NATIONAL NEWSLETTER

Jack Newton, President of the Toronto Centre, provides this interesting photo of the sword and belt region of Orion as an example of the fine work that can be done with commonly available equipment. Jack used a 200 mm telephoto at f4.2 for this picture on Tri-X film. The camera was mounted piggy-back on a small telescope which was hand driven during the 15-minute exposure.

Rules, Rules and a Few Regulations

The following article was written by a Society member well-known across Canada – Professor J. E. Kennedy. Mr. Kennedy is at present the Assistant Dean of the College of Arts and Sciences, University of Saskatchewan, in Saskatoon. He has been an active member of the R.A.S.C. for over twenty years, and during that time served as National Secretary from 1959 to 1964, and as National President from 1968 to 1970. Professor Kennedy was instrumental in forming the Saskatoon Centre a few years ago, and has served a term as Secretary of that Centre. He is well known to *Journal* readers as researcher, historian and raconteur.

The majority of members of the Society, and in particular those who have served on the Executives of Centres, have contributed on many occasions to the formulations of rules. (A rule is a regulation or by-law governing procedure or controlling conduct; a regulation is an authoritative rule dealing with details of procedure.) In drafting the By-laws for a Centre, members outline rules whereby the organization functions within the larger context of the Society as a whole: in borrowing a book from the Centre Library, a member must follow a series of procedural rules or regulations; and, if the Centre has access to a temporary or permanent meeting place such as an Observatory, regulations or rules must be passed regarding the use of the building, and the care and maintenance of the telescopes and accessories.

A colleague from the Department of Psychology informs me that it is a reasonable assumption that man is a rule-following, purposive animal. Furthermore, he tells me that the existence of rules, such as referred to above, serve to reduce variability in human behaviour. As regards situational rules, these seem "to provide coherence and intelligibility to what would otherwise be a series of unrelated, discrete, ever-changing, disturbing, and difficult-to-deal-with collages of persons, objects, and events". (Page 42 of *Social Psychology and Contemporary Society* by E. E. Sampson.)

While visiting the Burgh Museum at Dumfries, Scotland, in July, 1973, I discovered a set of rules, unusual by present day standards, and was able to obtain a copy of these. The Dumfries & Maxwelltown Observatory opened to the public on 1st August, 1836, and two days later this institution recorded the first visit in the world of school children to an observatory. It is most encouraging to see that an event which started initially in a small village in "Burns" country, has spread to so many observatories and planetaria throughout this land. My thanks are expressed to A. E. Truckell, Esq., the present curator of the Burgh Museum, for permission to publish these rules and regulations.

Rules and Regulations for Observatory

1. That the whole members of the Family of any of the subscribers shall have access at pleasure to the Observatory.

2. That none of the Subscribers or their Family shall take any one who is not a Subscriber to the Observatory without paying for him.

3. That the Janitor shall have power to admit or refuse visitors at pleasure from their appearance.

4. Anyone abusing the Instruments to be expelled for the time and pay all damages.

5. That no Spirits or malt liquor shall be sold within the premises.

6. The shares shall be £5 each and to consist of 120.

7. The shares shall not be transferable without the consent of $^{2}/_{3}$ of the other subscribers agreed at a General Meeting held for that purpose. The same rule shall apply in case of the Death of the Subscriber.

9. That the Janitor shall be a man without a Family – and shall keep the Observatory clean and attend *9 hours*.

10. It shall be called the Dumfries & Maxt. Observatory.

11. That it shall be shut during the Sabbath.

Rule 2 reflects the thriftiness of the Scots, a trait which has been preserved in popular jokes, and perhaps in fact. While living quarters for the janitor were provided in the basement of the observatory, he was not expected to be on duty continuously, since the observatory was open only from "six o'clock in the morning till ten o'clock at night, every lawful day". Thus, his work week was a mere 54 hours in length! It is difficult to imagine how he enforced Rule 3, or what would happen to a janitor in the modern world were he given such discriminatory powers. The omission of Rule 8 appears to have happened inadvertently as a result of ending Rule 7 on the first handwritten page and starting Rule 9 on the following one.

