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University Lowbrow
Astronomers

May 2006

Volume 30 Issue 5

Shooting M42: Part 1

An Introduction to Digital Deep-Sky Photography

David P. Tucker

A few weeks back I sent out an image I took of M42, along with a short description of how the image was made. Several club members e-mailed me to so they they were impressed with the image, and mildly annoyed that I hadn't saved the "making of" bit for the club newsletter. Reading this, It occured to me that I had kept the "making of" short and sweet for the benefit of the non-astronomers on my mailing list, but but I could do something a lot more detailed for the club newsletter. And so here it is, the original text plus the special extended "making of" featurette.



To the naked eye, M42 looks like a fuzzy star on Orion's sword. Through a small telescope, It begins to look like my picture, although it is difficult to see color because of the low brightness level (we are all effectively colorblind at low light levels). The object is described by astronomers as a huge star-forming region or "stellar nursery", where a huge cloud of stellar gas is condensing to form hundreds of new stars (including the ones visible in the image). Much higher resolution images taken from the Hubble telescope additionally show disks of dust and gas called "proplyds" forming around many of these new stars; these are believed to be embryonic solar systems. The object is believed to be about 1,600 Light years distant and about 30 Light Years across, and covers an area of sky about the size of the full moon (only the core is visible to the naked eye). It glows rose red due to ultraviolet light given off by the new stars causing surrounding hydrogen gas to Fluoresce (that rose red color is called the Hydrogen H-Alpha line).

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David Tucker—Astrophotographer

Important Club Info

- May 19 – University Lowbrow Astronomers' monthly meeting 7:30pm room 130 Dennison Bldg.
- May 20 – Public Open House at Peach Mt. Observatory starts at dusk
- May 27 – Public Open House at Peach Mt. Observatory starts at dusk
- June 2—3 Kensington Summer Star Gaze (Kensington Metro Park) 6pm to midnight
- June 16 – University Lowbrow Astronomers' monthly meeting 7:30pm room 130 Dennison Bldg.
- June 17 – Public Open House at Peach Mt. Observatory starts at dusk

Shooting M42: How this image was built: Equipment Used

My Camera:

My Camera is called an AtiK 2HS, from Atik instruments in Portugal (<http://www.atik-instruments.com/>), sold in the US by Adirondack Video Astronomy (<http://www.astrovid.com/>). It is essentially a Phillips "ToUCam" webcam which has been modified to allow it to take long exposure images, which is not possible using an unmodified webcam (in essence, it is modified so that your computer's parallel port can drive the CCD's (Charge Coupled Device – the light sensor array chip which forms the heart of the camera) internal timing, replacing the existing circuitry). They have also added a cooling fan, and replaced the 1/4" color CCD sensor chip with a 1/3" monochrome chip. Monochrome chips are inherently more light sensitive than comparable color chips (and can still be used to take color images, as will be described later), and the larger chip area makes for a larger field of view (also discussed later). The camera has a resolution of 640x480.

Overall I think it is pretty comparable to the Meade DSI pro (which was not available at the time I purchased the 2HS), although the Meade was designed specifically for Astrophotography – it is not a modified webcam.



Clockwise from upper left: Camera with nosepiece removed, Filter Wheel, Kendrick "KwikFocus"

My Scope

All of my images are taken with a mid-1980's vintage Televue Genesis Refractor ("Jenna"). The Objective lens is 4" in diameter, and it has an effective focal length of 20". It has four internal lenses, three made from glass and (I believe) one cut from Fluorite crystal. It was designed by Al Nagler (who still returns phone calls), and built at his small factory in Pearl River, New York. It is shown with CCD camera and RGB filter wheel mounted.

Why I love this scope for Astrophotography:

In CCD photography, your telescope's objective basically is used like a camera lens, focusing light gathered from the object being imaged directly onto the CCD chip. There are normally no intermediate lenses (although Barlow's and Focal Reducers can be used), and hence the distance from the objective to the chip surface should exactly equal the focal length of the object lens or mirror. The magnification, or more appropriately the field of view, depends only on the size of the chip surface and the focal length of the telescope. The specific relationship (with due apologies to the mathematically impaired) is:

$$S = 3438 * D / F$$

Where S is field of view in Arc Minutes, D is the chip diameter in millimeters, and F is the scopes focal length in millimeters. So, for example, the chip in my 2HS is about 4.4 mm wide by 3.3mm high and my Genesis has a focal length of 500 mm, giving a field of view of about 30 by 22 arc minutes, roughly the size of the full moon. My 10" F/6 Dob has a 1500mm focal length, giving it a FOV of about 10 by 7 Arc minutes, which is fine for planetary work, but too small for deep sky work. It's also important to notice that with a long focal length and small detector, the great majority of photons collected by your Objective lens or mirror are just going to whiz right by the sensor chip, essentially completely wasted. A Photon is a terrible thing to waste, especially if it's traveled thousands of light-years. The full moon has an area of about 700 square Arc Minutes, but only 10% of this would fall on the CCD chip if imaged in my Dob (compared to about 90% if the moon were imaged on the Genesis). The rest of the light collected is wasted. The big take away here is that for photographing extended objects, short focal length beats big aperture. The "Focal Ratio" of a scope is simply it's focal length divided by its aperture (i.e. objective diameter), and the lower the focal ratio the more photons the scope will collect in a given span of time (hence the term "fast" for scopes around F5 or lower, and "slow" for scopes with higher ratios). A scope with a focal ratio of F5 (like my Genesis) will collect photons about twice as fast (assuming a uniformly illuminated field) as an F7 scope, regardless of how small the F5 is and how big the F7 is (specifically, the rate is inversely proportional to the Focal Ratio squared). Many of the best Wide Field images are taken with objectives on the order of 60 to 80 mm, much too small for visual deep sky work. And scopes we would traditionally use for visual deep sky imaging (i.e. big Dob's) are usually poorly suited to deep sky imaging because of their long focal length's (somewhat surprisingly, they may be better suited to planetary imaging).

