THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

SASKATOON CENTRE

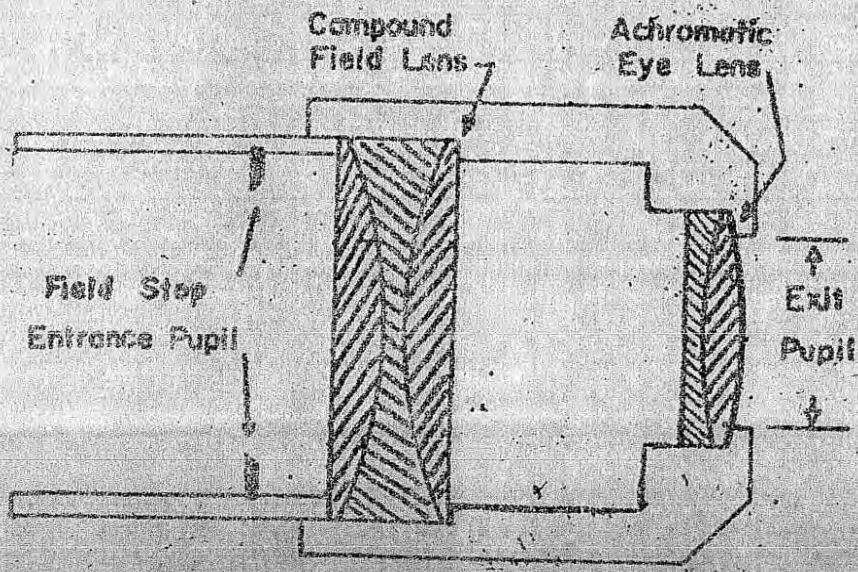
PRESIDENT: *Halyna Kornuta*

EDITORS: *Dave Pristupa & Greg Towstego*

Published by The Saskatoon Centre, R.A.S.C.

P.O. BOX 317, SUB 6,
SASKATOON, SASK
Vol. 5 — No. 12
DECEMBER, 1975

NEWSLETTER



ORTHOSCOPIC OCULAR

PRESIDENT'S MESSAGE

The Saskatoon Centre is beginning a new year with new faces and a different collection of attitudes and goals.

As we began 1975 by planning for our presentation at the Halifax General Assembly, we now plan for Calgary with renewed vigor. The short distance between Saskatoon and Calgary provides many of us with the possibility of attending and therefore participating.

Another important part of the Centre is General meetings where the Executive and members can get together to exchange ideas for the benefit of the Centre. Your Executive is always willing to listen to your ideas in regards to the operation of the Executive and the Centre. Perhaps you have a suggestion for a topic for an upcoming General Meeting. Members are also encouraged to start writing articles for the Newsletter.

As you can see, there are many ways for you to get involved in the Centre, so why not come to Astrophotography meetings and General Meetings.

Merry Christmas to all our Members and families

Happy Holidays

CORRECTION - Lillia Wilcox's phone number is 343 - 7462, not 373 - 7462 as was printed in the November Newsletter.

OCULARS (Eyepieces)

GN Patterson

Many amateurs are frequently confronted with finding the answer as to which ocular or oculars to buy for their telescope, particularly if costs are a problem. Obviously, you get what you pay for, so the more you can afford, the better the quality of the ocular. But the question is - which is the best ocular for the money one can afford ?

When I started digging into this problem I found there are well over one hundred different types of oculars, each designed for a specific purpose with distinct advantages for their designed purpose but with decided drawbacks if used for some other purpose. Fortunately, for the amateur astronomer it is possible to reduce this menagerie of oculars down to about six different types usable on a telescope. These are:

a) Huygens

b) Ramsden

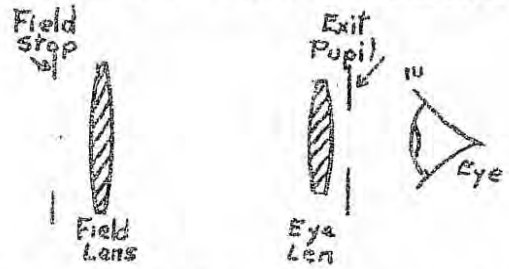
c) Kellner

d) Erfle

e) Orthoscopic, and

f) Concave Lens.

