SASKATOON SKIES

APRIL 1982

Volume 12 Number 4


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SASKATOON SKIES

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APRIL 1982 **Volume 12** **Number 4**

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HYPERING HINTS

 Dr. Jack B. Marling

Which B&W Film is best?

The number of films available to anyone seriously interested in astrophotography can be bewildering at first, especially when the new hypersensitization techniques are also included. This article discusses which B&W films are best, and the subsequent article will discuss the color film. David Healy's excellent articles on astrophotography (April, July, Sept. 1980 DSM) helped to clear up some of the confusion, in particular his Sept. 1980 DSM article on "Deep-Sky Photography: Films and Exposure times". However, the techniques of film hypersensitization using either a cold camera or gas-sensitization have added new factors, since a poor film, when sensitized, may become excellent after sensitization. For example, Kevin Ritschel's article on "Chilled Emulsion Astrophotography" (Nov. 1980 DSM) discussed how a cold camera can dramatically improve the performance of Kodak Tri-X film. Tri-X is a poor to mediocre film when unsensitized, but gains 10x or more in speed when chilled in a cold camera, so that it actually exceeds the speed of traditional astrophotography films like 103a-E for some deep-sky objects.

Since most of my personal experience involves the technique of gas-sensitization of film (see Dec. 1980, Jan., Feb., 1981 DSM), I have tried to make careful comparison of as many normal and sensitized film types as possible under controlled laboratory conditions. This is enormously easier than trying to make a series of a few dozen half-hour deep-sky exposures of celestial objects (with differing weather conditions and atmospheric transparency). Basically, there are two principal kinds of deep-sky celestial targets for astrophotographers: Emission nebulae characterized by strong red hydrogen alpha emission near 657nm, and stellar objects, such as galaxies and star clusters, emitting a broad continuum of colors, centered very approximately near 500nm (300-800nm). Light similar in color to these objects was simulated by using narrow bandpass filters to photograph a laboratory test subject lit with normal broad-band incandescent light. A deep-red band-pass filter for the 653-665nm spectral region simulated film response to a hydrogen-alpha emission nebula, and a blue-green band-pass filter for the 470-520nm spectral region simulated film response to broad-band visible light, such as from spiral galaxies. Exposures ranged from 7½ to 60 minutes in duration, and results are given in Table I, relative to normal (unsensitized) Kodak 103a-E.

TABLE I

Comparison of Relative Speeds of Hypersensitized B&W Film

Film Type	Treatment Time		Speed	Relative Film Speed	
	rolled up[a]	unrolled[b,e]	Gain	H-alpha[c]	blue-green[c]
103a-E (normal) - untreated			1	1	0.35
HP-5	3-4 days	8-10 hours	~8x	0.2	1
Tri-X	5-7 days	15-18 hours	~5x	0.06	0.5
Tri-X	-	cold camera[d]	≥10x	~0.1	~1
103a-E	1-1.5 days	4-5 hours	2.5-3x	2.5	1
103a-F	1.5 days	5-6 hours	2.5x	2-2.5	1.3-1.5
103a-O	2 days	5-7 hours	2x	0.00	1.2-1.5
2415	10-14 days	25-30 hours[e]	30-50x	1.4-2	1-1.5

103a and 2415 developed 4 minutes in D-19 at 70°F. Tri-X and HP-5 developed 8 min. in D-76 at 70°F.

[a] Film soaked rolled up in a film cartridge (loosened) in 8% forming gas at 15 psig at 30°C.

[b] Film baked unrolled on an open reel in 8% forming gas at 1 psig at 50°C. Preferred treatment procedure.

[c] Relative film speed to H-alpha light near 660nm (for emission nebulae), and to blue-green light at 470-520nm (for stars and galaxies).

[d] Film sensitized during exposure by a dry-ice cold camera.

[e] Preferred treatment procedure for 2415. Higher speed and lower fog results.

Table I gives the relative speeds of various films (normalized to 103a-E) for long exposure durations typical in deep-sky astrophotography. Table I also gives speed gain, which only tells you how good (or bad) the unsensitized film is. Only the relative speed after sensitization is important! This is shown in the last columns.
The treatment time given in Table I shows the time needed to achieve hypersensitization of a given film by soaking in 8% forming gas (A mix of 92% nitrogen and 8% hydrogen that is NON-FLAMMABLE in air under ordinary conditions). After evacuation of air, film is soaked unrolled on a reel in forming gas at 1 psig at 50°C for the required number of hours (more on this later), or rolled up in its original cartridge in forming gas at 15 psig at 30°C - see Dec. 1980, Jan., Feb., 1981 DSM.