To easily determine the FOV for an arbitrary camera/telescope pair, download the Ron Wodaski's freeware program CCDCALC.exe (available from the Adirondack Video Astronomy Site http://www.astrovid.com/ccd_calc.php).

Finding My Focus:

In the paragraph above, I stated that the correct distance from the objective lens/mirror to the CCD chip in the camera (again, in the absence of a Barlow or Focal Reducer) should precisely equal the scopes focal length. In practice, precise focus is extremely critical to taking sharp images, and is particularly difficult to achieve on faster scopes (which are more sensitive to minute changes to focus position – see, for example, Ron Wodaski's book "the New CCD Astronomy" if your wondering why). Standard rack and pinion focusers are not precise enough for doing photographic work on scopes below about F7. I currently use a "Feathertouch" dual-speed manual focuser from Starlight instruments which works very well, I have also used (and recommend) the JMI "Motofocus" units (<http://www.jimsmobile.com/>). The Motofocus allows entirely hands off (and hence vibration-free) focusing, but the Feather Touch is more compact and won't add to the maze of wires and hand controllers your likely to have anyway.

I also use a gadget called a "Kwik-Focus" from Kendrick (<http://www.kendrickastro.com/astro/kwikfocus.html>) which is just a commercial adaptation of something called a "Hartmann Mask", which has been around for a long time. All it is is a piece of plastic with three large holes that covers the front of the telescope. With the mask in place, each star will split into three images unless focus is virtually perfect. This is a huge help for accurate fine focusing.

Of course, remember to take the mask off once the scope is focused.

You could also easily make something similar out of a sheet of cardboard and taping it to the front of the scope, precisely cut holes don't make it work any better! (remember the old 35 mm camera where you would see two images that merged into one when the camera was correctly focused?).

Imaging in Color

As I said, my 2HS is a monochrome camera. To image in color requires taking separate images through red, green and blue color filters, then merging them afterward using software (programs like Photoshop and Paintshop have facilities to do this, but I like "Registar" from Auriga Imaging because it can align the three frames automatically (<http://www.aurigaimaging.com/>). Regrettably, you need to use the expensive "Dichronic" filters (available from Adirondack Video Astronomy, for example), simple colored glass isn't specific enough. My filters are mounted in a filter wheel, which allows me to switch filters with minimal disturbance to the scope and camera. Any significant jolt while switching filters will require re-centering the target.

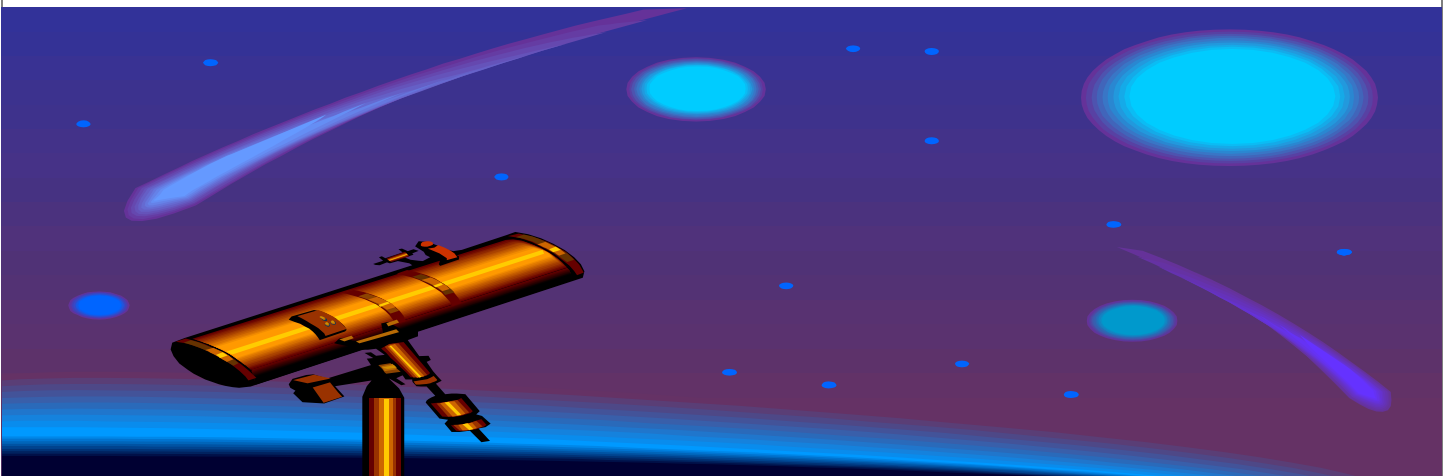
I have found it is necessary to refocus slightly (less than 1mm) after flipping filters, which presumably implies my scope has a very small (but not quite negligible) amount of chromatic aberration (blue light focusing at a shorter distance the red, a common problem in short focus refractors). When taking images in "white" light I actually often use a light yellow filter to reduce the effects of CA. I always use an IR-blocking filter; CCD chips (unlike our eyes) are very sensitive to near-infrared light but I don't think any refractor will focus Visible and Infrared together correctly.

