NATIONAL NEWSLETTER

August, 1980

SUPPLEMENT TO THE JOURNAL OF THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

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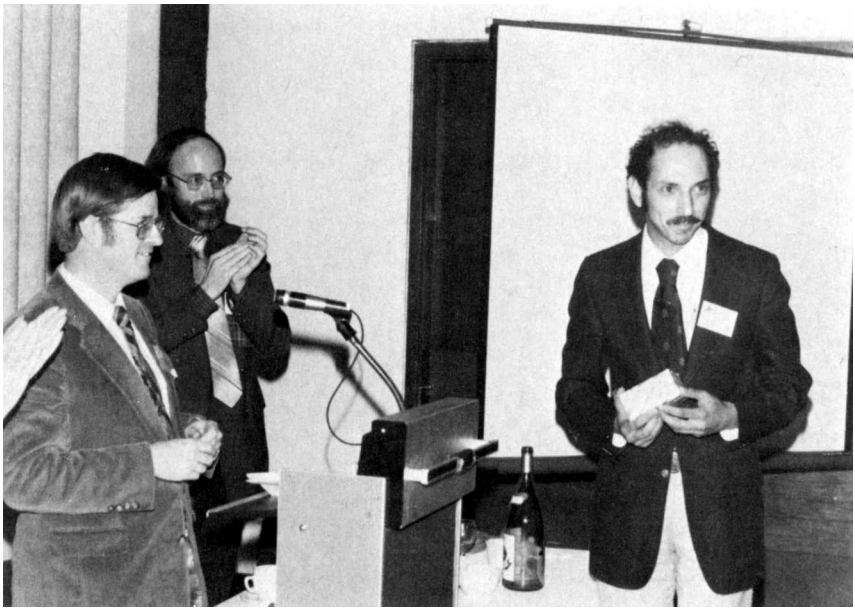

Mr. David levy (*right)* of the Kingston centre is the recipient of the 1980 Chant Medal of the Society at the Bluenose General Assembly in Halifax. Dr. John Percy (*left*), outgoing National President, and Dr. Roy Bishop, incoming 2nd Vice President, give their congratulations. See the October *Journal* and *National Newsletter* for a complete G.A. report.

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Centre and local items, including Centre newsletters should be sent to the Regional News Editor. With the above exception, please submit all material and communications to:

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Deadline is six weeks prior to month of issue

Edmonton Centre Presents Awards in the Name of the R.A.S.C.

At the March 21 Banquet, Edmonton Centre presented awards to members in recognition of outstanding achievements throughout the preceding year. This was the first occasion for a considerable time that the practice of making such awards had been observed, but it is the sincere hope of the Centre Council that they will continue to be presented each year hereafter.

Each of the awards consists of an annual (handsomely engraved) plaque and a matching individual plaque.

THE PRESIDENT'S AWARD
For outstanding service to the Centre or to the science of astronomy.

PRESENTED TO: Mr. Paul Deans, for his outstanding contributions to the Centre as editor of *Stardust* for over 6 years, a task he carried out efficiently and reliably without complaint and often without any assistance from other RASC members. Working around a hectic schedule of planetarium production, editing the Planetarium Association newsletter, and despite balky Xerox machines and typesetters, Paul always managed to get *Stardust* out on time. The quality and quantity of its content owes much to the many, many long hours Paul put into its production. With his departure to Toronto, the Edmonton Centre certainly loses a valuable member, one richly deserving of this year's President's Award. Thank you, Paul, and good luck in your new venture at the McLaughlin Planetarium.

THE OBSERVER-OF-THE-YEAR AWARD
For outstanding achievement in the field of amateur astronomical observation.

PRESENTED TO: Mr. Dave Holmgren, for his continuing program of deep-sky observing and sketching, and for his observations of variable galactic nuclei.

THE ASTROPHOTOGRAPHER-OF-THE YEAR AWARD
For outstanding achievement in the field of amateur astronomical photography.
PRESENTED TO: Mr. Dave Belcher, for his outstanding work in the area of lunar, planetary and deep-sky photography using a wide variety of film formats and equipment.

THE ANGUS SMITH AWARD
For outstanding achievement in the design and craftsmanship of telescopes and related equipment.
PRESENTED TO: Mr. Darrel Cross, for his construction of a fine 8-inch F/5 Newtonian reflector.

To the recipients of this year's Awards, congratulations for a job well done!

On Purchasing a Nebular Filter

by Trish Linke
Vancouver Centre

After foolishly selling a portion of property, I discovered that the developer's main aim was to put in the maximum number of streetlights that he could afford, (he must have been well-fixed!) the minimum distance from my house. I offered to return the money I had received if they would agree to remove the streetlights, but they would not do this. So, I was forced to use the money to purchase a nebular filter. This little optical aid is designed to block light emanating from mercury and sodium streetlights. You might call it a Pollution Control Device.

When finally there was a clear night, I carefully set out my 6" reflector and screwed the filter in place. It promptly fell out, rolled down the tube, and landed on my *mirror*! (We know how you felt, Trish, we once had a kitten land on ours! Ed.) Armed with the astronomer's friend (masking tape) I tried again, directing the telescope at the Orion nebula. With the first glance I was changed into a devoted fan of nebular filters, and accordingly spent the next hour removing and replacing my new toy just to see and enjoy the incredible contrast.

Now I am not a photographer, and I use it only for observing, so I cannot comment on its usefulness with the camera, but I have heard that it has gained quite a following in that area too.

For those of you who do not have one of these ingenious devices, I must tell you that it is worth every penny and I recommend that you get one – even if you have to sell a portion of your property to get streetlights, (which will make you need one) and money (so you can afford one). By the way – it works well even if you don't have streetlights!

What can an Amateur do?