Examination of Table I now permits a near optimum choice of films for any type of deep-sky astrophotography.

I. EMISSION NEBULAE.

Extended emission nebulae like the Horsehead Nebula, Swan Nebula, Rosette Nebula, North American Nebula etc. etc. all have primary emission at the red hydrogen-alpha. Table I shows that (surprisingly!) Tri-X and Ilford HP-5 have very poor hydrogen-alpha sensitivity, even after hypersensitization. DO NOT USE TRI-X. As expected, 103a-E and 103a-F both have excellent response, and are excellent choices - especially after hypersensitization, which yields a useful 2-3x speed boost. The new Kodak Technical Pan 2415 also has excellent sensitivity to H-alpha. After full sensitization it is actually faster than normal 103a-E.

CAUTION! The large 30-50x speed gain for 2415 indicates it is ab smally slow unsensitized, and also suggests improper or incomplete sensitization may leave it too slow. Full sensitization of 2415 is essential, and a later article will be devoted to this wonderful B&W film. When fully sensitized, 2415 is without equal, and is the film of choice for all emission nebulae. Figure 1 shows the faint nebulosity in Cygnus taken with a 135mm telephoto on well hypered 2415 (and a dark-red filter).

Attention Celestron and Dynamax owners: Owners of these popular telescopes need the fastest possible film for their slow f/10 - f/11 optical systems. Gas-hypered 103a-F or 103a-E are probably the best choice.

II. GALAXIES and STAR CLUSTERS.

These deep-sky objects emit a continuum of colors, ranging from bluish white for open clusters and spiral galaxies to yellowish red for elliptical galaxies and globular clusters. The blue-green relative film response given in Table I is used to help select the best (fastest) film. All films seemed fairly good, but the best were 103a-F, 103a-O and well hypered 2415. 103a-E was noticeably inferior to 103a-F. For low contrast, gas-hypered Ilford HP-5 or Kodak Tri-X in a cold camera are the best choices. A low contrast film is important in showing both the bright core and faint outer arms of spiral galaxies, for example. Surprisingly, well hypered 2415 again showed remarkable performance, and was noticeably faster than both normal unsensitized 103a-E and 103a-O. This is dramatically shown in Figure 2, showing spiral galaxies NGC 5921 photographed by Ron Potter, using identical 60 minute exposures. The much finer grain and greater detail with 2415 are apparent. For the f/10 or slower optical systems, gas-hypered 103a-F is hard to beat.

III. PLANETARY NEBULAE.

These objects are dominated by intense emission at the blue-green doubly ionized oxygen lines at 496 and 501nm. Since these are often small objects, a fine grain high resolution film like well-hypered 2415 would be best. Gas-hypered 103a-F is also an excellent choice. Figure 3 shows the planetary Nebula M-77 photographed on well-hypered 2415.

IV. REFLECTION NEBULAE.

These objects are characterized by ultraviolet, violet and blue emission. The best film choice is gas-hypered 103a-O, although well hypered 2415 is also good for fine grain. Figure 4 shows some of the faint reflection nebulae around the Pleiades photographed in only 12 minutes (8" f/4.5 telescope) using well hypered 2415.

SUMMARY

For slow optical systems, use gas-hypered 103a-O for reflection nebulae, gas-hypered 103a-F for galaxies, and gas-hypered 103a-E or 103a-F for emission nebulae. For all around deep-sky astrophotography, well hypersensitized 2415 is hard to beat, because of its vanishingly small grain, excellent panchromatic sensitivity and high contrast. As a further bonus, it also seems more resistant to sky-glow film fogging than the 103a films. However, full sensitization of 2415 is very important. More on this important film later.

NEWSLETTER

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Notice of Meeting

Place Room B111, Health Sciences Bldg., U o S Campus

Date April 19,1982 **(Day)** Monday

Time 8:00 p.m. *(Central Standard)*

Purpose April General Meeting

Program Voyageur at Saturn - Slides and commentary by G.N. Patterson.