My Mounting

I use the venerable Vixen Polaris mount, which works well as long as I take the time to Polar Align it properly. I almost never take "subframes" over 60 seconds in length, which helps reduce the impact of tracking and periodic error.

According to Ron Wadoski's book, the most important part of an Astrophotography setup is the mounting. I you have a so-so telescope and camera, but your mounting can keep an object well centered for an hour or more, you can still take great Astrophotographs. If you have a great camera and scope but your mount can't keep anything centered for more then a few minutes, you better stick to Lunar photography. It's also worth noting that the importance of accurate tracking goes up with both the length of the exposure and the focal length of the telescope. Long focus scopes will effectively magnify tracking errors more then short focus scopes because of the larger image they produce on the CCD chip (see optics discussion above).

Shooting M42: Part 2 will appear in the June 2006 Issue of this Newsletter. It deals with the software and processing of the image.



University Lowbrow Astronomers Annual Report 2005

Submitted 4/2/2006 by Charlie Nielsen

It was a fairly normal year for the Lowbrows with our usual mix of club meetings, open houses, Kensington, and various group observing sessions like Black Forest, John's driveway, Leslie Park, Seven Sisters, Lake Hudson etc. This winter seemed almost as cruel for lack of observing opportunities as the last one. I think we had two open house or member events at Peach Mountain since November, which is admittedly better than zero. For some time over the mid-winter months much blame was placed and exchanged between various club members for buying astronomy equipment, thereby fouling the weather. I share some guilt in this, but not nearly to the extent of Mike Radwick for buying his fully optioned and tricked out 37 centimeter Starmaster with a mirror by Mr. Zambuto. That event caused a lot of damage.

We had our usual mix of meeting topics with guest speakers and some of our club members as speakers. We had our usual elections and swap meet in April. Officers elected were: Pres.-Charlie Nielsen; VPs-Bernard Friberg, Jim Forrester, Paul Walkowski, Bobby "G"; Treasurer-Kathy Hillig; Observatory Director-D.C. Moons; Webmaster-Dave Snyder. Our Newsletter Editor started out as the team of Tom and John Ryan, but due to John going to college, and Tom's new job, they found themselves in a serious time shortage. In November Mark Deprest took over for them and will (was) likely to be elected to the post in April. On behalf of the officers and the whole membership, I wish to thank the Ryan's for their efforts and their fine product while they were able to produce it. Your service to the club is appreciated.

In July we had our usual temptations presented to us by John Kirchoff of Riders Hobby Shop. The weather did not allow us to hold the meeting at Peach Mountain and try out the new toys, but a good time was had anyway. The Astronomy on the Beach event was the usual success with an average to good turnout. Both nights were clear enough for observing, and Saturday night even treated us to an aurora show. Honorary club member Dr. Fred Adams was one of the keynote speakers. The Lowbrow team for the enjoyment of Black Forest had another excellent time in late summer. This group continues to grow, and will enlarge by at least three more, including this author for the first time (finally).

The observatory is still holding up, and looking much better with the recent repainting. The roof pulling cable has been replaced and the drive components improved. The latest coatings on the McMath telescope seem to be doing fine so far. D.C. Moon's delicate honing of the RA drive worm seems to be doing well also. Some serious tree pruning last spring also improved our horizons, especially to the south.

Dave Snyder is still maintaining our excellent website, and still tweaking in improvements here and there. The vast majority of our members have now moved to just getting our online newsletter, and we started charging a subscription for a printed version per a vote at our March 2006 meeting.

Our Treasurer, Kathy Hillig has submitted her own report. I would like to add the observation that our club seems to be maintaining around 100 members and a stable treasury. I have noted that we have recently added several members that are younger folks, and of varied ethnic background and of both genders. I believe this is a very positive sign for the future of the club, and hopefully the start of a most welcome trend.

Finally, our Interim Newsletter Editor, Mark Deprest, hit the ground running. Of course I expected nothing less given his enthusiasm and energy, and Mark has certainly provided that. He immediately sought out and obtained articles, taking no prisoners along the way. He has issued several online editions, all of excellent quality, and before the deadline. So to close; this article was not as good as I would have liked it to be if I had more time to put into it, and you may or may not agree. But the really good news is that I saved money on my life insurance by writing this article and getting Mark off my back for a little while. Actually, he has taken it easy on me so far, but as sure as the clouds are coming in November, my time was coming.

Scope Woes

By Paul Walkowski

Did I mention that I spent last weekend working on taking out the old mirror and putting in the new one with the "99% strel ratio" that I bought from Nathan? The mirror is likely a very good, hand figured from some well known Canadian mirror maker, I am just skeptical of anything Foucault tested and pronounced perfect.

