Astrophoto is Easier Than You Might Think!

Brady Johnson tells you how to take some pleasing pictures with a minimum of equipment, expense and effort.

The Club's New Nikon D1 digital SLR

John Kulczycki gives us an introduction to one of our new cameras - and it looks like a winner!

Where have all the good films gone?

Alen Koebel tells us of another great astro film that bites the dust.

A Recent Visit to a Hamilton Centre Meeting

Bernd Mueller talks about a recent trek to Hamilton with Jim Graham and Brady Johnson.

The Minolta Dimage Scan Dual III

Alen Koebel reviews our new 35 mm slide and negative scanner.



The California Nebula by Alen Koebel. A 30-minute exposure on E200 using a 6-inch f/5 Schmidt-Newtonian.

Editor's Corner

Welcome to a brand new Pulsar. Major changes and growth in the Kitchener-Waterloo Centre over the last few years have required that its newsletter also change to keep pace. The spiffy new layout you're looking at was created by Brady Johnson, whose obvious visual design skills must be added to a long list of other talents.

My job as editor is to keep that layout filled with articles that are both interesting and relevant to you, the members of the KW Centre. But I can't do it alone. If you've done something in the hobby,

attended an astronomically related event, or just want to share what you know, why not write an article about it? Don't worry if you feel you have no writing skills; helping you sound good is part of my job description. I extend special encouragement to the observational enthusiasts, amateur telescope makers and armchair astronomers in the club; without your input, the Pulsar will be over-run with articles about astro-imaging - my particular interest. Fair warning!

Alen Koebel, Editor

RASC KW Centre

<http://kw.rasc.ca>

ROYAL ASTRONOMICAL SOCIETY OF CANADA

Centre News

Grade-Sixers Get Astro Talk

On February 4th John Kulczycki and Brady Johnson had the opportunity to visit Glencairn Public School in Kitchener at the invitation of Principal Sue Mark and science teacher Rob Wilkie. They had been invited to offer the ninety grade-six students at the school a chance to ask questions about astronomy, and to show them some of the equipment used in the hobby. Armed with a 254 mm (10-inch) Schmidt-Cassegrain on a German equatorial mount, a 90 mm refractor, a 114 mm demonstration reflector and two sets of binoculars, they set up a display area to show differing powers of magnification and fields of view with the instruments.

Their instructional display consisted of a black and white chart showing all the Messier objects, a white board for illustrating telescope styles and optics, and assorted books and magazines. John gave an excellent presentation that generated many great questions by the students - and even a few great answers by John!

The enjoyable 90-minute presentation ended far too soon for both the students and the presenters.

A Recent Visit to the Hamilton Centre

by Bernd Mueller

On February 6th, I accompanied Brady Johnson and Jim Graham to a meeting of the Hamilton Centre where Brady gave a talk on the subject of wide-field CCD imaging.

The Hamilton Centre's meetings are usually held in the Hamilton Museum of Steam and Technology, just off the Burlington Skyway. We arrived early, having given ourselves extra time to find

the place. There was only one member present when we got to the meeting room. He assured us the meetings usually started promptly but was at a loss to explain why more members weren't present. (It turned out that for some reason his clock was running an hour fast.) When more members finally showed up, I took the opportunity to chat with some of them. As



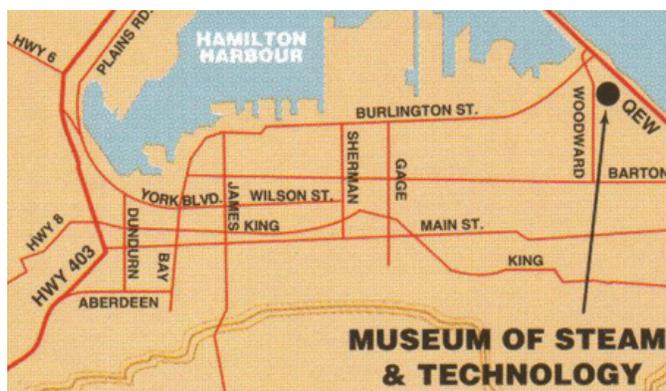
Bernd and Jim managed to finally wrangle this 35 mm Panoptic away from Brady, ignoring Brady's protests that "it is my gift for being the guest speaker".

in our club, some were veterans of the hobby while others were just getting their feet wet. While the Hamilton Centre has about 140 members (slightly more than

ours), only about 30 to 40 attend any given meeting.