The establishment of shares in the Observatory with special privileges for the shareholders, placed this young Society on a sound financial basis. By raising substantial funds in the early stages of its operation, members of the Society included among their purchases a Camera Obscura, which is still being used to good advantage, and a splendid Gregorian telescope. As specifically stated in Rule 7, the shares were to be rigidly controlled by the subscribers and not traded on the open market. On 4th July, 1846, approximately ten years after this observatory was opened, share No. 152 was sold and transferred to a Mr. McMinn and to a Mr. James Halliday of Dumfries. Dr. Halliday, Editor of the R.A.S.C. Journal, is entitled to claim relationship to this latter subscriber; if Ian visits the Burgh Museum, he "should have access at pleasure to the Observatory".

In a recent newsletter, the Director of the Starlab Observatory of the Hamilton Centre proposed the establishment for members of a system of accumulated credits, a concept not far removed from that of selling shares in an observatory, with special benefits to the shareholders. It is worthwhile to reflect that the basic principles for the successful operation of an observatory, originating as these did in Scotland almost one hundred and forty years ago, may be followed to some degree at the present time.

On a few occasions, Centres of the Society have departed from Rule 5 when General Assemblies have been held at planetaria, but to my knowledge have never offered the quality of refreshment provided by malt liquor from Scotland. Well, after this length of time, minor modifications to rules are bound to occur, but these rules and regulations may still provide helpful guidelines for those members who wish to make us all conform to a pattern.

Sorry, my colleague would prefer that I say "to a norm".

J. E. KENNEDY,
Saskatoon Centre

Observing Lunar Occultations

Every amateur has doubtlessly heard the term "lunar occultation" and many may even recall the simple techniques involved and uses to which the results are put. But have you considered occultations as a regular feature of your observing programme? Granted that the eager amateur under Montreal skies might be somewhat predisposed to the more theoretical (or armchair) side of astronomy, the occasional burst of obser-

vational activity can be quite stimulating. To refresh your memory, and also your interest, this article describes the technique and rewards involved.

An occultation is simply the disappearance (the ingress) or reappearance (egress) of a star from behind the moon. Since the angular diameter of a star is negligible, an occultation is an instantaneous event. An occultation occurring on the bright limb is extremely difficult to observe and time accurately (if the star's brightness is less than 4.5, forget it). Therefore, predictions are given usually for dark-limb events. Since the moon's relative stellar motion is eastward, predicted events before full moon are disappearances, while those after full moon are reappearances.

The point of the exercise is not simply to observe however, but to time the event to 0.1 second accuracy if possible, with an error no greater than half a second. In that 0.1 second the moon has moved about 150 yards in its orbit, so if the observer's latitude and longitude are known to within 1 second of arc, a precise positional relationship can be derived between the moon and earth. Today there is little error in the measured positions and movement of most occultable stars, so that these timings play a decisive role in defining more accurately the moon's orbit and the earth's period of rotation.

That the earth is slowly spinning down can be directly seen through examination of long term lunar occultation data. There are also many complex periodic variations in the earth's rotational period that become evident through similar analysis.

Occultation timing techniques are relatively simple. Usual equipment includes a good stopwatch, a source of short-wave time signals (WWV or CHU) and a telescope of two to twelve inches in aperture. Since the observer is aware of the approximate time of occultation, he may focus the telescope on the star about to ingress, or the estimated point of the star's egress on the lunar limb, and dark adapt. Then, starting the stopwatch on the occultation and stopping it on a standard time signal will yield the all-important time of occultation.

The variations on this technique, however, are limited only by one's ingenuity and resources. If two events occur within seconds of each other, and only one stopwatch is on hand, you may start it on the time signal, stop it on the occultation, read, reset, and proceed with the second event in the usual manner. If time signal reception is temporarily impossible (perhaps due to an aurora in the opposite part of the sky!) you, undaunted, may use a second good stopwatch as a time reference to the first, later calibrating it and hence your observations against the once-again available time signals. If no radio is available the really desperate occultation addict may establish a telephone link with someone in possession of a short-wave receiver. In all such cases, accuracy may suffer somewhat, but not significantly if sufficient care is taken.