By Dennis Ryan
Newfoundland

Many amateur astronomers, and this may be especially true for budding amateurs, will probably ask themselves an important question; as an amateur, can I contribute anything of practical importance to astronomy? According to some you might ask, the answer would be no. They would argue that, for any work of real value to get done requires large telescopes and hundreds of thousands of dollars worth of equipment inside huge domes on top of high mountains, the total cost of which is in the millions. And since these observatories are equally

expensive to maintain, for optimum results, they are open only to professional astronomers with specific projects in mind. The only time amateurs may get into an observatory is when they are part of the "Saturday Night Tour" in the summer, and then they get to look through the "visitor's eyepiece"; or when special arrangements are made with the local organization. There are exceptions to the rule and these exceptions are serious amateurs who are willing to spend a few thousand on a small observatory housing a medium sized reflector or refractor with another two or three thousand dollars worth of equipment. But these are exceptions and their desires are usually limited by either knowledge or, more often, pocketbook.

But what about the amateur, serious or otherwise, who has a six, eight, or ten-inch reflector or comparable refractor, or the beginner who may, at most, have a pair of binoculars? Surprisingly, three areas in which an amateur can make a valuable contribution are almost ludicrously simple to do. One of the first which comes to mind is solar observations; in particular, the counting of sun-spots on the sun's surface. All that is needed for this exercise is a piece of welder's no. 14 glass, say 4″ x 5″ (you can get smaller for less, but when dealing with the sun I think the increased safety margin is worth a few extra dollars) and, for better magnification, a pair of binoculars. You place the glass in front of one of the objectives and observe. Then you count the sun-spots and take a note of how many. It may take daily observations for a month or so before the observations are worth anything but with time and patience you'll have something to contribute.

Another area is Comet and Nova Search. You simply pick a constellation, take a pair of binoculars and memorize what's in it. Then if something unusual shows up, you'll know it. It will take plenty of patience for this task, but with perseverence and a little luck you may find yourself inscribed forever in astronomical journals as the discoverer of a comet. Yet another area is the Meteor Shower watch. To be a success this requires patience on the part of the observer, some organization, as it is not a solitary endeavour, instruction in some easy-to-learn rules and, in the case of Canada between October and March, warmth. Of course, clear skies are mandatory and the darker the better. All of these activities are easy to do and require little, if any, technical or mathematical knowledge. And don't expect a tremendous discovery all at once; that usually comes only after long and hard research. The main objective of these exercises, after the contribution, is to learn and to have fun.

The area of astronomy in which I personally feel that amateurs can make a great impact is the field of teaching and information. Essentially, teaching astronomy to beginners and those who simply wish to learn, and deciphering astronomical information which the professionals discover. Astronomy, like other sciences, has both basics, which are necessary to learn and understand before one can engage actively in it, and also its own language which non-astronomers would not be familiar with. It is the responsibility of the experienced amateur, I believe, to assist beginners in acquiring knowledge of the basics and to continue that assistance when necessary until they have enough knowledge to continue on their own. After that, how far they go is based on their own interest and abilities which could turn out to be considerable. I've had personal experiences where I've taught the basics to beginners and found the experiences very rewarding.

Astronomy, as mentioned, has its own language and professional astronomers, having been trained in that language, are apt to use it. Non-astronomers, not trained in that language, can easily become confused by it. Amateurs can be of tremendous importance here, for, also knowing the language, they can interpret it for ordinary folk. It is not that professionals cannot do it, it's just that amateurs may have more opportunity to spread the knowledge.

No amateurs should feel, or be made to feel, unimportant or inadequate. They have a lot to give and can be of great help to professionals or those learning. The amateur also has the opportunity to go into wider areas of research since the equipment possessed is likely to be his own. No matter what areas one might desire to get involved with there is plenty of opportunity for the amateur to make a contribution, even if it's carrying equipment. If anyone doesn't think that's important, try carrying some of the stuff I've helped to carry – believe me, its important. Even if your strength isn't technical, there are other ways for your talents to be utilized, If one's best foot is put forward, the result can be fun, rich and rewarding.

Nouvelles des Centres Québécois

de Damien Lemay

CENTRE D'ASTRONOMIE DE MONTREAL

Un membre bien en vue à la Société d'Astronomie de Montréal s'apprête a nous quitter pour des cieux plus cléments. Il s'agit du Dr René Racine qui fut Directeur de l'Observatoire du Mont Mégantic depuis son entrée en service en avril 1978, et qui devait entrer en poste le 20 juillet, a titre de Directeur Exécutif de l'Observatoire "Canada, France, Hawaï Telescope", à Hawaï. Monsieur Racine est membre de la S.A.M. depuis plusieurs années et son absence des diverses activités d'amateurs sera grandement ressentie. Nos meilleurs vœux l'accompagnent!

LE CENTRE DE QUEBEC

En plus de la venue de monsieur Percy, le Centre de Québec fut également choyé d'une conférence donnée par le Dr Kronberg de l'Université de Toronto. Lors d'un séjour à l'Université Laval, il a en effet accepté l'invitation du Centre de Québec, où il a parlé de la Radioastronomie.

Une visite aura lieu a l'Observatoire de l'Université Laval, les 10 et 11 août (ou 11–12 août, dépendant de la météo). L'instrument de 16 po. vient d'être équipé d'une nouvelle monture équatoriale, plus divers accessoires. Si des membres d'autres centres de la S.R.A.C. se trouvant dans la region pendant cette période estivale, désirent se joindre à ceux de Québec, prière de communiquer avec Réjean Dutil, à 839–6687, rés. ou 656-4047, bureau.

MONTREAL ET QUEBEC

Au cours des dernières années, il fut mentionné à quelques occasions dans ces pages, le nom de "Magnitude Zero" qui est la revue officielle de l'Association des Groupes d'Astronomie Amateur (AGAA), dont la S.A.M. et le Centre de Québec sont également membres. Ce mensuel est évidemment devenu en compétition avec le Québec Astronomique édité par la S.A.M., ce qui a causé quelques malaises. Il y a plusieurs mois, un comité était formé pour étudier la possibilité de fusion et grâce à la bonne volonté des parties en cause, on en est venu à une entente qui se resume comme suit: une toute *nouvelle* revue portant le nom "Le Québec Astronomique" et éditée par l'A.G.A.A. remplacera les deux revues actuelles.