The meeting started off similar to our own, with a discussion of business and sale of raffle tickets; this month the prize was an astronomical calendar donated by Steve Barnes (a member of the Hamilton Centre and also the owner of Sky Optics in Burlington). It was also announced that the March meeting would be moved up to the last Thursday of February to accommodate the schedule of speaker Rajiv Gupta, the RASC national president. (*Rajiv gave this talk to the KW Centre the next evening.* - Ed) It was then time for our eminent vice president to give his presentation on wide-field CCD imaging using camera lenses. The talk was very informative (Jim nodded off only once - just kidding!) with Brady illustrating step-by-step the procedure for acquiring the data to produce his images.

Brady's presentation was well received and there were some good questions afterwards. (Funny, no one asked him how to spell "CCD.") I look forward to seeing this same presentation at one of our own monthly meetings soon. The president of the Hamilton Centre then presented Brady with an honorarium of a Tele Vue 35 mm Panoptic eyepiece. (Not really, but Brady did come home with one after purchasing it for our club from a Hamilton Centre member.) The meeting was then adjourned and we followed about a dozen members to a nearby Kelsey's for food, drink, and some good conversation.



Hamilton Centre meetings are held in the Museum of Steam and Technology, usually on the first Thursday of the month. Members from all RASC centres are welcome. According to Brady, they give the best gifts to guest speakers of all the RASC Centres across Canada.

Feature

Taking Your First Astrophoto

by **Brady Johnson**

What will be the subject of your first astrophoto? The answer depends largely on the equipment you have available to you. In this article we'll review two of the simpler types of images you can take with just a film camera, tripod and cable release. Even with this very basic setup you can take some pleasing astrophotos.

Planet and Constellation Portraits

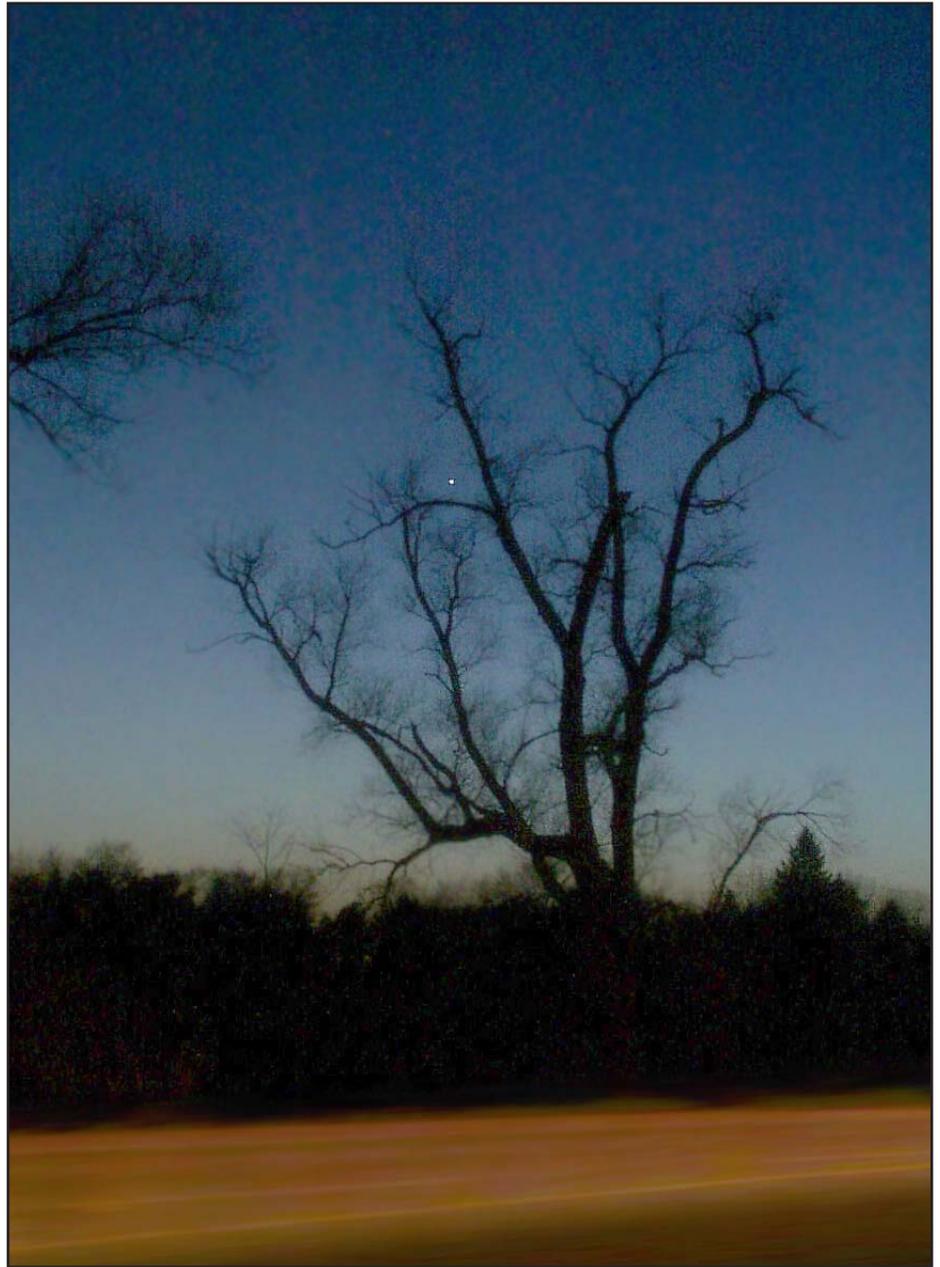
Portraits are a great starting point for anyone new to astrophotography. To take a portrait you simply need a standard (50 mm) or wide-angle (e.g., 28 mm) lens, a medium-to-fast film (400-800 ISO), a sturdy tripod, and a shutter release cable.