Before discussing these various types of oculars, it would be advisable to review a few simple lens concepts and formulae. The lens nearest the telescope



objective is known as the field lens; that nearest the eye the eye lens. Lenses between these two, if any, are intermediate lenses. A field stop is placed at the focal plane, usually ahead of the field lens at the point where the light rays from the objective are brought to a focus, ie, the primary image. This stop prevents stray light from entering the ocular. The clear opening of the eye lens is the exit-pupil, and should be at least of equal size to the entrance pupil of the eye - about 7 to 8 millimeters when dark adjusted, but considerably less in daylight (about 2 to 3 mm). For this reason, an ocular intended for

use in daylight, ie a microscope ocular, is not good for night work since the exit pupil is too small resulting in a loss of light to the eye.

The effective focal length of a two-lens combination spaced apart is given by the formula:

$$E.F.L. = \frac{F_f \times F_e}{F_f + F_e - D}$$;

where F_f = focal length of field lens
F_e = focal length of eye lens
D = distance between principal points of the two lenses.

The focus, F, is considered positive (+) if the lens is convex, and negative (-) if the lens is concave.

The ocular is used to collect the light rays focused by the telescope objective, and present these rays to the eye in a parallel beam. The effective length of a telescope focused at infinity is the sum of the EFL of the telescope objective and the EFL of the ocular;

$$\text{Effective Length} = EFL_{objective} + EFL_{ocular}$$

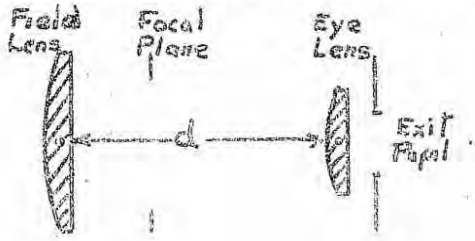
The power (X) of a telescope is the ratio of the two EFLs;

$$\text{Power (X)} = \frac{EFL_{objective}}{EFL_{ocular}}$$

so by reducing the EFL of the ocular it is possible to increase the power of the telescope. Maximum USABLE power of any telescope is limited by the clear aperture of the objective lens ie mirror, and is usually listed as 60X per inch of objective diameter, so that a telescope with a clear aperture of 3 inches has a usable power of 3 x 60 or 180X. Any increase over this power is offset by a loss of brilliance and image definition, and is only of value for something very bright such as the Moon.

A. THE HUYGENS OCULAR

This ocular was designed by Huygens in 1700 in an attempt to minimize the aberrations of a single simple lens in common usage at that time. When two simple lenses are seperated by one-half the sum of their focal lengths certain aberrations are minimized. This is now known as the Huygens' Principle.



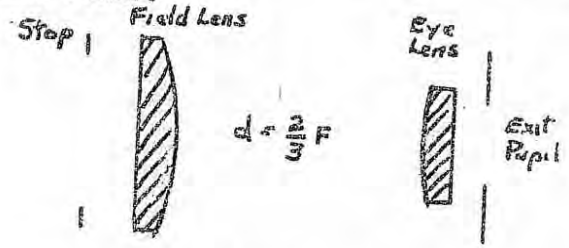
In the Huygens ocular, the focal length of the field lens is twice that of the eye lens, both lenses are simple plano-convex, and are mounted so the convex side is toward the telescope objective. Using the lens formula with $F_f = 2\ F_e$, and $D = \frac{1}{2}(F_f + F_e) = \frac{1}{2}(2F_e + F_e) = 3/2\ F_e$

$$E.F.L. = \frac{2F_e \times F_e}{2F_e + F_e - 3/2\ F_e} = \frac{4}{3}.F_e \text{ or } \frac{2}{3}.F_f$$

In this ocular the image is formed between the two lenses so if a cross hair or reticule is used it is mounted between the lenses and protected from damage. This ocular has a field-of-view varying from 25° to 40° and has relatively good color correction. The color correction can be improved even further if achromatic lenses are used in place of the simple plano-convex lenses but of course the cost of the ocular increases. It is a good ocular for telescopes but is primarily designed for microscopes, and is not suitable for wide angle low power usage.