A compter de septembre prochain donc, les membres de la S.A.M. et du Centre de Québec recevront le nouveau "Québec Astronomique". Les autres centres de la S.R.A.C. qui échangent déjà leur "Newsletter" avec Québec et/ou Montréal, recevront eux aussi cette nouvelle revue. Il sera également possible de s'y abonner sur une base individuelle. Ces lignes en indiqueront l'adresse et le coût dans le numéro d'octobre.

Dans un autre ordre d'idée, les deux centres français de la S.R.A.C. ont eu le plaisir de recevoir notre président national comme conférencier. En effet, monsieur John Percy a récemment visité Montréal, puis Québec. Il nous a entretenus sur les étoiles variables, un sujet cher aux amateurs.

MILLE EXCUSES

L'Editeur du "National Newsletter" désire s'excuser auprès des membres des centres français pour la piteuse traduction française des "Règles pour le concours de la S.R.A.C. 1980", lesquelles étaient publiées dans le numéro d'avril. Dans la hâte d'acheminer ce materiel (via notre merveilleux Service des Postes) en temps chez l'imprimeur, la procédure habituelle voulant que ces écrits passent entre les mains de l'éditeur adjoint pour les centres français, ne peut être suivi avec le résultat que vous connaissez. Ces excuses s'adressent également aux membres de l'Exécutif National, pour la mauvaise impression que ceci ait pu causer à l'image de la S.R.A.C.

Community Astronomy in British Columbia

As is indicated in the article in this issue by Mr. Dennis Ryan of Newfoundland, one of the fields where RASC members can ride their hobbyhorses for the enjoyment of all is that of introducing astronomy to others. All centres of the Society, from time to time, have accounts in their local newsletters of Star Nights, displays in shopping malls, cooperation with the local Planetaria, etc. in providing equipment and personnel for this most fascinating activity.

In British Columbia, through activity of the H.R. MacMillan Planetarium, a somewhat more intensive approach has been underway for the past three years. Personnel, largely recruited from the ranks of the RASC have been travelling through the Provincial Parks, and other locations, getting the message across to tourists, and local residents who are too far from the parent institution, that astronomy is not just for a few, but is fun for everyone. Dave Hurd, who has recently been appointed Director of the H.R. MacMillan Planetarium has been principal organizer for the programs.

Such a program demands more time than can be expected on a voluntary basis, such as is involved in the usual Star Night etc., so funding was arranged through two sources to date: The National Museums Association, and Placer Development Ltd. The latter company has provided $10,000 per year for the past three years, and has indicated that this arrangement will be continued through 1981.

From funds such as this it has been possible to provide telescope equipment, audio visual equipment, and allow personnel to move into areas where they had to take vans or personal overnight camping equipment. In some locations portable power equipment is a necessity. Such locations have one advantage, no light pollution.

Public acceptance of the program has run high. Attendance has varied from a low of perhaps half a dozen on a rainy night before the actual season opened, to a maximum of 550 on one occasion! The program has extended into the foothills of Alberta, and even south of the International Boundary and across to Vancouver Island.

Throughout the season when the parks are not in operation, staff have visited schools by arrangement with the local school boards and teachers, supplementing the usual curriculum, or in some cases perhaps supplying it. Of special interest, because of the spontaneous enthusiasm of the audiences, are visits to hospitals, penal institutions, churches, and YMCA camps where the youth of the community are always ready with questions to stump the lecturers!

That funding of this type is a possibility could perhaps be explored across the country. We know there is public interest from Newfoundland to Vancouver Island. Let's hear from the regions in between.

How Long are the Seasons?

by G.H. Moller
Alpine, Texas

Leo Enright (*Newsletter*, Feb. 1980) points out that the predicted alignment of the planets in 1982 will not come to pass: I concur on the basis of my own calculations (No Alignment, *The Mathematics Teacher*, Nov. 77).

A propos of checking other people's calculations, I tried without success to duplicate W.M. Smart's computations of the *lengths of the seasons* and then noticed that there is some confusion on the subject in the literature.

W.M. Smart (*Spherical Astronomy*), D. McNally (*Positional Astronomy*), A.E. Roy and D. Clarke (*Astronomy: Principles and Practice*) tell us that in the northern hemisphere the durations of Spring, Summer, Autumn and Winter are, respectively, $92^{d}20.^{h}2$, $93^{d}14.^{h}4$, $89^{d}18.^{h}7$, $89^{d}0.^{h}5$.

First, observe that half a century separates Smart's publication from the other two and that during that time the length of spring, for example, has decreased by almost an hour.

Second, as anyone can check, the given durations do not follow from Smart's formulas and input, nor do they follow from Roy and Clarke's.

Third, McNally characterizes the given durations as mean values which, of course, implies that on the average the seasons have unequal lengths.

The foregoing gives rise to two questions: just how long are the seasons in our time and how can it be that in the long run the seasons have unequal lengths?

The answer to the first question is that around 1980

$$\text{L(spring)} = 92^{d}18^{h}.8, \qquad \text{L(summer)} = 93^{d}15^{h}.1$$
$$\text{L(autumn)} = 89^{d}20^{h}.1, \qquad \text{L(winter)} = 88^{d}23^{h}.7$$

For verification of L(spring), for example, we note that according to the almanacs the time of the 1980 spring equinox is Mar. $20^{d}11^{h}$ and the summer solstice occurs on June $21^{d}06^{h}$, giving $\text{L(spring)} = 99^{d}19^{h}$.

