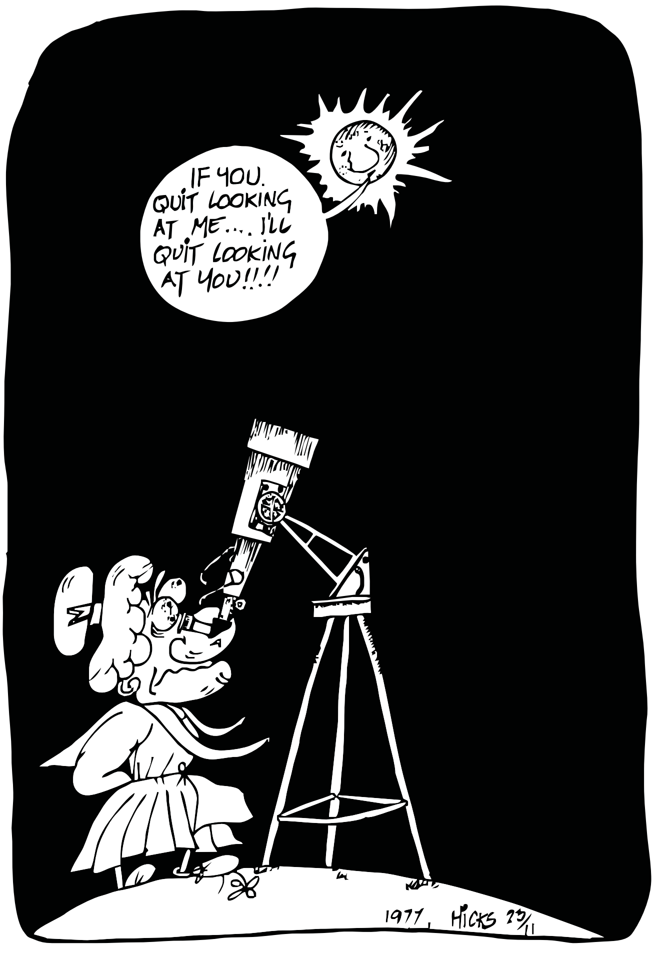
NATIONAL NEWSLETTER

October 1978

Supplement to the JOURNAL OF THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

Vol. 72, No. 5.



John Stephen Hicks of Keswick, Ontario describes himself as a "budding" amateur in both astronomy and cartooning. The above seems particularly appropriate to the article entitled "Eye Injuries and the Solar Eclipse" by Ralph Chou on the inside pages.

NATIONAL NEWSLETTER

October, 1978

Editor: B. Franklyn Shinn
Assistant Editors: Harlan Creighton, Ralph Chou, J. D. Fernie, P. Marmet, Ian McGregor
Art Director: Bill Ireland *Photographic Editor*: Richard McDonald
Press Liaison: Al Weir

Regional News Editors
Centre and local news items, including Centre newsletters, should be sent to:
Winnipeg and West: Paul Deans, 10707 University Ave., Edmonton, Alberta T6E 4P8
East of Winnipeg: Barry Matthews, 2237 Iris Street, Ottawa, Ontario K2C 1B9
Centre français: Damien Lemay, 477, Ouest 15ieme rue, Rimouski, P.Q., G5L 5G1

Except as noted above please submit all material and communications to:
Mr. B. Franklyn Shinn,
173 Kingston Row,
Winnipeg, Manitoba,
R2M 0T1

Deadline is six weeks prior to the month of issue.

Eye Injuries and the Solar Eclipse

B. Ralph Chou
School of Optometry, University of Waterloo
Waterloo, Ontario

Introduction

Since antiquity the solar eclipse has inspired both wonder and fear in people around the world. In recent years the general public has demonstrated a greater awareness of this and other astronomical phenomena, thanks to the news media and the many public education programmes organised by the astronomical community. On Monday 26 February 1979, the last total solar eclipse which can be observed from North America in this century will no doubt draw one of the largest viewing audiences in history.

The task of the astronomical community is to ensure not only that the public is aware that this rare event is taking place, but also that the casual observer is given the best possible advice on how to observe the eclipse safely.

In this paper we will describe the nature of eclipse-induced eye injuries and suggest some points which should be included in public announcements concerning the eclipse.

The Eye and Vision

The human eye is a small fluid-filled organ approximately 2.4 cm in diameter, weighing about 7.5 g. The transparent cornea provides 80 per cent of the eye's refracting power, with the remainder provided by the crystalline lens. The iris acts as a diaphragm to vary the retinal illuminance by a factor of thirty times. In addition to structural and nutritional functions, the aqueous humor and vitreous humor provide a transparent optical medium. The retina contains the photoreceptors and nerve cells which mediate vision. The optic nerve conducts the nerve impulses to the brain, where the visual percept arises.