B. THE RAMSDEN OCULAR

The Ramsden ocular was designed in 1780 using the Huygens Principle of spacing the two simple plano-convex lenses apart a distance equal to one-half the sum of the individual lens focal lengths. However, it differs in that thw two lenses are of equal focal length, and the two convex sides face each other.

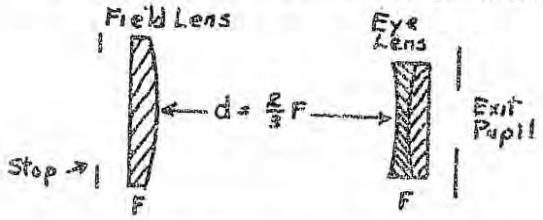


$$EFL = \frac{F^2}{2F-F} = F$$

In this ocular the image is formed on the plano-surface of the field lens making it possible to etch measuring lines on this surface. While this is an advantage in certain usages, it is also a disadvantage in that any marks or dust on this surface is also in focus necessitating frequent cleaning. To overcome this difficulty, it is customary to reduce the seperation between the two lenses to 2/3 F so that the focal plane (field stop) then lies outside (in front) of the field lens. The chromatic correction is not as good with such reduced seperation but this disadvanatge is outweighed by the advantage of having an external focal plane. Field of view ranges between 35° and 45°. This is an economical ocular and is good for use with a reticule or cross-hairs.

C. THE KELLNER OCULAR

The Kellner ocular is simply an adaptation of the Ramsden, using an achromatic eye lens, hence is an achromatized Ramsden, designed in 1850. Lens spacing is usually two-thirds that of the unmodified Ramsden ocular.

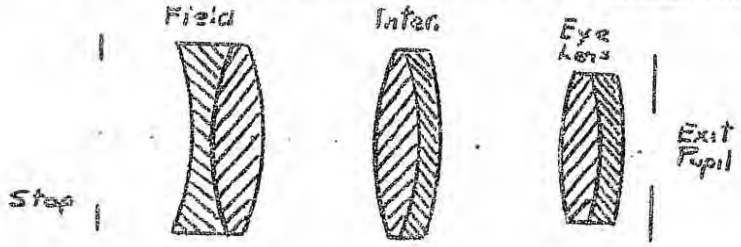


$$EFL = \frac{F^2}{2F - 2/3.F} = \frac{3}{4} F$$

The Kellner ocular gives a wider field of view than that of the Ramsden, varying between 40° to 55°. The ocular has low achromatic aberration. This makes it a very good low-cost telescope ocular, and it is widely used for this purpose. Like all the preceding oculars, the Kellner does suffer from some spherical aberration near the outer edges of the field of view, so these oculars are not ideal for use for projection astrophotography.

D. THE ERFLE OCULAR

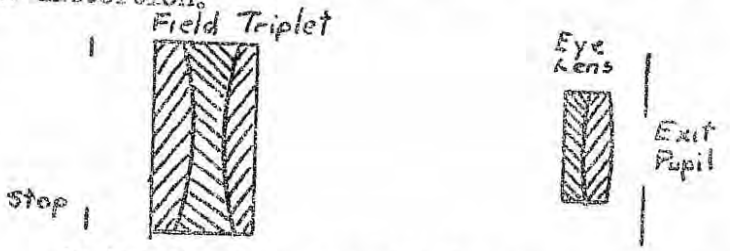
The Erfle ocular, developed about 1925, was designed specifically to give an extra-wide field of view between 65° and 70°, with good correction for all aberrations. It is usually a triple lens system with all lenses being achromatic. Lens spacing depends upon a variety of circumstances, so no attempt will be made to indicate a lens formula for this type of ocular.



This type of ocular is ideal for low-power instruments, particularly Rich Field telescopes, and is used in wide field binoculars. While this ocular can be used for projection photography, its projection field is not completely flat, making the stars at the outer edges of the film out of focus unless the film plane is curved.

E. THE ORTHOSCOPIC OCULAR

The word, Orthoscopic, means flat field, and this type of ocular is the preferred one for most telescope work. In its basic form it uses a triplet field lens (three lenses cemented together) and a convex achromat for the eye lens. The field of view is relatively wide, varying from 35° to 45° and this ocular has excellent color correction, allowing for very high magnification without distortion.