The problem I ran into was that I radiused all of the corners in my octagonal tube with 1/4 inch of wood glue and saw dust and then flocked the inner walls with sawdust between paint coats. I glued 3/4" plywood baffles in at 12-inch intervals throughout the tube like aircraft bulkheads to strengthen it, and in between bulkheads I installed small alignment blocks with 22.5 degree angles on their faces to make sure the plywood side panels had perfect butt joints for gluing. Only the last 2

inches of the tube did not have this treatment because the last bulkhead held the mirror and needed to be removable. Well, the new mirror has a 4 inch shorter focal length (f/5.2 not f/5.6) and needed to be moved in 4 more inches to reach focus at the eyepiece. But the last bulkhead with the mirror cell was only about 0.010-inches smaller than the tube diameter and would not go in further because of the radiusing, alignment blocks, and flocking. This was learned at 6pm Sunday evening after I modified my mirror cell to go from a thin to a full thickness mirror (made longer, thicker, hold down brackets, by hand) and made mounting blocks to move the last bulkhead 4 inches deeper, but still utilize the existing tube mounting screws, and of course covered all of the new details with black Krylon paint, cork and felt pads, etc. If I continued I would need to belt sand and finish sand the inside of the tube for about 8 inches to remove all the flocking, chisel out the 8 alignment blocks, and need to reseal and repaint the entire tube. Since the paint dries slowly in the cold basement in winter, especially in a confined space like the tube, that would mean an extra weeks delay to buy materials and let things dry between coats, and mean removing, replacing and realigning the diagonal mirror and focuser as well. Shoot the Messier marathon was just 5 days away, Slam this project into full reverse cap'n.

So I sent my wife out to find 95% isopropyl alcohol, pure cotton balls, distilled water, and pH neutral Johnson Baby Shampoo so I could clean the coating on my old mirror. It was beyond dirty from 5 days of 24/7 exposure at Black Forest, I had a small twig hooked behind one mirror retainer clamp. I learned the art of mirror cleaning from Tom Ryan Years ago (another story, a house 2 streets away was delivered my mirror by mistake, they opened the box, and finger printed my "unusual ash tray" before looking to see that the package was not for them. Tom helped me clean it that evening before the finger prints set in the aluminum). First a clean water rinse, water running gently in the center and radially outward to remove loose dirt. Next, clean, ozone treated Ann Arbor city water and baby shampoo soaked on the mirror for an hour, stirred gently by a finger tip making waves near the center. Next a quick rinse with running water. Then roll a hundred cotton balls, exactly one turn, in a radially outward pattern from the center of the mirror while still water covered. The one turn is so you don't pick up dirt in the cotton and spread it elsewhere; the rolling is so you don't scratch it and make sleeks in the aluminum. More long rinsing with city water, then distilled water, and distilled water soak to remove all traces of baby shampoo, then more rinses. The last rinses took place out doors in the waning twilight, because I did not want to blow up the house with evaporating alcohol when the furnace came on. First a rinse with distilled water tipping the mirror at 45 degrees or more to the vertical to get as many droplets off before they left behind "droplet marks". Repeat quickly with Isopropyl alcohol 95% to remove the water spots and tip vertically so the alcohol thins out and runs off before it evaporates in streaks. My wife poured and I held the mirror, hands trembling from the cold and the quickly evaporating alcohol.

Now walk smartly over to the mirror cell, set, and tighten things down without pinching the mirror. Finally mount the mirror, cell bulkhead assembly in the tube and tighten it down. Not to align everything. Hmm the central dot is still there but really faint, well I can fix that next time I have things apart. I had the presence of mind to borrow Marks pattern laser (thanks, Mark) and turned what had been a 3 hour job with a Kodak film canister with a hole drilled in the axis into a 3 minute job. Finally I took the whole project outside and found a convenient cell tower a couple of miles away and aligned the Telrad and University Optics finder with the main mirror. When you live under a blanket of cloud cover, you learn to make do with what you have. I won't tell you how many hours I spent observing that blinking cell tower, hoping for a hole in the clouds 8^).



First Scope... Long Wait... First Light

By Mike Kurylo

It is sometimes a daunting challenge having a large dob. You spend the time painstakingly looking for a specific object when someone invariably asks “can I see?” Under normal circumstances I would use my tried and true delaying tactics, but when it’s your 6-year old son who knows most of your traits, you have no choice but to relinquish the controls to the next generation observer. The problem is typical for most of us without tracking, your finely searched object has left the eyepiece by the time you come down off the ladder and escort the young one up to the top hoping they can reach the faint photon extractor. John Causland has no idea how I jealous I am!

The nearly perfect solution and excuse to execute it came upon me this past February. It was a Meade 60AZ-T refractor as a birthday gift for my son. Is it a great telescope? Hardly, but for a young explorer wanting to spend time with dad it was a decent starting spot without spending a small fortune. Had I spent more I would have started looking for a convenient “second” scope to carry around with more bells and whistles and called it mine. But I’ll get to that later.

As usual with a child opening a gift there is the initial excitement. Then it was tempered by the fact that it was still daylight. Luckily I had thought ahead far enough to purchase a scope that could be used for spotting, a definite plus for kids wanting to explore the great outdoors. We had fun observing bird nests and wildlife but my little astronomer was keen on seeing Saturn and the “the other galaxies”. Danny’s biggest issue would be learning to have some patience waiting for clear, dark skies. And waiting, and waiting, and waiting.