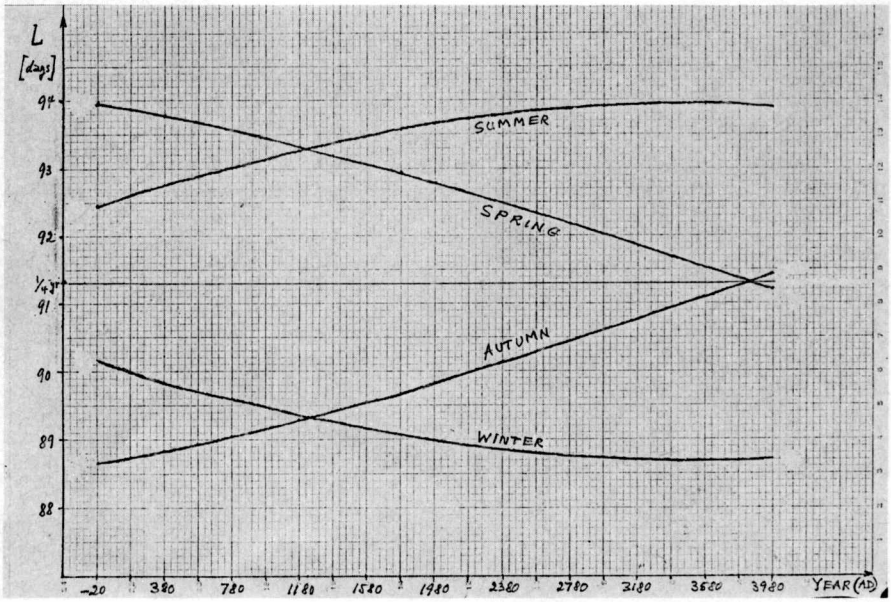


Fig. 1. Lengths of the seasons, 20 BC to 3980 AD

As for the mean durations of the seasons, intuition suggests that if the lengths of the seasons fluctuate about some mean value, then that mean value should be exactly one quarter of a tropical year, or $91^{d}.31$ for each season. A little calculus will prove our intuition sound. The length of spring is given by

$$\text{L(spring)} = \frac{T}{4} - \frac{e T\sqrt{2}}{\pi} \sin\left(\bar{\omega} + \frac{\pi}{4}\right),$$

where

T = one tropical year = 365.2422
$\bar{\omega}$ = longitude of the sun's perigee
e = eccentricity of the earth's orbit.

Treating *e* as a constant, L(spring) becomes a function of $\bar{\omega}$ with domain $0 \le \bar{\omega} < 2\pi$ and *mean value*

$$\frac{1}{2\pi}\int_0^{2\pi} \mathrm{L(spring)}\, d\bar{\omega} = \frac{T}{4} = 91^{d}.31 \qquad \text{Q.E.D.}$$

The demonstrations for the other seasons are similar, and the results are not affected by the long-periodic variation of *e*. Figure 1, in which the lengths of the seasons are plotted for the period 1980 ± 2000 yrs, takes into account the variation of the eccentricity and suggests that the duration of each season indeed oscillates about one quarter of a year.

Comments on "How Long are the Seasons"

(Courtesy of editorial referee)

The "error" in Smart's calculation is probably that he quotes his values for the lengths of the seasons to more precision than the approximation he says he is using. He derives the formula (Smart's fourth edition, p. 153)

$$l = 0 - 2\, e \sin M$$

from equation (25) by dropping the higher-order term in e^2. This term may easily amount to 2% of the term in *e* which he retains. Since the seasons are roughly 2200 hours long, this may be the cause of the apparent discrepancies of an hour or so. The author might wish to repeat these calculations retaining one higher-order term to check this effect.

Concerning "mean" values, it may be necessary to distinguish between short-period and long-period means. The major axis of the earth's orbit rotates with respect to the vernal equinox in about 20,900 years. Over this long period, or any similar one including variations in *e*, it is not surprising that, as shown in the paper, the seasons have equal length on the "average". Suppose we want to compare the length of the seasons at present, however. It will not do to just compare the relative lengths for this year. From 1970 to 1980 the length of spring varies between $92^{d}18^{h}30^{m}$ to 48^{m}. A general decline is evident but there is one jump of 17^{m} in one year! The explanation for the scatter is probably nutation so some mean value for the present is of interest and is presumably what Smart and the others are talking about.

Volcanic Ash gets in Your Eyes

by Chris Rutkowski
Winnipeg Centre

Monday night, May 19th, I was coming home from the store in the early evening when I happened to look westward. Although the news reports that day were full of warnings of the volcanic ash fallout from Mt. St. Helens in Washington, no one was really worrying about what Winnipeg might get. The sun was still about 5 to 10 degrees above the horizon, yet was a red ball, spectacular in the grey-blue sky. Across its face, thin dark wisps were visible. I strained, but failed to detect any spots. The effect lasted another half hour before the sun dipped behind some trees. Most people did not even notice the significant appearance of our dear old Sol.

However, the next day it was obvious that the sky was getting obscured by haze. By noon the sky was definitely a cobalt blue. By 6:00p.m., the atmosphere was an off-white. Distant buildings disappeared from view. The air became full of dust which caused breathing to be punctuated with coughing fits. Indeed, many people wore surgical masks. But the sun!! 25 to

30 degrees up in the early evening, and you could see it! No, no, I don't mean that you can't see it normally, but instead of being merely aware of a bright source of light in the sky, a visible ball of off-white light was in view. Wisps of dust floated across the disc, and, yes, a few spots could be seen occasionally. The sunsets for that day and a few days after were quite striking.