Mount your camera on the tripod and aim it so that you have subject framed the way you want it. Then, using your cable release, expose your shot either counting it down or timing it with a watch.

If you want an image with dots for stars (i.e., free of any trailing), limit your exposures to about 15 seconds for subjects near the Celestial Equator (0 degrees declination), or about 30 seconds for subjects near the Celestial Poles. The shorter the focal length of your lens, the longer you can expose without getting trails. This makes focal lengths longer than 50 mm unsuitable for portraits done using a camera on a tripod. Longer focal lengths require *reduced* exposure times to avoid trailing, leading to severe underexposure in your picture.

Get to Know Your Camera

When first starting out, take several pictures of the same exposure but with your lens wide open, 1-stop down, then 2-stops down from fully open. This will give you feedback on how well your lens performs for astrophotography. You are



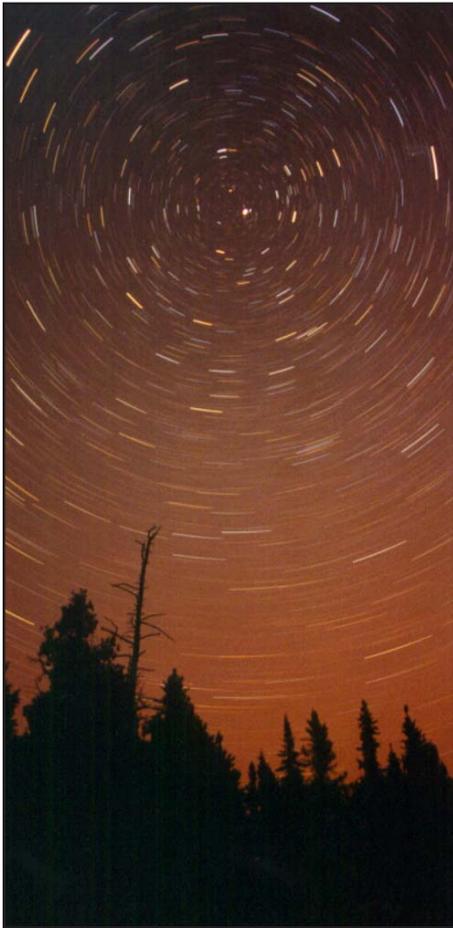
Venus is the lone "star" in this camera-on-tripod digital camera image taken by the author.

likely to find that wide open it produces too much vignetting (darker at the edges of the picture than at the centre). You will also likely find that stars near the edges of the field are distorted in shape, and brighter stars may have colour halos. These effects are all due to optical aberrations common in consumer grade camera lenses. By "stopping down" your lens you can reduce these effects quite

dramatically. Next time out, then, you'll know just what settings to use.