It’s tough being six. Just when you see the clouds starting to break mom informs him it’s time for bed, and that was in February. This time change in the spring has to be eating him up, and I feel his pain. It took a while, but a weekend finally rolled around with clear skies and voila! It was like magic for him. Since I am a beginner astronomer I now have incentive to learn more, and quickly. It’s amazing how fast the young ones can start rattling off questions. But we survived by pulling out a sky atlas and took a quick tour of the cosmic neighborhood.

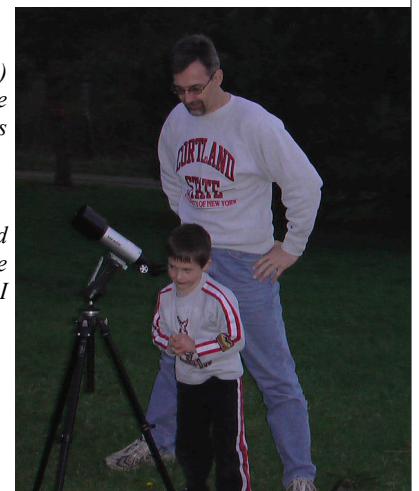
I wanted to keep it simple so that he could repeat the viewing session on his own. Except that we ended up going down “equipment road.” After experiencing views of the moon, M31, M42, M45 and the like, Danny was getting frustrated that everything was “leaving”. After a quick explanation of celestial movement and tracking he had decided that he needs a better scope. Bigger and with that tracking thing! Best of all he was willing to save up his allowance to do so and would then bequeath his current scope to his younger brother. Kind of brings a tear to your eye doesn’t it? An added bonus is that I can guide him in his purchase of my second, excuse me, his second scope. He already plans on charging me pay per view.



Left: Danny (I want to see more) Kurylo and his Meade 60 AZ-T. Move over Steven J O'Meara here comes the next great astronomer!

Right: Mike Kurylo, Danny and scope, I'm not sure but it looks like Mike is telling Danny, "come on I want to look too!"