In comparison to Mt. St Helens, which was the first volcanic eruption in North America for quite awhile, it is interesting to consider another famous volcano. In 1883 Krakatoa ("East of Java") erupted with many times the force of Mt. St. Helens. Its explosion killed many more people, and the British government sailed several rescue missions to the area. A few months after the occurrence, the skies in England were vividly coloured, and remained so for over a year. The weather patterns for the world were, of course, changed somewhat. For Mt. St. Helens, the two airstreams are carrying ash around the world. One, dipping southward as it travelled east, took the dust across the U.S.A. and headed across the mid-Atlantic. The other curved upwards into Canada, across southern Saskatchewan and directly over Winnipeg, into northwestern Ontario. It will continue on to Europe (if it hasn't already by the time you read this). While it was hoped that the volcanic ash might become the nuclei for much-needed raindrops here in Manitoba, it didn't, and only caused a mild "greenhouse" effect for the already intense heat we were experiencing.

As for changing weather patterns, it is speculated that Mt. St. Helens will cause a slight lowering of our annual temperature. The amount, only a few tenths of a degree, may not be noticeable, but heck, our winters are so cold anyway! On the brighter side, the volcanic ash has no doubt deposited more minerals in our bodies and probably will actually make us healthier. That way, Manitoba astronomers can expect to be better able to withstand the colder weather in winter out at Glenlea! Right?

Just in Case You Missed it

(That other part of the *Newsletter*)

We once asked a local member about something that appeared in the monthly notice of our centre, and he looked completely vacant.

"It was in ..." we said, mentioning the publication.

"Oh, was it?" he said, "The thing was rather long this month, so I threw it aside until I had time to look at it."

In case you pulled a similar stunt yourself, take a look in your files for the publication that accompanied your April *Newsletter*. I'm sure you'll find it somewhere. On page 81 there is a most thought-provoking, and stimulating article by our President, Dr. John R. Percy, on **The Teaching of Astronomy in Canadian Schools**. Most of us have experienced just what John is talking about, and in some ways we are trying to tackle the very factors he brings up by becoming members of the RASC ourselves.

Then two of the papers offered as entries in the 1979 Simon Newcomb Award competition are printed in the issue: **Astronomy at King's College, Windsor, Nova Scotia**., by William J. Calnen of the Halifax Centre on page 57; and **The Brightest Star that Shines**, by Peter Jedicke of the London Centre on page 88.

This is not to do discourteous service to the other contents of the *Journal*, but just to refresh our memories that whatever our particular diet, we are likely to find food for thought even outside the pages of the *National Newsletter*!

Buying Your First Telescope

Dave Belcher
Edmonton Centre, RASC

Basically, there are three kinds of telescopes available to the budding amateur astronomer, and it is important to know the advantages and disadvantages of each kind before parting with

that hard-earned cash to pursue your favourite night-time hobby. It is also important to know that all telescopes are merely an extension of your own eye. The characteristics of each kind of telescope are what determines its performance. When we speak of telescope "power", we mean the following:

Resolving Power – The telescope's ability to see very fine detail. This is determined by the aperture or diameter of the lens or mirror and by the precision with which the optical components are made.

Light Gathering Power – This is determined by the diameter of the lens or mirror. A 6-inch telescope will gather four times as much light as will a 3-inch scope, and images will look four times brighter.

Magnifying Power – This is determined by the focal length of the main lens or mirror and by the focal length of the eyepiece used. The maximum magnification depends on the aperture, the quality of the optics, the steadiness of the mounting, and on the "seeing conditions" in the atmosphere.

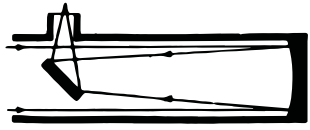
BASIC TELESCOPE TYPES:

Refractors: These use a *lens* as the light gathering element, and have the eyepiece at the opposite end of the tube.

Achromatic Refractor

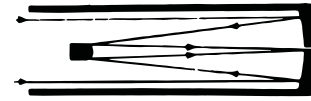
– *Advantages* – very sharp images for a relatively small aperture (i.e., good resolving power) – easy to set up and use – easy to maintain and keep in alignment.
– *Disadvantages* – images have some chromatic aberration or colour fringing – less suitable for astro-photography – very expensive in larger apertures (4-inches or larger) – larger refractors are not portable.

Reflectors: These use a mirror to gather light and are made in the basic Newtonian form with the eyepiece on the side of the tube or the Cassegrain form with the eyepiece at the back of the telescope.



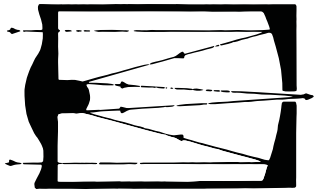
Newtonian

Cassegrain



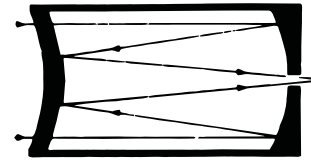
– *Advantages* – for their size they are more portable than refractors – relatively inexpensive in larger apertures and easy to construct for the amateur – does not suffer from chromatic aberration – adaptable to astro-photography.
– *Disadvantages* – not as easy to maintain in alignment as refractors – short focal length reflectors suffer from coma and consequently have a narrower field of sharp definition.

Catadioptrics: These combine elements of both the refractor and the reflector to produce a very fine instrument. They have a *mirror* and a *corrector* plate or lens. e.g., Schmidt Cassegrain and Maksutov designs.



Schmidt-Cassegrain

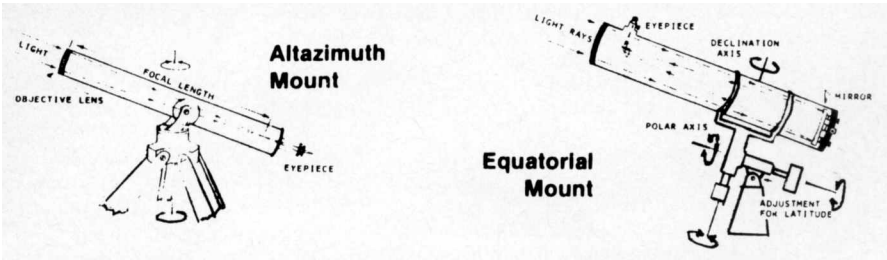
Maksutov



– *Advantages* – excellent definition and an exceptionally wide field of view – The "folded" optical path, even for a relatively long focal length, can be housed in a very compact instrument making them very portable and easy to set up – easy to adapt to astrophotography.
– *Disadvantages* – moderately expensive – difficult to manufacture for the amateur – large secondary mirror degrades contrast and resolution somewhat compared to an equivalent Newtonian.