Star Trails

With the same equipment as described above you can take long exposure images for the purpose of creating streaks (star trails). The trailing is due to the movement over time of the earth as recorded by a camera that is moving with it.



Star trails by Perry Cash, near New Liskeard, Ontario. An interesting foreground adds a lot of drama to the picture. Twenty-minute exposure with a 28 mm lens at f/2.8.

Star trails can be recorded with exposures from a few minutes to several hours. Unlike portraits, you should use a slow speed film for star trails, and set your f-stop to somewhere near the middle of the range for your lens. This will give you better optical performance, and the slower film will give higher contrast and less grain in the final picture.

To get nice round star trails you'll need to point your camera at the North Celestial Pole (NCP), which is just next to Polaris. The farther you point from the NCP the flatter your trails will be. If you point your camera at the Celestial Equator, your trails will look like straight lines streaking across the sky.

What about Digital Cameras?

Digital cameras are not well suited for star trails as they are unable to expose long enough. They should work fine for constellation portraits though, especially if you can expose for up to 30 seconds or so. If you have a digital camera with suitable exposure controls, then by all means, mount it on a tripod and give it a shot!

Imaging

Another One Bites the Dust

by Alen Koebel

Good colour films for deep-sky astrophotography are hard to find. The best have fine grain, are reasonably fast, and have good reciprocity characteristics (indicating that the film maintains its ability to collect light over long exposures). Most importantly, they are sensitive to the spectral lines typical of emission nebula (primarily hydrogen alpha) and, ideally, are also sensitive in the blue end of the spectrum, a prerequisite for photographing galaxies and reflection nebula (e.g., the nebula surrounding the Pleiades). Not many films measure up. It doesn't help that manufacturers like Kodak and Fuji, the two largest, routinely improve their film formulations to make them better for everyday photography, in the process almost always making them worse for astrophotography.

The latest film to be so "improved" is Kodak Professional Supra 400. The new formulation will eventually be sold under the new name Royal Supra 400 but for now Kodak has been shipping it under the old name, with an "Improved Colour" starburst on the box. According to recent posts by members of the Astro-Photography Mailing List (APML), the new formulation has essentially no red response, making it useless for photographing emission nebula.

Supra 400 is only the latest casualty in a general move by Kodak to convert most of their colour negative films to "improved short red sensitivity" formulations, in which the peak red response is moved from 650 nm down to around 615 nm. Kodak claims this results in better skin-tone reproduction, as well as more accurate colours overall. Unfortunately, it also leads to very poor response at the critically important HII emission wavelength of 656 nm. While it's understandable that Kodak would make changes to try to prop up their film sales in this age of digital photography, it's unfortunate that it has to be at the expense of amateur astrophotographers.

So what colour films are left for long-exposure, deep-sky photos? A few colour negative films, such as Kodak Royal Gold 200, still have the old red response (for now!) but are too slow unless they are gas-hypersensitized, a process that can improve their sensitivity over long exposures by soaking in a special gas mixture at an elevated temperature. However, this isn't a practical solution for everyone.



It's the end of the roll for Kodak Professional Supra 400, another casualty of the manufacturer's quest for the ultimate *daylight* film.

The only other choices are slide films, in particular Fuji Provia 400F and Kodak Elite Chrome 200 (or its professional counterpart Ektachrome E200). Kodak actually recommends E200 for astrophotography, which implies that it does recognize the value of the old red response for this application. But that's no guarantee the company won't "improve" the film into astro-oblivion in the future. Keep your fingers crossed!