Images by Mike Kurylo



P/Schwassmann-Wachmann (73P) C, B, G, R + 20 more

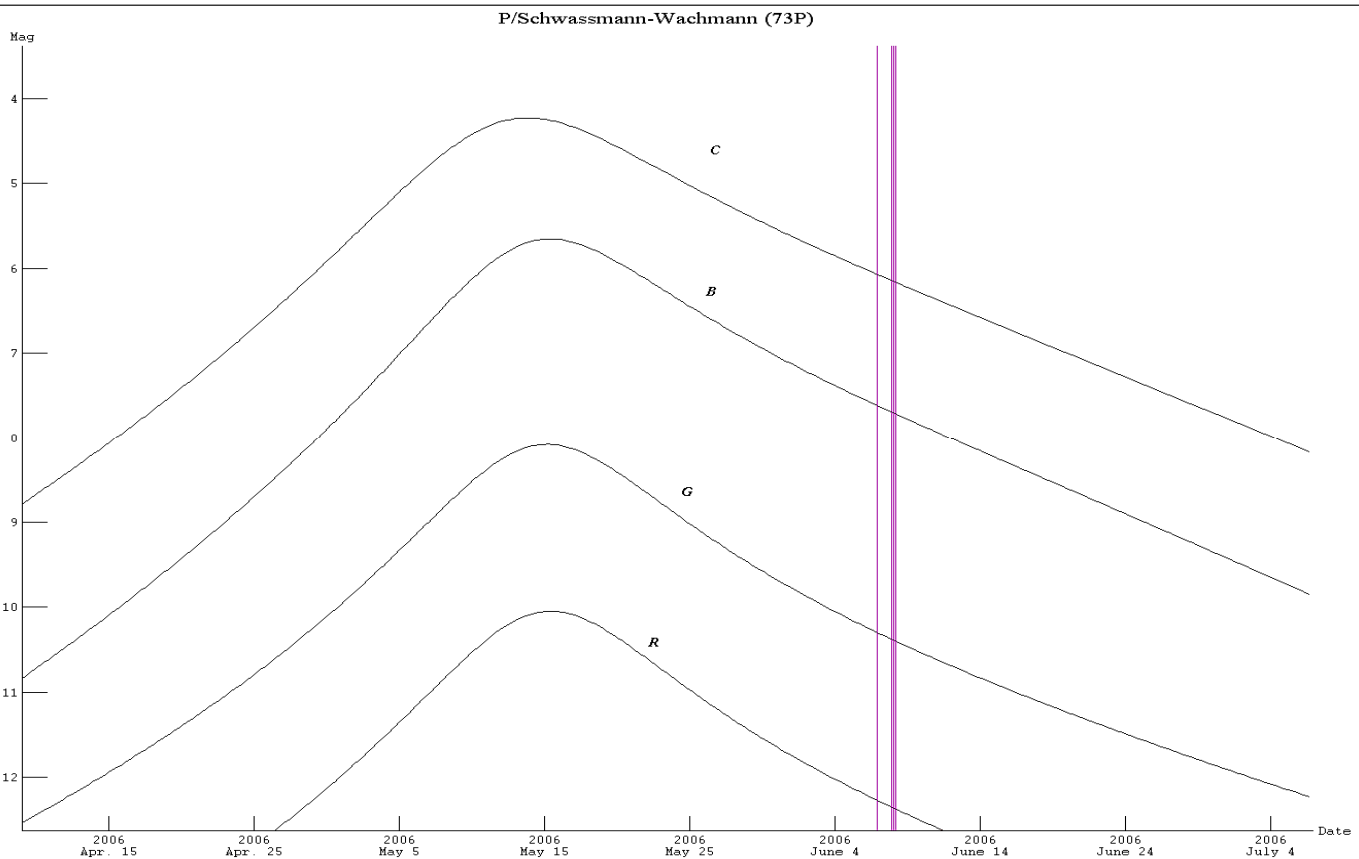
Comet Alert—Mark S Deprest

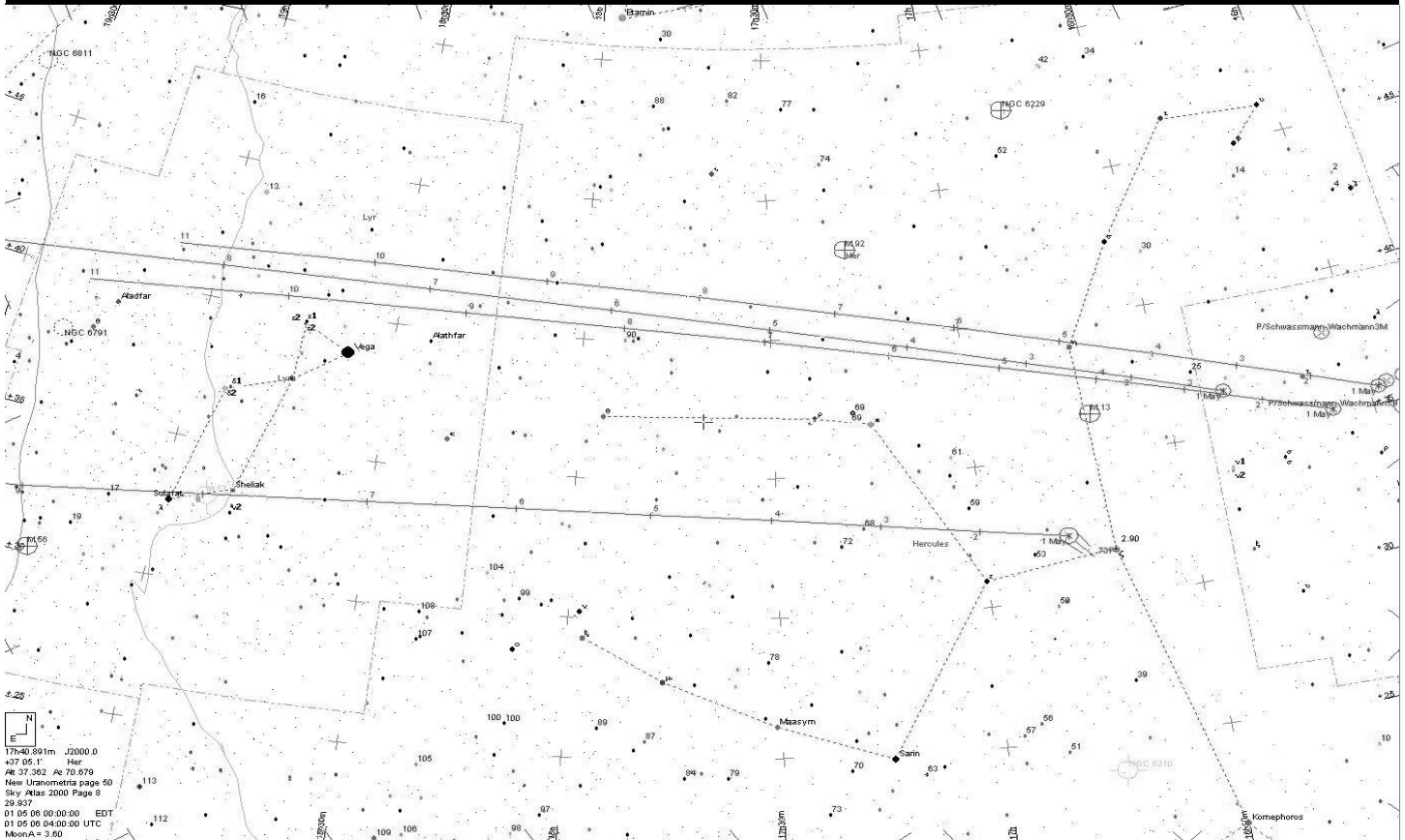
That's right folks I'm reporting on a comet ... (big surprise). Just in case you haven't been following the Astro-news lately, here is a short summary on this comet's journey thru our solar system.

Discovered in 1930 as P/73 Schwassmann-Wachmann 3 and later renamed. Its orbital period was determined to be 5.36 years and its absolute magnitude (m_1) = 11.5. However, after its initial discovery it was not recovered again until 1979 and was missed again in 1985 but recovered once more in 1990. During these two apparitions the comet's light curve remained rather steady, but in August of 1995 the comet's nucleus split and its absolute magnitude brightened to 5.5. After this initial split 3 components were observed, the main component C, along with two fainter pieces labeled A & B. In 2001 along with the main component C, two new components were observed and listed as B & E. There is some debate concerning component E and just where it came from, but the A component has not reappeared and is thought to be totally sublimated.