Another method is the "eye-and-ear" procedure whereby the observer watches the event while listening to WWV or CHU and mentally estimating (in tenths of a second, no less!) the time of occultation. A more reliable technique involves the use of a tape recorder into which are fed standard time signals, and at the moment of truth, a verbal or electronic response from the observer. On playback the occultation time may be easily ascertained. Another ingenious method for the ardent observer is to set up a camera focused on a running stopwatch. The occultation time is subsequently recorded on film when the extra-long cable release is finally depressed.

All of the above techniques possess innate and different sources of error. However, the one common and largest error is that due to the observer's delay in responding to the instantaneous appearance or disappearance of the star. This is his "personal equation" and should be recorded, if known, alongside the timing data. If it is not reported, an average personal equation of 0.3 seconds is assumed for disappearances and 0.5 seconds for reappearances. An observer should also estimate the accuracy of the timing for factors other than his personal equation. Poor seeing, faintness of star, intervening cloud all may result in a delayed response reducing the accuracy and subsequent statistical value which may be assigned that observation.

A most efficient way to muff an egress timing is to estimate incorrectly the reappearance point of the star on the lunar limb. Other good ways are fumbling the stopwatch after starting it, and barring this, misreading it (especially one with a 30-second sweep) under a dim red light with five seconds to go before the next occultation.

If you survive the stress of careful observation and timing, fill in and file a report form and await the results. Your reward? The accumulated observations are sent to the Royal Greenwich Observatory to be reduced by computer. A reduction of each observation is returned showing a "residual" in seconds of arc between the calculated

position of the lunar limb and that deduced from the observation. If a residual greater than 1.5 seconds is found, a major error in timing or recording is assumed to have occurred, or perhaps station co-ordinates are inaccurate.

In examining these residuals and comparing with other observations of the same event, the new observer can detect possible sources of error. More important, he can see patterns evolving in the variations in apparent lunar motion.

Predictions of occultations down to magnitude 7.5 are given in the *Observer's Handbook*. If you have a large instrument, extended lists for stars as faint as magnitude 10 are available.

A third type of occultation, the graze, involves somewhat more elaborate observing and recording techniques, and requires an article all by itself. You may have noticed, however, that the 1975 *Observer's Handbook* in error uses the old 1974 graze maps.

As mentioned before, the observer's geographical co-ordinates must be known to within one second accuracy. This data is available from large scale topographical maps. The observer's height above sea level should also be known to the nearest 100 feet – also on maps.

The *Observer's Handbook* lists 66 occultations visible from Montreal within the next year. The extended lists, however, include 1321 (!) events. Nine of these are grazes, the paths of which are within a short driving range of Montreal. Within the past calendar year, 117 successful timings were made by John Allcock, Henry Nothof, and me. We can do much better this year.

A 3 AM occultation in mid-January is the best remedy for insomnia.

DAVID BROWN
Reprinted from Montreal Centre's *Skyward*

Ed. Note: If the above article whets your appetite for observing occultations, contact your Centre's Observing Chairman.

Nitrogen Soaking

The Royal Observatory, Edinburgh, Scotland, recently reported that Illa-J emulsion film soaked in nitrogen needed only 0.2 to 0.5 times as long an exposure as the untreated film. A 1.2 magnitude increase was detected in a two hour exposure.

I undertook a study to determine the effect of nitrogen on 35 mm Tri-X, 103a-F, GAF 500 color. The experiment was set up using an old cookie canister, oxygen regulator and tank of nitrogen gas. A coil of copper was soldered into the lid to act as a light trap and would also act as a vent for the nitrogen when flushed. The torch tip was then soldered into the side of the canister near the bottom.