Equipment

The Nikon D1 Digital SLR Camera

by John Kulczycki

[The KW Centre recently purchased a used Nikon D1 camera, along with a number of accessories. The D1 is a 2.7 megapixel camera producing 36-bit images (12 bits per colour) with a pixel format of 2000 x 1312. This is an older model: Nikon currently offers the improved D1H and the up-market D1X, the latter with twice the number of CCD pixels. Although discontinued, the original D1 remains one of the best and most versatile digital cameras around. -Ed]

The Nikon D1 is a professional digital SLR camera capable of producing pictures of print media quality. The D1 has been the mainstay of newspaper photojournalists for a number of years. As such, it is a heavy camera with robust construction, as one would expect of equipment built for the bump and grind of everyday use by photojournalists. Weighing 1.1 kg without batteries (about 2.5 lbs.), the camera may need to be counter balanced when used for astrophotography.

Using digital media for photographic purposes allows for far more options in image capture than possible with film based cameras. Because of this, some users may get frustrated with the D1 when faced with making decisions on what options to use or how to set up the camera. The best way to avoid this frustration is to read over the manual with the camera close at hand.

I won't get into how to use the D1 for astrophotography because your own results will be dictated by what software you use to process your images. I do encourage you to get hold of the camera and experiment with it. The greater the number of approaches we have on using it the more flexible a tool it becomes.

The camera stores images on a CompactFlash memory card that fits in a slot in the right side of the back of the camera.



The Nikon D1 digital SLR takes Nikon compatible lenses, and came with an outstanding 70-300 ED Nikon Zoom Lens. This will be an outstanding planetary camera when used at prime focus.

The slot is protected by two doors and a latching mechanism. As purchased, a 64 megabyte card was included with the camera. The club's purchase also included a Lexar Medial "Jumpshot" memory card reader. This attaches to your computer via a USB port. You may need to download a driver for the Jumpshot depending on your particular computer.

Once the card reader is installed on your computer as a removable media drive, you simply insert the memory card into the reader's slot and the Nikon View software (a standard accessory included with the D1) puts up a screen with thumbnail images on your computer automatically, allowing you to select the images you want to download from the card. You can then load the images into the image processing software of your choice. [The latest Windows and Macintosh versions of Nikon View can be downloaded from Nikon's web site. -Ed]

A rechargeable battery system was also included in the purchase. This consists of a removable battery pack located in the base of the camera and an external charger.

Also purchased with the D1 was an AF Nikkor 70-300mm F4-5.6 ED Auto Focus lens, which mounts to the D1 body using a standard Nikon bayonet mount. The lens is a standard Nikon product not specific to the

camera. Most F-mount Nikkor lenses will work with this body. The bayonet mount will also accept the appropriate Nikon "T" ring adapter for photography through a telescope. The body itself has a standard ¼ inch screw hole in the base, allowing piggyback or barn-door photography.

The left side of the camera back features a 2-inch diagonal colour LCD that allows the user to review images, once they are stored on the memory card. It also displays the camera's menus, from which its many options and operational settings are chosen.

Although the camera features auto exposure, TTL flash and auto focus, most astrophotographers will want to use the camera in full manual mode. ISO speed can be set as on a conventional film camera, as can shutter speed. Aperture can be manually assigned as well. The only difference is the media used for creating the image. ISO film speed settings range from 200 to 1,600. Shutter speeds range from 1/16,000 of a second to 30 seconds, with several astronomically useful settings longer than one second. A "B" (Bulb) setting is also available.

The camera includes an "anti-vibration" mode. In this mode the camera will capture an image after the shutter has been released, minimizing mirror shock. There is also a "mirror up" setting that is primarily used for cleaning the CCD but it does not appear that this mode can be used to produce an image.

A very comprehensive review of the camera's features can be found online at www.dpreview.com/reviews/nikond1.

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a lot more
from your
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Equipment

The Little Film Scanner that Could: Minolta's DiMAGE Scan Dual III

by Alen Koebel

Thanks to our recent wave of equipment purchases, the KW Centre now has a new 35 mm film scanner: the Minolta DiMAGE Scan Dual III. One of the newest scanners on the market, it has very good specifications yet costs much less than other models with similar capabilities (about \$500 CDN). Given its comparatively low price, how well can it really perform? I had a chance to find out recently during a couple of "marathon" sessions in which I scanned dozens of astrophotos (mostly slides but also some black-and-white negatives). Here's what I discovered.