Enter 2006 and a very close approach (0.076au) to Earth, a great opportunity to observe the weakly bound nature of comets. So far this apparition has not disappointed anyone in a comet's ability to be anything but predictable. First, 20+ components have been recovered as of now (most of them extremely faint) 4 of these have become bright enough to be seen telescopically and at least 2 of these binocular objects. The main component C has held together and is brightening slightly below its predicted line and should come close to un-aided eye visible at closest approach. Component B, a very volatile piece has been going through some major outburst and at one point became brighter than C. However, in recent days it has become very diffused visually and split into 2 very distinct pieces. (see image on page 10). Components G & R although much fainter than the two components described above, have also been somewhat volatile and brighten sharply a couple of weeks ago. G & R have since steadied out and appear to be following their respective light curves.

The over all fate of this comet on this pass is still very uncertain, so my suggestion is to get out and observe it as often as possible, but especially in the night of May 7th—8th, when the C component will pass directly in front of M57, the Ring Nebula. (see the finder charts on page 8)

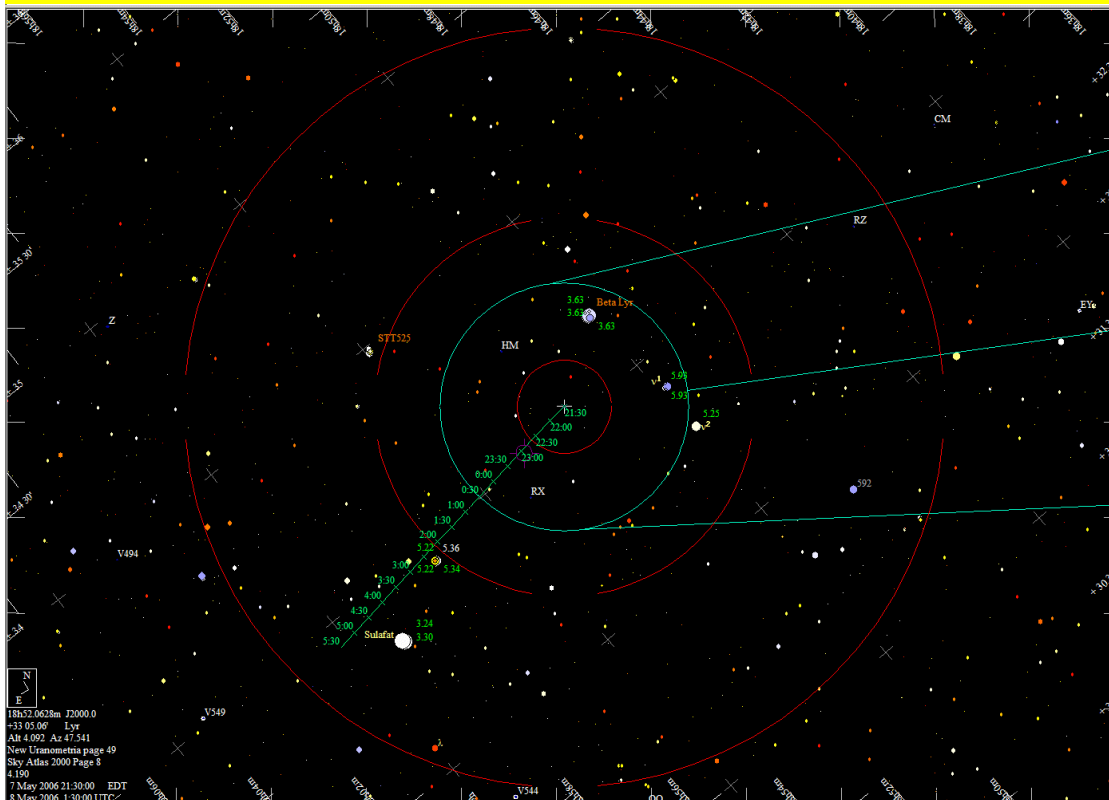




Above: Comet P/Schwassmann-Wachmann (73P) tracks of the 4 brightest components from May 1st thru May 11th 2006.

Below: Component C on the night of May 7th—8th as it passes in front of M57, the Ring Nebula.

Charts created using Guide 8.0



Note: On May 7th at 21:30 EDT this component will only be 4 degrees above the northeastern horizon. However, by 23:00 it will be almost 18 degrees up and should be a spectacular sight!

So, find an observing site with low horizons and clear skies, get your binoculars, your telescopes, and / or your cameras ready this is going to be a sight to remember!

"Beauty of Spring Skies"

Orion and Gemini, with no audible sound,

Emit soft music...as we view from the ground.

We stand on earth, grain of clay...with two eyes,
Viewing the wonder, of star-sprinkled skies.

No need for words.....when we view this ART,

Joy and beauty.....drip into our heart.