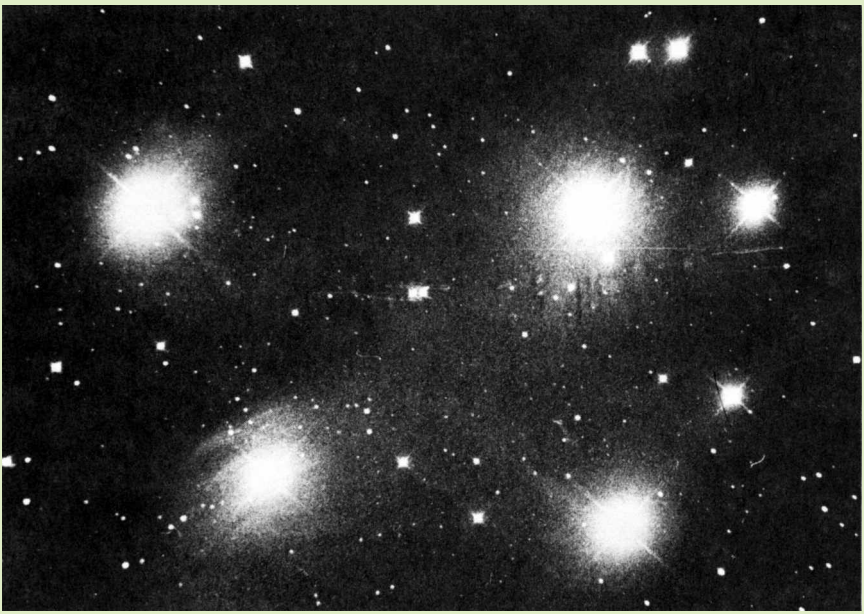
Nitrogen Soaking procedure:

The film was placed into the tank and black plastic tape was used to seal the lid. Each day for 60 seconds, ten pounds of pressure of nitrogen flushed the tank. This procedure was repeated for 30 days before testing the film.

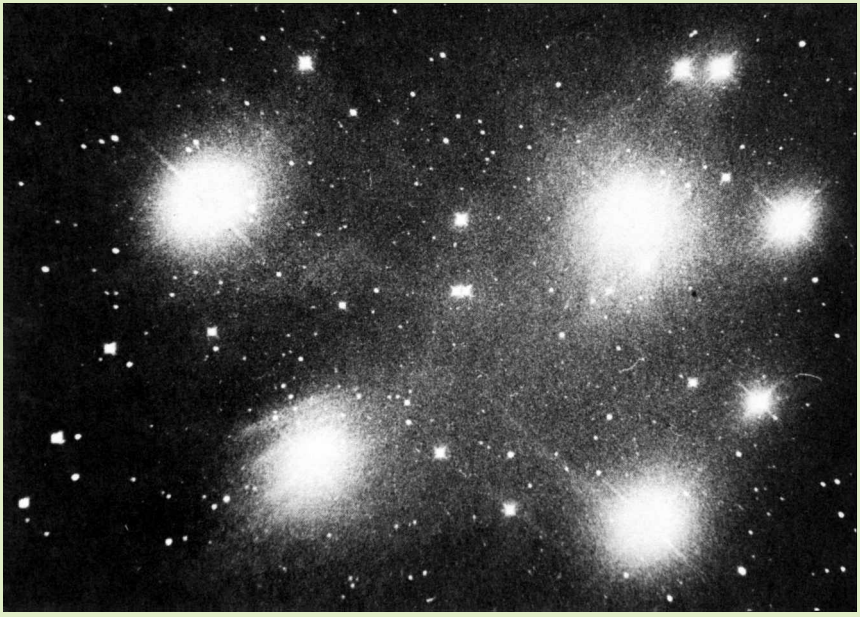
The films were tested by photographing, first with the nitrogen-soaked film and then with the unsoaked film. The same object, on the same night was used for the same length of time. A 12½″, f4.6 reflector was used for all the exposures. Each exposed film was processed in the same tank and therefore subject to the same developing times and temperatures.

Observations:

After Nitrogen Soaking, the 35 mm films became brittle and cracked when sharply creased. The film leader had to be moistened so that it could be advanced in the camera without breaking off.



Photograph of the Pleiades on untreated Tri-x film.



The same exposure, under the same conditions, on nitrogen-soaked Tri-x film shows more of the nebulosity.

Nitrogen treated 103a-F showed only a slight gain in speed in a 12 minute exposure. The Tri-x in a 12-minute exposure showed more of a gain as illustrated. The GAF 500 showed the largest gain in speed during a 30-minute exposure. Most of the gain seemed to be in the red layer of emulsion. However, further testing will have to be conducted to confirm the above findings.