The Royal Astronomical Society of Canada
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P.O. Box 317 Sub 6
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NEWS RELEASE

VOYAGEUR AT SATURN

Mr. Gordon Patterson will present a slide show of Voyageur at Saturn, with running commentary.

MONDAY, APRIL 19, 1982

8:00 p.m. C.S.T.

ROOM, B111, HEALTH SCIENCES BUILDING
UNIVERSITY OF SASKATCHEWAN

The meeting will adjourn to the U of S Observatory for coffee and viewing through the 7" telescope, weather permitting. There is NO ADMISSION CHARGE. Anyone interested in joining is urged to attend. For more information, contact Mike Wesolowski, 374-3331.

MINUTES OF AN EXECUTIVE MEETING

Saskatoon Centre of the Royal Astronomical Society of Canada

PLACE - - - U of S Observatory
DAY / DATE - Monday, March 15, 1982 **TIME** - 7:00 P.M. **C.S.T**

Present: Gordon Patterson, Mike Wesolowski, Patrick Skinner, Jim Young, Lillia Wilcox, Doug Miller, Walter Fernets, John Greer, Richard Huziak, Mike Williams.

ITEM	DETAIL	ACTION
68.	Meeting called to order 7:00 P.M.	G. Patterson
69.	The 1982 General Assembly was discussed. a) Local members please register early for the G.A.	G. Patterson
70.	Permission has been asked by the meteor searchers to present an award during the G.A.	G. Patterson
71.	T.V. media expressed a willingness to cover astronomy Day on May 1 if given sufficient notice.	G. Patterson
72.	The possibility of applying for a grant from National office to help with the building of the telescope was discussed	D. Miller
73.	A large donation has been received at the National office, and they are looking for suggestions for its use.	D. Miller
74.	It is estimated that the 16" telescope for the dark site will cost six thousand dollars to construct.	G. Patterson
75.	Power is now hooked up at the dark site on a temporary line.	G. Patterson
76.	A mirror grinding blitz will be held Sat. March 20 at 8 A.M.	D. Miller

MINUTES OF A GENERAL MEETING

Saskatoon Centre of the Royal Astronomical Society of Canada

PLACE - - - Health Sciences Bldg. Room B111
DAY / DATE - Monday March 15 1982 TIME - 8:00 PM C.S.T

Executive members Present: Gordon Patterson, Mike Wesolowski, Patrick Skinner, Jim Young, Lillie Wilcox, Doug Miller, Walter Fernets, John Greer, Richard Huziak, Mike Williams.

ITEM	DETAIL	ACTION
77.	Meeting called to order 8:00 PM	G. Patterson
78.	The format of the newsletter has been slightly changed. We would like to thank the printing staff for getting back into operation so quickly after their move.	G. Patterson
79.	January and February minutes adopted as published. CARRIED	R. Gillespie J. Young
80.	A mirror grinding blitz will be held on Sat. March 20, 1982 from 8 AM to 5 PM. Those interested in helping should notify Doug Miller or Richard Huziak.	G. Patterson
81.	General Assembly is rapidly approaching. a) Please register NOW b) Any entries for competitions should be made soon. c) Anyone wishing to present a paper must also get their abstract in as soon as possible.	G. Patterson
82.	Our exchange speaker Stewart Krysko from the Queen Elizabeth Planetarium in Edmonton gave an illustrated talk entitled "The Riverside Amateur Telescope Maker's Conference".	G. Patterson
83.	Meeting adjourned to Observatory at 9:20 PM.	J. Young

16" MIRROR PROGRESS

DOUG MILLER

Rough grinding of the 16" mirror was delayed while Rick Huziak and I tried to cast a plaster support for the truncated cone of the 16". After two unsuccessful attempts, a support was cast. Originally we had planned to waterproof the support with an epoxy or plastic resin. A simpler waterproofing agent was used. The plaster cast was simply placed in a large plastic garbage bag. Waterproofing completed, the rough grinding began.

Thirty-six hours of grinding with #80 silicon carbide over a two month period has left the mirror with a focal length of 79" (f/4.91) as measured with a spherometer. Placing a straightedge across a diameter of the mirror allows the 0.205" sagitta to be easily seen. Approximately five kilograms of #80 was used in the grinding.