As the field is essentially flat, this type of ocular is probably the best to use for projection astrophotography, but the major drawback is its cost. However, if this can be handled, the orthoscopic ocular is the best all-round ocular for the amateur astronomer.

F. THE CONCAVE OCULAR

Many amateur astronomers fail to realize that the concave lens can be used as an ocular yet this was probably one of the first types of ocular used by Galileo. When used as a concave (negative) achromat it gives excellent color correction, and is an excellent projection lens for photography.

Most amateurs are aware of the Barlow lens used to increase the power of a telescope - this is usually a negative achromat. The Barlow has been badly maligned by many amateurs, but it is probably one of the most useful oculars available. However, to be fully effective the lens should be securely mounted in its tube at one fixed position, providing a fixed power increase, ie 2.4X or similar. The Barlow can increase telescope power without loss of eye relief that is usual in the case of increasing power by using a shorter positive efl ocular having a smaller exit pupil.

The Barlow operates on the principal of increasing the effective focal length of the telescope objective without increasing the effective telescope length more than a few inches. Variable power Barlows should be avoided as it is not possible to ensure precise axial fitting with a lens that can be freely moved. It is this type of Barlow that has given this type of lens such a bad reputation.

PARAFOCAL OCULARS

One of the many problems all amateur astronomers encounter is the need to change magnifying power by changing from one ocular to another, with a consequent refocusing required.

This problem can be almost completely overcome by using parafocalized oculars - all oculars in the set are designed to have their focal point at the same position in the focusing tube used to hold the ocular. Unfortunately, a set of parafocalized oculars is expensive and may be outside the price range of most amateurs. A cheap (?) substitute is a Zoom type ocular, adjustable from about 8 mm to 21 mm. Personally I do not consider such an ocular as good as separate fixed focal length oculars.

CARE OF OCULARS

The quality of the image seen depends largely upon the ocular, and if this is dirty or scratched the resulting image is seriously deteriorated, so it is essential that oculars be kept clean.

Oculars used in amateur work are frequently changed, often in cold weather. An ocular not in use should be capped at both ends to prevent dust etc from entering. In addition, if the ocular is taken inside after use in cold temperatures, condensation will form on and between the lenses unless the ocular is tightly wrapped in plastic while still outside. This will prevent the warm moist inside air from causing condensation on the cold surfaces of the ocular.

Normally, any film or dust is only on the outer surfaces of the lenses so it should not be necessary to dismantle the ocular to clean these surfaces. All dust should be removed before attempting to wipe a lens - this can be done with a soft camel's hair brush and compressed air. If this is not done, wiping the lens surface with dust on it will cause scratches that cannot be removed. If the lens surface needs washing, use a solution of mild detergent and a soft brush, rinsing after in clear water. Do not use alcohol as this will dissolve the bonding between a cemented lens.

An ocular should never be taken apart unless the person doing so thoroughly understands what he is doing. Proper tools and extreme care is needed to avoid damage and possible mis-spacing between lens elements.

A GOOD CHOICE of oculars is 40 mm, 32 mm, 24 mm, 16 mm and 8 mm with a 2.4X Barlow. Do not buy an ocular that will exceed the maximum usable power of your telescope of 60X per inch of objective diameter. Good viewing.

GENERAL MEETINGS

To get to Room B-110, Health Sciences Building, U of S, you enter the door to the building opposite (west) the Observatory. When you come in the door you turn left at the first corridor, walk a short way, and then turn right at the next corridor. You walk down this corridor a short way and then turn right again. Room B-110 is a short way down this hall to your right. After meetings we adjourn to the Observatory for coffee and hot chocolate.

THE ROYAL ASTRONOMICAL SOCIETY 1968
SASKATOON CENTRE

MEETING NOTICE

Place Rm B110, Health Science Bldg., U of S

Date Tuesday, 16th December 1975

Time 8:00 pm

Purpose Regular Monthly Meeting, plus Lecture by Dr. J.A. Koehler on Radio Astronomy.