And now a word on telescope mountings

Even the finest optics on the most expensive telescope will be of little use if the telescope has a flimsy mounting. The most important thing about a mounting is that it must be RIGID, so that the magnified image remains steady in the field.



The simple *altitude-azimuth* type of mounting is suitable for casual observing and widefield, low-power use. It is the type of mounting often found on small "beginner's" refractors. For more serious prolonged observing, and for astronomical photography, the *equatorial* mounting is essential. With it, the telescope need only be moved in one circular motion, preferably with some sort of fine motion adjustment, in order to track objects during the night. This mounting, to be effective, requires that the observer learn how to align his or her telescope to the North Celestial Pole. Many telescopes over the $300–$400 price range also come equipped with an electric clock drive which automatically rotates the telescope around its polar axis at the correct speed to follow the sky. This is a "must" for photography of objects other than the moon and sun.

Answers To Commonly Asked Questions

How powerful is that telescope?

The magnification of a telescope is its least important characteristic. Any telescope can be made to magnify at any power simply by inserting the eyepiece of the appropriate focal length. What limits a telescope's performance is its "light-gathering power" – the larger the aperture of the main lens or mirror, the more light the telescope will collect. More light means a brighter, sharper image. Excessive magnification on a given telescope will cause the image to be too dim, very fuzzy and lacking in detail. In general, the maximum magnification for any telescope is equal to 50x the diameter of the lens or mirror (in inches). Therefore a 2.4-in. refractor can be used up to 120x , a 6-in, reflector up to 300x , and an 8-in, telescope at no more than 400x. However, even with large aperture telescopes, a magnification of over 200x is rarely required.

How far can you see with that telescope?

This question assumes that faint objects in the sky are necessarily far away and that bright objects must be close by. Unfortunately, in astronomy this is not always the case. Even with the unaided eye you can see the Andromeda Galaxy, an object which is 2,000,000 light years away (provided, of course, you know exactly where to look!) By comparison, even an experienced astronomer using a telescope of say, 25 to 30cm aperture (10–12-in.) will find it difficult to observe Pluto, the very faint planet at the edge of the solar system. Even small amateur telescopes can be used to observe faint galaxies that are often tens of millions of light

years away, but this is only because those galaxies are intrinsically so very bright. Therefore, the question should really be reworded as "How faint an object can you see with that telescope?" An 8-inch telescope, for example, can detect objects that are 500 times fainter than what the unaided eye can see.

How much does a good telescope cost?

As with everything else, the price of telescopes has gone up a fair amount in the last few years. Gone are the days when $150.00 would get you a decent 10cm (4-inch) reflector, or for $300.00 you could purchase an equatorially mounted 80 mm (3-inch) refractor. However, one should keep in mind that a telescope, unlike most other consumer goods, will last a lifetime (provided, of course, it is well cared for).

Today, a simple alt-azimuth 60 mm (2.4-inch) refractor, a standard "beginner's telescope", can be purchased for about $175.00. Beware of telescopes of this design selling for much less than this as they may only be plastic imitations, no more than breakable toys. Look for solid metal and wood construction. In reflectors, a good basic model designed for low power sweeping of the skies is the Edmund Astroscan. While the tube is largely made of plastic, there are almost no moving parts, and short of dropping it onto a concrete surface, it would be very hard to break.

Small refractors and reflectors manufactured in Japan, and of respectable quality, used to dominate the low and mid-price category. But the falling dollar and rising Japanese yen has inflated their price to an exhorbitant level. For example, 80 mm refractors once the mainstay of amateur astronomers, now list at $700–$800! Therefore, the prospective buyer contemplating spending over $300–$400 for a telescope would do well to consider a 15 or 20cm Newtonian reflector from Meade Instruments or Edmund Scientific, both American firms. In the upper price ranges are the Celestron line of "compound mirror/lens" telescopes.

Can I take photographs with this telescope?

Unfortunately, the simplest telescopes such as alt-azimuth refractors and small reflectors, while suitable for the novice observer, are largely unusable for astronomical photography. If you wish to pursue astro-photography, an equatorially mounted 15 cm Newtonian reflector with an electric clock drive is the minimum requirement. Better yet consider a Celestron 5 telescope, or its larger brother, the C8.

Which is better – a short-focus F/5 or a standard F/8 design?

Often Newtonian reflectors are offered in a choice of focal lengths, perhaps a relatively short-focus, "fast" system such as an F/5 or F/6, ora standard focal length F/8 scope. The F/5 system is better suited to deep-sky observing and astro-photography due to its wider field and lower magnification with any given eyepiece. The F/8 design is better suited to lunar and planetary observing but is a good general purpose focal length. Which is best for you depends on your observing interest. The short F/5 focal length is much more portable; this may be the most important consideration since the capability of easily transporting the telescope to the country for dark skies is essential for good observing and photography.

What can I expect to see with a telescope?

Even a small 60 mm refractor has sufficient light-gathering power and resolution (remember, magnification is not important!) to show the craters, mountains and valleys of the moon, the moons and cloud belts of Jupiter, the rings of Saturn (at least when they aren't "edge-on" as they are in 1980) and the more prominent star clusters. However, telescopes of larger aperture are able to show fainter deep-sky objects such as nebulae and galaxies, and will reveal far more detail on bright objects like the moon and planets. More sophisticated telescopes also feature such things as sturdy equatorial mounts, manual slow motion controls, and electric drives, items which make photography possible and observing far more convenient. With telescopes of apertures of 100 mm (4-inches) or larger, there is a wealth of objects within reach. How much use a person gets out of a telescope depends very much on whether

he or she is willing to learn how to find these objects. A good set of star charts and observing handbooks is essential, teamed up with a familiarity with the constellations.