Conclusion:

Having had only one month to test the nitrogen-soaked film, the findings are very encouraging but not confirmed. Many months of testing using longer exposures will be required. More results will be published in my revised book, *Astrophotography from Film to Infinity.*

JACK NEWTON,
Toronto Centre

Ed. Note: *Astrophotography from Film to Infinity*, is available, in soft cover, to RASC members for $2.00 per copy by writing to Jack Newton, 157 Thoms Crescent, Newmarket, Ontario L3Y 1C9.

News Briefs

Astronomy for Campers, 1975

During the summer of 1974, four members of the Royal Astronomical Society of Canada, Toronto Centre, developed an innovative addition to the interpretive programme of the Provincial Parks in Ontario. They developed Project AFC, Astronomy for Campers.

Project AFC was a summer work project sponsored by the federal government's Opportunities for Youth Program and was carried out in cooperation with the Ministry of Natural Resources. The aim of the Project was to introduce astronomy into the interpretive programme of the Provincial Parks in Ontario with the hope of increasing the campers' awareness of the universe around them. In order to fulfil this aim, programmes on astronomy were conducted in several Provincial Parks throughout southern Ontario.

Project AFC was a success. The campers enjoyed the programmes and some even came back twice. Due to this favourable response, Wesley Denyer, Andreas Gada, Richard McWatters, Paul Mortfield and Elizabeth-Jane Schott, applied for and received an OFY grant with which to carry on the work of Project AFC during the summer of 1975.

This year's Project is bigger and better than last year's. More and better quality slide shows are being prepared. A mirror grinding demonstration and infomal classes on astronomy have been added to the programme.

During the day, the "Observe the Sun" programme will be held from 1 PM to 5 PM on the beach. This programme consists of displays offering a mini course in astronomy, a telescope set up to view the sun, and a mirror grinding demonstration. There will also be informal classes on astrophotography, the use of the star chart in constellation recognition and how to use the telescope.

In the evening, as soon as it is sufficiently dark, the "Main Programme" consisting of several slide shows and an observing session will be held. After the "Main Programme", practical field sessions will be held in astrophotography, constellation recognition and how to use the telescope which will supplement the astronomy classes held during the day.

In addition to these regular programmes, special programmes will be set up to observe the Delta Aquarid and Perseid meteor showers.

During the two months on the road, June 13th to August 20th, it is hoped that over sixty programmes will be presented to more than 5,000 people.

If you are interested in participating in any of these programmes and would like

more information about them or a schedule of the parks to be visited, please feel free to write or phone the following address:

Project AFC
c/o WILLIAM T. PETERS
McLaughlin Planetarium
100 Queen's Park
Toronto, Ontario
M5S 2C6
phone: 416–928–8547

Our congratulations to Mr. Frank Shinn on his appointment as Director of the Planetarium of the Manitoba Museum of Man and Nature in Winnipeg. Mr. Shinn has been a leading member of the Winnipeg Centre for many years and has recently received the Society's Service Award. He formerly was Assistant Director of the Planetarium.

Astronomy Update: Recent Results of Research in Astronomy

About seven years ago, John L. Schmitt, then at the University of Toronto, was able to identify a new variable radio source known as VRO 42.22.01 with the previously known variable "star" BL Lacertae. BL Lac has proved to be the prototype of a class of radio/optical variables which includes W Comae, OJ287 and ON325. They are characterized by high galactic latitudes and nearly continuous spectra. Where spectral lines have been detected they have rather large redshifts implying that these objects are extragalactic. Indeed, they are widely believed to be galaxies of a type related to the Seyfert galaxies and quasistellar objects. Within the context of this picture there is one very unsettling observational feature of the 'Lacertids': the characteristic time of variation is very short for an object with galactic dimensions. A recent discussion of the radio source PKS1514–24 (Astron. J. *79*, 1352, Dec. 1974) indicates light variations of 0.5 magnitude (a 60-percent change in brightness) occur in a time interval of only 20 minutes.