First of all, the Dual III uses USB 2.0 to connect to a host computer instead of the SCSI or IEEE 1394 (FireWire) interfaces common on older scanners. USB 2.0 is just as fast, and has the advantage of being backward compatible with the slower USB 1.1, which almost all PCs and Macs include nowadays (only the newest have 2.0, but you can buy a card to add it). Minolta claims full-resolution scans can be done in as little as 30 seconds when using 2.0. Since my PC is equipped only with 1.1, my full-resolution scans took longer - about 60 seconds, which was still quite acceptable.

The scanner comes with several pieces of software. There is an Easy Scan utility for novices, which is very simple to use but too limited for astrophotos. The main application, and the one I used exclusively, is the cunningly named Dimage Scan. It's a full-featured scan utility that provides a multitude of adjustments for getting the best out of your scans (but you don't have to use all of them - more on that below). The final piece of software to round out the package is Adobe Photoshop Elements,

which I did not try. Dimage Scan can be run stand-alone or as a plug-in for either Elements or the full-blown Adobe Photoshop.

One software-based feature that is conspicuously absent from the Dual III is Digital ICE, a technology licensed from Applied Science Fiction and available on

for the "Dual" name, a holder for APS (Advanced Photo System) film is also available at extra cost (we did not buy it). I found both the slide and the film-strip holders easy to use. However, the film did not lay as flat as I would have liked in the latter.

One aspect of the Dual III that makes it particularly well suited for scanning astrophotos is its ability to digitize at 16 bits per colour channel (48 bits in total). Other scanners in its price range typically use only 12 bits (36 bits total). Eight bits per colour channel (24 bits total) is standard for images to be printed or



The Dual III does a great job on astrophotos. Too bad it doesn't do medium format!

more expensive scanners. It automatically removes dust, scratches and other surface flaws as the film is scanned. Minolta has elected to replace it with a less expensive, in-house-designed feature in Dimage Scan called Auto Dust Brush. Reportedly, this doesn't work nearly as well as Digital ICE. In any case, if you handle your slides and negatives carefully and keep them clean, you shouldn't need to use it much.

The Dual III comes with two film holders: one for 35 mm slides, up to four at once, and the other for 35 mm film strips with up to six frames. Accounting

viewed on a monitor, but a scanner needs to use more than this internally, even if the scans are ultimately saved as 8-bit files. In general, the higher the number of bits, the more information the scanner can potentially capture from the film, and the "deeper" it can penetrate into the darkest areas of the film while still faithfully recording the brightest areas.

The Dual III has three scanning modes; 8-bit, 16-bit and 16-bit linear. The last is its native mode; the other two just process the 16-bit linear data digitized from the internal CCD detector according



This image is the result of an Index Prescan for slides, which scans all four positions in the slide holder at low resolution. All photos by the author.

to user adjustments. The technique for making the adjustments needed for astrophotos (which aren't like regular photos) is well described in an article by Jerry Lodriguss in the February issue of *Sky & Telescope*. Since I had a lot of photos to scan and couldn't afford the time required to do that, I elected to use the native 16-bit linear mode and make the adjustments later in another program (specifically, *Picture Window Pro 3.1*). In my opinion, it's better to start with 16-bit data for image manipulation in any case.

The optical resolution of the Dual III's CCD detector is 2,820 dpi. For a 35 mm frame, this produces an image size of 4,032 x 2,688 pixels (nearly 11 million pixels in total). I found that this easily resolved the film grain in Kodak Elite Chrome 200 slides. I suspect it would also resolve the grain of typical 100 ISO films, but not the extremely fine grain of black-and-white Technical Pan. That would likely require a 4,000 dpi scanner, which besides being considerably more expensive than the Dual III would produce truly gargantuan file sizes in comparison. A full-resolution 16-bit file from the Dual III is large enough at 62 megabytes!