Reprinted from Edmonton Centre, RASC *Stardust* May 1980

"Nine Planet Club"

from Leo Enright
Kingston Centre

Leo Enright advises us that David Levy, Kingston Centre, (Arizona Branch) recently had the occasion of observing all nine planets in one night. He reports that the most difficult one was Mercury. It was certainly not his first viewing of Pluto, for he had been watching it move among the stars near the time of its opposition.

David Levy has also established the **Nine Planet Club**. There are two divisions: those who have seen all nine planets, and those who have seen all nine planets in one night.

Observations of a Yukoner

by Ron Richards
Vancouver Centre

In a virtually frozen wasteland where temperatures drop to –62°C and refuse to rise above –40°C for four months at a time, not much appears to be alive. Too cold to snow, the ice fog settles in at times so thick that you can't see a friend 20 feet ahead of you. The eighteen to twenty four hour nights are unending, but when the skies are clear those long cold nights are a blessed gift to a budding, (or an experienced) astronomer, (as long as you keep warm).

Absolutely free of any type of pollution, and with a totally dark sky, the Yukon at 62½ degrees N. latitude is host to amazing views of the stars and their configurations. Fainter magnitudes being more easily seen in these dark skies, the Milky Way is truly splendid. The Hyades and Pleiades, as well, appear richer and fuller. Constellations become easier to define and the planets seem brighter with no disturbance from the atmosphere. But by far the most awesome sight of all offered by the gracious Host of the North is the spectacular light show the Aurora Borealis.

More commonly called the "Northern Lights", it is a stunning panoply of ever changing and unending beauty. These lights are caused, of course, by charged particles from the Sun bombarding the rarified gases in the atmosphere, causing them to glow. The phenomenon takes place more than 60 miles above the surface, and is observed most frequently around 70° latitude.

If you are fortunate enough to be living in a dark sky area, keep an eye on the northern sky, as solar activity is high, and the two phenomena are related. Check as often as possible, for aurora can appear as suddenly as a meteor, or brighten gradually and gracefully. Auroral lights may disappear and then suddenly return intensified ten-fold. The show can last minutes or hours, and there is no way of knowing when the "big attraction" is on stage.

Constantly moving, sometimes racing from one section of the sky to another they cover more than 100° in a second, and at other times they wave and bend, gently and serenely, as seductively as the hips of a young Polynesian dancer. Often times they light up the sky with shimmering reds, greens, yellows and whites. More common are paler shades stretching across the zenith in the form of a band, and common also is a band beginning at one horizon and reaching unbroken to the other. The auroral shapes and colours differ from night to night, hour to hour, and minute to minute. They are less predictable than the wolverine or the

grizzly, and definitely more beautiful than any sunset. Sometimes they imitate the clouds, and form shapes of recognizable forms in the eyes and imaginations of the observer.

I remember an evening in November last, gazing into the sky and seeing the most beautiful reproduction of a fox tail I have ever seen. Pink, yellow and white, and approximately 25′ wide at the base, it curled inside itself until it formed a perfect tip, as would the tail of a sleeping fox. The outside edges shimmered in a manner suggesting the fur being swept by a gentle breeze.

Several nights later I saw a beautiful set of green and white moose antlers set in Ursa Major. The rack's bases began each side of the bowl stars of the Dipper, washing out the stars in the handle. Most amazing about the auroral rack was its perfect symmetry. From each side of the bowl it swept downwards perhaps 40 degrees, and the ends "shooting" provided the appearance of the antlers' tips.

There is one other evening I will remember more vividly than either of those; I was hiking along an exploration road and the light show began. At first it was pale and faint, while I continued my hike pleased and feeling part of the whole experience; suddenly its intensity and brightness increased fantastically. The aurora began to shoot across the sky so fast I had to stop and try to catch as much of it as I could. Then I heard it! It was a faint crackling and hissing like cellophane and steam. It was one of the eeriest moments of my life – listening to the aurora alone in the bush, miles from town.

When I'm away from the Yukon I miss the light show. The sky seems somehow empty and I feel a part of my life has been taken away. Under the aurora I suppose I could say I am floored, or should I say star struck! But I'm not sad, because I know I'll see it again.

All of you should have the good fortune of seeing the Northern Lights, because if you do you'll never forget them either. Remember, keep an 'eye in the sky' and look north. You may get lucky too in the coming months.

British Astronomical Association Asks for Observations of Saturn During 1964–1970

from Circular No. 603 of the BAA

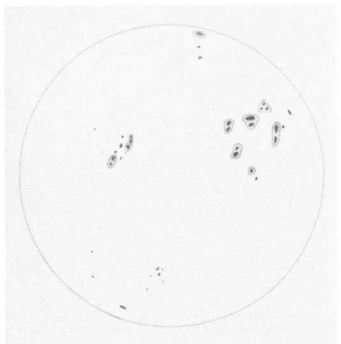
An analysis of the latitudes of the belts of Saturn during the period of 1946 to 1976 is currently being carried out by BAA members. From 1964 to 1966 the edge of the North Polar Region appears to have moved southwards and this seems to have been followed by a similar movement of the remaining belts in succession ending with the South Polar Region in 1970. It has the appearance of a shock wave moving across the upper atmosphere of the planet. A. J. Hollis is coordinating the analysis of observations.

To assist in the analysis of this period it would be greatly appreciated if a copy of any observations made and recorded by members during the relevant years could be sent to either the Director of the Saturn Section of the BAA, or Andy Hollis.