The next step in the mirror work is to partially perforate the mirror from the back. Gordon Patterson has prepared a 3½" biscuit cutter which will be used to perforate the mirror to within 1/8"- ¼" of the final mirror surface. The perforation is required for two reasons. The truncated cone shape of the lightweight mirror blank precludes the use of a standard flotation support. The mirror must be clamped from the front and back to a tube passing through the mirror perforation. As well, the perforation will allow a secondary mirror to be placed near the mirror to give access to the Cassegrain Nasmyth focus.

After partially perforationg the mirror, the resulting annulus will be filled with wax or plaster. The further stages of grinding, polishing and figuring will be completed at which time the perforation will be carefully completed. Hopefully, the mirror will be perforated within the next few weeks.

WHAT'S NEW--WHAT'S HAPPENING

AMATEUR ASTRONOMY SURVEY
from the Astronomical League

Active American and Canadian amateur astronomers own $58 million worth of telescopes packing the light gathering power of 68 Mt. Palomars. Last year they added more equipment and accessories to this arsenal than could be bought by triple the budget of Kitt Peak National Observatory.

Fantastic? This is the conclusion reached in a summary survey of North American amateur astronomy compiled by the Astronomical League Light Pollution Committee at the request of a group of the Lighting Engineers Society studying harmful impact of light waste.

The League queried some major United States telescope manufacturers, our Canadian colleagues, government agencies such as the United States Department of Commerce and the National Science Foundation, major astronomy magazines, specialty societies such as the American Association of Variable Star Observers and others.

Total interest in astronomy as a serious hobby is widespread. An estimated 185,000 "active" non-professionals are among at least 400,000 who, the survey estimated, have "some interest" in the hobby. A recent university estimate, for example, put the number who have "recently" taken voluntary astronomy courses at about 200,00 people.

In the two countries there are 20,000 active amateurs organized in more than 400 local astronomy societies and clubs. About 60 percent of these are affiliated with national or regional groups such as the League or the Royal Astronomical Society of Canada.

The League concluded, projecting a recent reader study published in *Astronomy* magazine, that there are as many as 112,000 "active" telescope owners. They muster 56,000 instruments in the 4 to 8-inch class and 3,700 telescopes of 10-inch or larger. The total U.S. annual market for imported and domestic instruments may be more than 40,000 units, including at least 15,000 produced here in Harrisburg, PA. Several telescope industry executives have stated that these figures may be low.

The scientific contributions of amateur astronomers are significant. Probably 500 observers, the study concluded, provide scientific data to six specialty societies which make the data available to professional researchers. As a comparison, there are 3,300 active members of the American Astronomical Society.

The study also mentioned cultural benefits of this unique popular science and the costs of continued degrading of the quality of the dark sky. "Tens of millions," it said,"look at the sky and tens of millions, in addition, would be interested but have probably never seen a dark sky..." The report cited a United States Environmental Protection Agency study of the daytime sky which stated, "Decreasing visibility of the sky creates aesthetic and psychological costs, loss of property values, loss of tourist revenues in scenic areas and general citizen dissatisfaction." The League report concluded that, "Rural and suburban communities should realize that a key but often overlooked ingredient in their rural setting is the fact that one can see the stars at night."

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Jan/Feb 1982 Vol. 20 No. 1

EDITOR'S PAGE

Astronomy Day 1982

The year has gone by very quickly, hasn't it? It doesn't seem all that long ago that it was Astronomy Day 1981, and everyone was being urged to come out and help at the Mall at Lawson Heights on the big display we were having. That was the time the editor found out that the entire contents of the U of S and Rystrom observatories could be loaded into one van at one time!

This year we're at it again.

On Saturday, May 1, the Saskatoon Centre will once again descend upon The Mall at Lawson Heights with telescopes, mirrors, star charts, photographs and all of the other equipment and paraphanelia we habitually cart around with us. In fact, about the only two things that won't be in evidence are bug repellent and Nanook.

Setup for the display will begin shortly after 8:00 AM and the display proper will begin at around 9:00 AM or whenever the public arrives. We expect to continue straight through to 5:00PM, so quite a number of Centre members will be needed to take care of the display and meet the public.

Remember, Nanook won't be there, but you should be!

For futher information, contact the Editor at 664-2933 during business hours, or just show up at the display--we can put you to work!!