The Dual III has a number of automatic features, including auto-exposure and auto-focus. I found in general that it was better to turn these off. The unique nature of astrophotos fools both of these features into using the wrong settings. I usually needed to manually set the exposure control to neutral ("0") to avoid saturating the brightest features in each image, except for a few very weakly exposed slides that tolerated a higher



Detail from a scan of M42, magnified here about 15x. No processing of the linear 16-bit scan was done beyond gamma correction. Note that film grain is resolved and that there are none of the artifacts sometimes seen with other scanners (including some earlier models from Minolta). Photo by the author.

setting. Similarly, rather than use the scanner's auto-focus I usually opted for the manual mode, which provides an on-screen slidebar for feedback of the best setting. I later discovered that the auto-focus system could be made to work well if I instructed it to focus in an area with some actual detail instead of in the center of the frame (the default) where it usually saw only sky background.

Another feature of the Dual III I did not use is multi-sample scanning. This scans the film two, four or eight times and automatically averages the results. This feature is intended to reduce any noise inherent in the scanner's electronics, but at the cost of much longer scanning times. After comparing a few test scans I couldn't see any real difference with up to four passes even in the darkest areas of the

slide, which suggests that the electronics has very low noise.

The only real problem I encountered with the Dual III was how it scanned black-and-white negatives. When I tried to scan a few frames that I had taken many years ago on Kodak Tri-X, a lot of the detail and smoothness visible in the originals near black was lost. I could only get it back if I scanned the film as a black-and-white positive and inverted the resulting image in *Picture Window*. Although I didn't scan any colour negatives, this problem likely doesn't apply to them otherwise I would have read about it in other, more extensive reviews of the scanner for general photography. One of the best of those reviews can be found online at www.imaging-resource.com/SCAN/DSEIII/DSEIIIA.HTM.

In conclusion, aside from a few minor niggles, the Dual III is an excellent film scanner, especially for the price. It is a worthy addition the KW Centre's arsenal of astro-equipment.

Dual III Film Scanner

Performance and Features Summary

- 35 mm or APS film
- 2,820 dpi
- 16-bit A/D conversion
- Dynamic range (Dmax): 4.8
- Cold-cathode fluorescent lamp
- Output of 8 or 16 bits per colour channel
- 2x, 4x or 8x multi-sample scanning
- Auto and Manual focus
- USB 2.0 (compatible with USB 1.1)

Want to be rich and famous?

You won't become either writing for the Pulsar. But, you will get a great deal of personal satisfaction and win the respect of your fellow club members. So why not give it a try? Contact the editor at alen_koebel@yahoo.ca to find out what the Pulsar needs for upcoming issues or to pitch your own article ideas. Submission guidelines will be available in the near future on the club's web site.

UPCOMING EVENTS

National Dark Sky Week (US)
April 1 to April 8
(www.nationaldarkskyweek.htmlplanet.com)

Texas Star Party
April 27 to May 4
Prude Ranch near Fort Davis, Texas.
(www.texasstarparty.org).

Frozen Banana Star Party
May 1 to May 4
Munro Park, Powassan, Ontario
Sudbury Astronomy Club
(www.sudburyastronomy.com).

KW Centre Astronomy Days
May 2 and 4, Conestoga Mall
(to help, contact Anita Burns,
burns@mjburns.net)

KW Centre Public Star Night
May 6, 6:00PM to 12:00PM
(rain date May 7)
Waterloo Park, Waterloo, Ontario

International Astronomy Day
May 10
(www.astroleague.org/al/astroday/astroday.html)

RASC General Assembly
June 27 to June 29
Vancouver, BC
(www.rasc.ca/ga2003)



In Coming Issues ...

- Reflections on Starfest
- Barndoor Astrophotography
- Equipment Reviews:
 - William Optics GT-1 GOTO EQ Mount
 - Tele Vue Genesis 4" APO Refractor
 - SBIG ST8XE and CFW8
 - Coronado Solar Max
 - Meade 14" LX200GPS SCT
 - Meade 10" SN and LX255 Mount

and lots more ...

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The KW Centre of the Royal Astronomical Society of Canada meets the second Friday of every month, excluding July and August. Meetings are held in the Science Building at Wilfred Laurier University, Waterloo, Ontario. All are welcome.

Want to join?

To become a member please call John Beingessner at 519-884-2425