Last Chance to Renew Your Membership

MEMBERSHIP

All members who do not plan on renewing their membership in the Saskatoon Centre, R.A.S.C., please take note that this will be the last Newsletter that they will be receiving. All those who do plan on renewing their membership and have not done so as yet are urged to mail in or bring in their fees. If this is not possible please phone in a reservation. If you are not signed up as of the December General Meeting, you will get all of your Newsletters, however, you may lose out on some of your Journals, as the National Office must have this information early.

Minutes
of
an Executive Meeting
Saskatoon Centre, R.A.S.C.
Held in the Observatory at 1:00 PM
Sunday 2 November, 1975

Present: Halyna Kornuta, President
Jim Young, Vice President
Lillia Wilcox, Secretary
Gordon Patterson, Centre Rep.
Greg Towstego, Editor
Hugh Hunter, Librarian
Merlyn Melby, Activities

Absent: Alan Blackwell, Treasurer
Doug Beck, Sub-Councillor

Minute	Subject	Action By
8.	Moved that the meeting be opened.	
9.	It was moved that Dr. Currie's membership be paid by Centre.	Halyna Kornuta
10.	The Auditors report should be submitted to Regina and the Corporate Fee be paid as soon as possible.	
11.	Constitution to be rewritten by Jim Young and Merlyn Melby.	
12.	Seventy copies of the "Observers Handbook" to be ordered by telegram (night letter).	Gordon Patterson
13.	Will notify National Office about new Executive by telegram if Postal strike continues.	Hugh Hunter
14.	Next General Meeting to be held 18 Nov., 1975, with Executive Meeting to follow.	
15.	Newsletters will be available at Observatory on Wednesday open houses from 8:00 pm to 11:00 pm during Postal strike. This will also be mentioned over news media.	
16.	Membership to be paid up by December General Meeting in order to qualify for the Journal.	
17.	The Calgary Assembly was discussed and will be mentioned at every General Meeting.	
18.	It was moved that the category list for General Assembly be reprinted in Newsletter.	
19.	It was moved that another 40 copies of the Astrophotography Handbook be printed at 5.00 per copy for non-members, (lab type cover).	Jim Young Lillia Wilcox
20.	Meeting adjourned - 2:00pm.	

Minutes
of
a General Meeting
Saskatoon Centre, R.A.S.C.
Held in the Health Sciences Building, Rm B-110
at 8:00 pm, Tuesday 18 Nov., 1975

Present: Jim Young, Vice President
Lillia Wilcox, Secretary
Hugh Hunter, Librarian
Gordon Patterson, Centre Rep.
Greg Towstego, Editor
Merlyn Melby, Activities
Doug Beck, Sub-Councillor

Absent: Halyna Kornuta, President
Alan Blackwell, Treasurer

Minute	Subject	Action By
21.	Moved that the meeting be opened	Jim Young
22.	Moved that October minutes be adopted as published.	Gordon Patterson Hugh Hunter
23.	Newsletters may be picked up at the Observatory until Postal strike is over.	
24.	At the December General Meeting, DR. KOEHLER will give a talk on "RADIO ASTRONOMY." In January, the talk will be by DR. SKINNER, and in February by DR. B.W. CURRIE.	
25.	The film, "The Strange Case of the Cosmic Rays" was shown.	
26.	Meeting adjourned to Observatory - 9;00 pm.	Tory Wilcox Hugh Hunter

Minutes
of
an Executive Meeting
Saskatoon Centre, R.A.S.C.
Held in the Health Sciences Bldg. Rm. B-110
at 9:00 pm, Tuesday 18 Nov., 1975

Present: Halyna Kornuta, President
Jim Young, Vice President
Lillia Wilcox, Secretary
Gordon Patterson, Centre Rep.
Hugh Hunter, Librarian
Greg Towstego, Editor
Doug Beck, Sub-Councillor
Merlyn Melby, Activities
Alan Blackwell, Treasurer

Minute	Subject	Action by
27.	Moved that meeting be opened.	Halyna Kornuta
28.	An attempt will be made to get more publicity about General Meetings on Campus.	
29.	A discussion was held on the best possible methods of getting the new membership lists to the National Office.	
30.	It was suggested that we seriously consider putting on a display at the 1976 "Hobby Show."	G.N. Patterson
31.	Articles for the Newsletter would be greatly appreciated by the Editor.	
32.	Meeting adjourned - 9:40 pm.	Doug Beck Jim Young