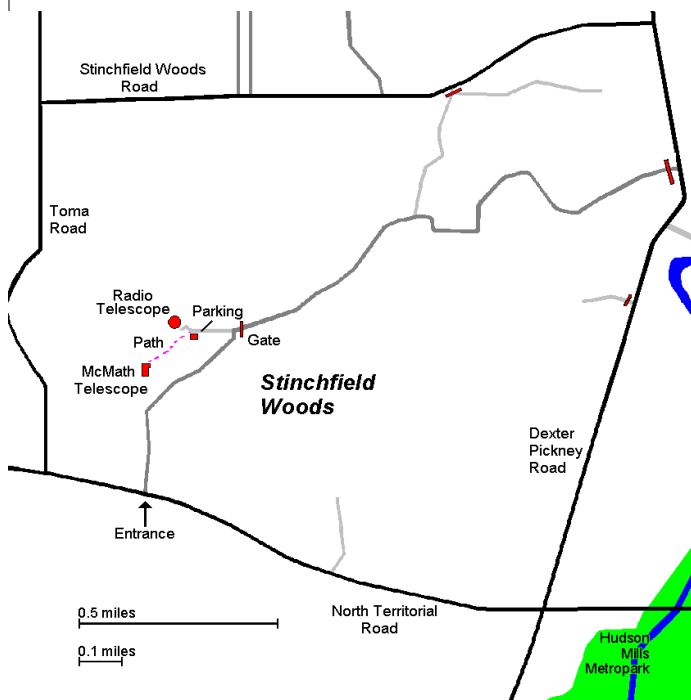
Anna Scott

Lowbrows March 2006

Places & Times

Dennison Hall, also known as The University of Michigan's Physics & Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. Dennison Hall can be found on Church Street about one block north of South University Avenue in Ann Arbor, MI. The meetings are usually held in room 130, and on the 3rd Friday of each month at 7:30 pm. During the summer months and when weather permits, a club observing session at the Peach Mountain Observatory 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" telescope which is maintained and operated by the Lowbrows. The observatory is located northwest of Dexter, MI; the entrance is on North Territorial Rd. 1.1 miles west of Dexter-Pinckney Rd. A small maize & blue sign on the north side of the road marks the gate. Follow the gravel road to the top of the hill and a parking area near the radio telescopes, then walk along the path between the two fenced in areas (about 300 feet) to reach the McMath telescope building.



Public Open House / Star Parties

Public Open Houses / Star Parties are generally held on the Saturdays before and after the New Moon at the Peach Mountain observatory, but are usually cancelled if the sky is cloudy at sunset or the temperature is below 10 degrees F. For the most up to date info on the Open House / Star Party status call: (734)332-9132. Many members bring their telescope to share with the public and visitors are welcome to do the same. Peach Mountain is home to millions of hungry mosquitoes, so apply bug repellent, and it can get rather cold at night, please dress accordingly.

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 Newsletter and use of the 24" McMath telescope (after some training). Dues can be paid at the monthly meetings or by check made out to University Lowbrow Astronomers and mail to:

The University Lowbrow Astronomer c/o Kathy Hillig

**7654 W. Ellsworth Road
Ann Arbor, MI 48103**

Membership in the Lowbrows can also get you a discount on these magazine subscriptions:

Sky & Telescope - \$32.95 / year

Astronomy - \$29.00 / year

For more information contact the club Treasurer. Members renewing their subscriptions are reminded to provide the renewal notice along with your check to the club Treasurer. Please make your check out to: "University Lowbrow Astronomers"

Newsletter Contributions

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call or Email the Newsletter Editor: **Mark S Deprest** (734)223-0262 or msdeprest@comcast.net to discuss length and format. Announcements, articles and images are due by the 1st day of the month as publication is the 7th.

Telephone Numbers

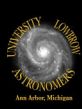
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Lowbrow's Home Page

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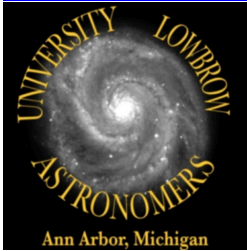


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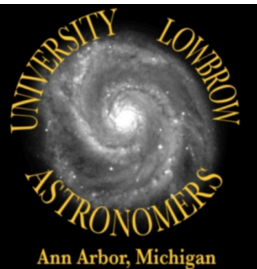
Phone: 734-663-8699
E-mail: hilligk@hotmail.com

Reflections & Refractions

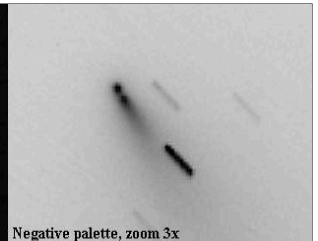


Website

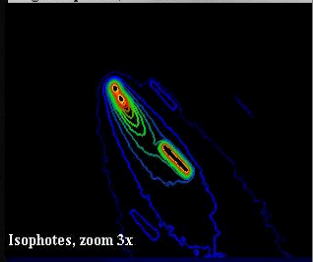
www.umich.edu/~lowbrows/



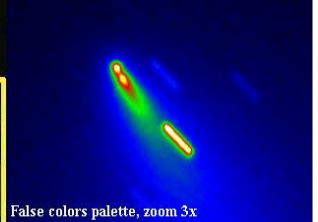
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Negative palette, zoom 3x



Isophotes, zoom 3x



False colors palette, zoom 3x

73P/Schwassmann-Wachmann (fragment B) 2006, April 22.31
Average of 10 unfiltered exposures, 60 seconds each
Takahashi Epsilon, D=0.25m, f/3.4 + SBIG-ST8XE
Remotely from the "New Mexico Skies" Observatory
E. Guido & G. Sostero (Remanzacco Observatory, Italy)
<http://www.afamweb.com> <http://cara.uai.it>



Comet P/Schwassmann-Wachmann (73P) component B splits into 2 fragments, will it last through perihelion? How bright will it get? Only careful observations will tell the whole story.