The observed differences between the abundance of heavy elements in the youngest stars and in the oldest stars in the disc of the Galaxy are considered by some astronomers to be less than one would expect on the basis of the observed and/or calculated rates of star formation and evolution. In a recently proposed solution to this problem it is supposed that a natural feature of star formation may be the formation of a cloud of cometary material which, in the case of the Sun, lies on the outskirts of the Solar System, and which acts as a sink for heavy elements – all elements other than hydrogen and helium. (Astrophys. and Sp. Science *31*, 1974). This concept is consistent with Oort's theory for the origin of comets in a circum-solar cloud, and requires only that the cloud contain about 2% of the stellar mass in the form of heavy elements.

On the question of whether the Universe is open or closed (see National Newsletter, April 1975) the contribution from James Gunn and collaborators has appeared in Astrophys. J. *194*, 543, Dec. 15, 1974. On the basis of a wide variety of different arguments they conclude that the density of matter in the observable Universe is no more than one-tenth the value required to close the Universe.

The astrometric binary (in effect, a visual binary with only one visible component) with the shortest known orbital period is Chi Draconis. The period is only 280.5 days. The system is also observable as a spectrographic binary. (Pub. Astron. Soc. of the Pacific *86*, 448, 1975).

A classic test of General Relativity is the observation of the 'bending of light' in the gravitational field of the Sun. Observation of the effect at optical wavelengths is very difficult and can only be carried out during a total solar eclipse. At longer wavelengths (eg. radio) the test can be performed on a more regular basis whenever the Sun's apparent position in the sky is close to that of a suitable point source. The bending by the Sun's gravitational field of microwave radiation from quasistellar objects has recently been measured, the observed deflection agreeing to within one percent of Einstein's prediction. (Nature *253*, 231, Jan. 3, 1975).

On November 15, 1974, a small sunspot was observed by Swiss astronomers at solar latitude +37°. This marks the beginning of the next solar cycle, the present cycle being expected to end in 1976. (Nature *253*, 419, 1975).

Quick. Which of the planets is the strongest radio source? Jupiter? Wrong. Observations made by the Imp-6 satellite indicate that at frequencies around 100 kHz Earth is almost two orders of magnitude brighter than Jupiter. Surprisingly, the source of this radiation has not been identified. (J. Geophys. Res. *79*, 4227, 1974).

D. HUBE
Reprinted from *Stardust*
Newsletter of the Edmonton Centre

Calgary 1976!

The 1975 General Assembly of the R.A.S.C. will be held in Halifax from June 27 to 29, and we hope it will prove to be a highly successful gathering. But we are looking ahead to the 1976 Assembly to be held in Calgary from May 21 to 24, and giving publicity now to a new "Exhibits" proposal which is designed both to recognize and to encourage amateur observational astronomy in the Society.

We are offering prizes in thirteen categories of observational astronomy, plus a "fun" category, and we are hoping that many members of the Society will enter. We will do our best to ensure that all entrants stand an equal chance of winning. Here are the details:

The Categories

1. *NAKED-EYE* Best report on an observing project carried out without optical aid.

2. *BINOCULARS* Best report on an observing project using binoculars.

3. *MOON* Best black-and-white photograph of a thin lunar crescent *either* less than 48 hours old or less than 48 hours before new.

4. *MOON* Best set of three eyepiece drawings of any one lunar crater, the three drawings to be done under different conditions of illumination at least two days apart.

5. *SUN* Best series of either drawings or photographs showing a sunspot group moving across the surface of the sun.

6. *METEORS* Best report on the observation of a meteor shower, with paths plotted on a star chart and the radiant point indicated.

7. *OCCULTATION* Best report on an occultation project successfully carried out.

8. *PLANETS* Best report on an observing project involving Jupiter and/or its satellites.

9. *OPEN CLUSTERS* Best set of black-and-white photographs of any four open (galactic) clusters from the Messier Catalogue.

10. *GLOBULAR CLUSTERS* Best set of eyepiece drawings and descriptions of any four globular clusters.

11. *GALAXIES* Best report on observations of any four galaxies in any one constellation with descriptions and field drawings

12. *COLOUR PHOTOGRAPHY* Best set of three colour slides of any three astronomical subjects.

13. *OPEN CATEGORY* Best submission by an entrant of a report on an observational project (which may include photography) of his or her own choosing – double stars, aurora, variable stars, asteroids, conjunctions, nebulae, variations of any of the other categories, or whatever.