Alan Heath, Director,
136 Trowell Grove,
Long Eaton,
Nottinghamshire,
England,
NG10 4BB

Andy Hollis,
Ormanda,
85 Forest Road,
Cuddington, Northwich,
Cheshire, England,
CW8 2ED

1980 Observations of Solar Activity sketched by Angelika Kahrkling, Kingston Centre



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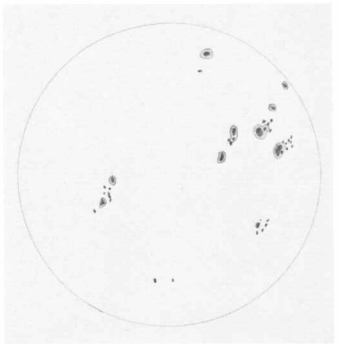

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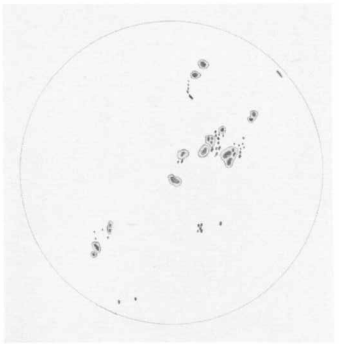

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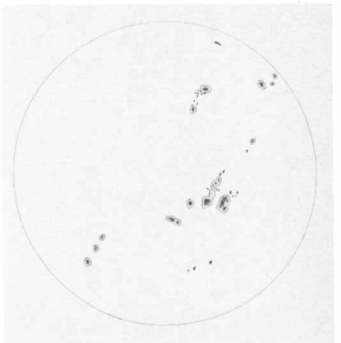

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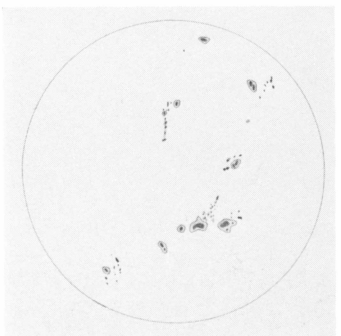

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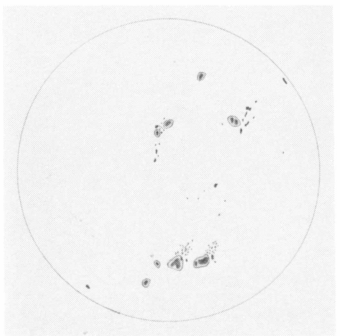

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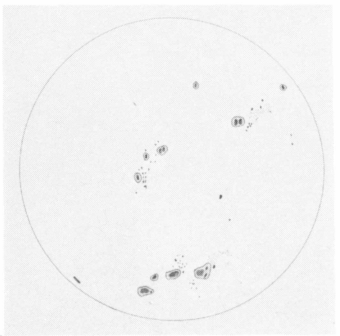

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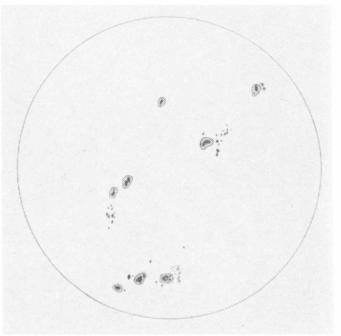


May 29, 15:45 EDT.

All observations were made with a 60mm telescope, a 12.5 mm eyepiece, and a solar filter attached to the dewcap of the telescope. (We would again caution against the type of solar filters often supplied which screw into the eyepiece. They often fracture dangerously. Ed.)

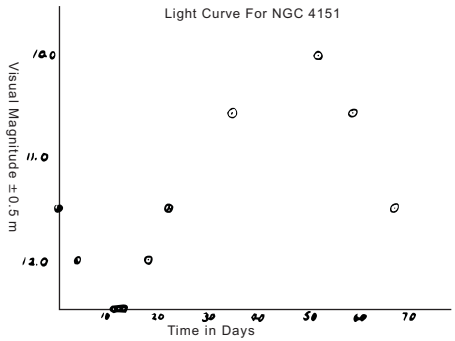
Observations of a Variable Galaxy

by Dave Holmgren
Edmonton Centre

Over the summer of 1979, I was able to make some observations of the Seyfert galaxy NGC 4151, in the constellation of Canes Venatici. This galaxy is the most well-known member of a class of galaxies known as variable galaxies – so-called because they seem to flash on and off like variable stars. From a set of observations, an observer can deduce some interesting facts about these objects.

I observed NGC 4151 over a period of 70 days, although for nearly half of that period the object was very low in the north, with the summer twilight also interfering. The observations are listed beside the graph.

The magnitudes were estimated by comparing the brightness of the galaxy to that of non-varying stars. Knowing that the brightness of the galaxy varies over a number of days allows us to actually calculate the size (diameter) of the central part or nucleus of this galaxy. Two or more such calculations show us how the nucleus changes in size over some period of time. The first calculation produced a result of 0.0355 light years, making it roughly 57 times the size of our solar system, but still very small when compared with the distance to the nearest star. Another calculation produced 0.0200 light years. Thus, a small object is generating a very large amount of energy.



Day	Time	Magnitude
May 27	00:00	11.5
May 30	23:45	12.0
June 7	00:15	12.5?
June 8	00:20	12.5 - 13.0
June 9	00:20	12.0 - 12.5
June 15	00:30	12.0
June18	01:00	11.5-12.0
August 2	00:05	11.5

Obviously, the center of NGC 4151 has changed size (in this case by 0.0155 light years over a period of 57 days). As to why this occurs, there are many theories but nobody can pin down any concrete reasons for this behavior. To support the previous statements on the size of the center of the galaxy, I have sketched a light curve that represents the change in brightness over a corresponding change in time.

Many conclusions could be drawn about the nature of NGC 4151 and other similar galaxies, but since they are indeed numerous, I shall only state a few. The most obvious is that the nucleus changes size and brightness correspondingly, which leads us to the fact that this object at the center of NGC 4151 (whatever it is) must be very small indeed. To realize that this small object is generating enormous amounts of energy makes NGC 4151 truly unique.