14. *AND FINALLY, A "FUN" PROJECT* The most imaginative proposals for dividing the constellation of Hydra and the constellation of Eridanus each into two new constellations, with new outlines and names which may be mythological or modern or anything in between.

The Regulations

1. This competition is open to all paid-up members of the R.A.S.C.

2. The work on a project entered must be done by the entrant between May 1st, 1975 and April 30th, 1976. Old observations, photographs, drawings, etc. must not be submitted.

3. One prize will be awarded in each category, along with 1st, 2nd and 3rd prize ribbons. In addition, a Grand Prize will be awarded for the best overall exhibit.

4. No individual may enter in more than three categories, and may enter only one exhibit in each category chosen.

5. The judges will be appointed by, but will not necessarily be, members of the Calgary Centre.

6. All entries which qualify will be on display during the 1976 Assembly, and the names of the prizewinners will be announced before it closes.

7. In judging the "best" entries the judges will take into account the location of the observing site(s), the size and type of the instrument(s) and equipment used, the age and experience of the entrant, the time of year the work is done, the initiative, imagination, care and thoroughness shown in the project, and the neatness and clarity of the presentation.

8. All entries must be mailed in before the Assembly begins; and it is not necessary for an entrant to attend the Assembly in order to qualify. It will be a help if entries are sent in as soon as can conveniently be done when the project is completed; no entry will be accepted bearing a postmark later than May 4th, 1976.

9. Each entry must be accompanied by an official entry form which can be obtained from Mr. U. Haasdyk, 3123–48th Street SW., Calgary, Alberta, T3E 3X6. Members planning to enter are asked to write for entry forms at their earliest convenience, stating the categories in which they are interested, in order to give us some idea of the probable exhibition space required.

10. Some categories (e.g. No. 6 or No. 7) may require assistance from other people; this is permissible, but the entry should be submitted over the name of the one person only.

11. Any entry which qualifies in more than one category may be entered in one only e.g., a binocular observation of an occultation may be entered in Category 2 or Category 7, but not both.

12. Entries may be submitted in English or French.

13. More detailed information about the categories will accompany the entry forms; any queries should be addressed to Mr. Haasdyk.

Send for your entry forms today!

Murphy's Laws

1. The probability of a clear sky is inversely proportional to the number of important observations planned.

2. The probability of clear skies is directly proportional to the amount of moonlight present.

3. Any object anywhere near the horizon will require at least 5 minutes of moving around to get a half-decent view.

4. Mercury-vapor lights are always in the direction of faint objects, and are always on.

5. The difficulty of finding an object is inversely proportional to the temperature, and the amount of time available.

6. The probability of a clear sky is inversely proportional to the time spent in setting up for the observations planned.

7. The sky transparency is inversely proportional to the temperature.

8. If an outside light is near the observing area, the chances of its being turned on are directly proportional to the faintness of the object, and are further multiplied by 10 if photographs are being taken.

9. Telescope "technical difficulties" become more common as the time for an observation becomes less.

10. Switching to another power will lose the object if clouds are moving in, or if the object is setting.

11. Good seeing always occurs when the object is moving out of the field of or the 'scope is being moved to follow it.

12. The night when a naked-eye nova appears, or U Gem rises, etc., will be the beautifully clear one when you are sick in bed, have a ton of homework, (or income tax forms) to do, or have your night tied up in a city with about 18,000,000,000 000,000,000,000,000,000,000,000 watts worth of light swamping anything below mag. –4.

13. If you commit the Ultimate Sin (not going out to see U Gem because it "won't be up anyway"), you will be sorry.

Murphy's Laws comes to us courtesy of Caroline Hurless' little publication *Variable Views*, via Montreal Centre's *Skyward*.

The Editors of the *Newsletter* are actively considering changes in its format and content. Any suggestions from our readers for improvements would be appreciated. Among the changes being considered are regular columns, the inclusion of more photos and printing on a paperstock better suited to reproducing drawings and photos. Please submit your ideas to the address on the masthead.

NATIONAL NEWSLETTER

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Toronto, Ontario
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Deadline is two months prior to the month of issue.