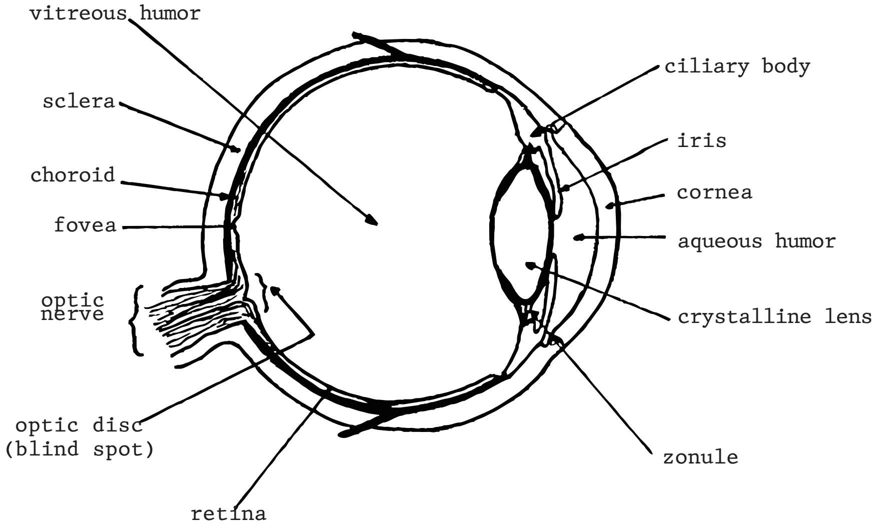


FIG. 1—The human eye—cross section (after Duke-Elder)

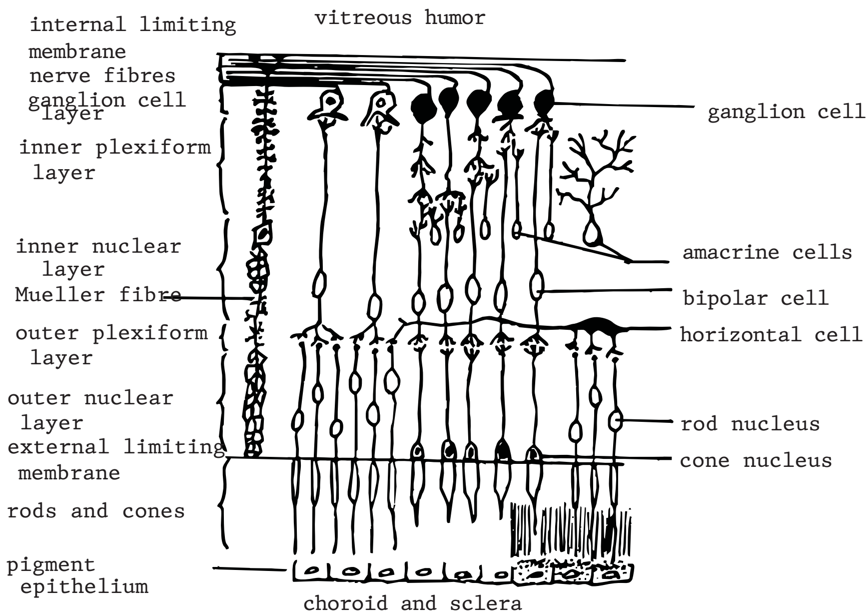


FIG. 2—The human retina (schematic)

The retina contains ten layers (Fig. 2). Of greatest interest in this discussion are the retinal photoreceptors, and the underlying pigmented epithelium. There are two types of photoreceptors, the rods and the cones. The rods are responsible for vision in dim illumination, the cones for vision when the retinal illuminance level is above about 1 cd-m^{-2}. The pigmented epithelium is the principal source of nutrients for these cells.

The distribution of the photoreceptors is a function of the angular distance on the retina from the fovea. The fovea is that part of the retina responsible for the central region of the visual field, and has the maximum area density of cones. Rods are absent from this area. Colour vision arises from the cones.

Unlike the telescope, for which the minimum angle of resolution (MAR) is determined by the aperture of the system, the MAR of the eye also varies with the location of the stimulus on the retina. In the periphery, where rods are predominant, the MAR is large. In the macula, an area 3 to 5 mm in diameter centred on the fovea, it is as small as 1 arc-minute (see Fig. 4). The visual acuity of the eye is said to be maximal at the fovea, where the MAR reaches a minimum value.

The structures anterior to the retina provide a system of optical filters to screen out harmful radiation. Most ultraviolet radiation is absorbed by the cornea, while much infrared radiation is absorbed by the crystalline lens (Borish, 1970). Of the remaining radiation incident at the eye, about thirty per cent is absorbed by the optical media of the eye (Duke-Elder 1954).

Eclipse Retinopathy

Many references are to be found in the literature on the subject of eye injuries resulting from sungazing (solar retinopathy), and especially those resulting from casual eclipse watching (eclipse retinopathy).

Tso and LaPiana (1975) made a histological study of three human eyes, each of which had been exposed for one hour to direct sunlight prior to removal. They concluded that the mechanism for solar retinopathy in general was thermal coagulation due to absorption of the radiant energy by the retinal pigmented epithelium. They suggested that a second mechanism might affect the photoreceptors, in addition to the thermal burn. Zagora (1970) notes that eclipse burn can develop after an exposure time of one minute or less. A simple energy calculation supports these findings:

The solar constant is 1.3953×10^{3} W-m^{-2}. This is the total energy incident on one square metre of the surface of the Earth due to the sun. Let us assume that the eye is emmetropic (no optical correction is needed) and that accommodation is relaxed; thus the dioptric system has an effective power of +60.00 D. Further, we assume that the pupil constricts upon direct exposure to sunlight to a diameter of 2 mm (the average size of the maximally constricted pupil). The ocular media absorb approximately 30% of the radiation entering the eye. The energy incident on the retina is therefore

$$\begin{aligned} U &= (\text{solar constant}) \times (\text{pupil area}) \times (\text{transmittance of the ocular media}) \\ &= 1.3953 \times 10^{3} \times \pi \times 0.001^{2} \times 0.70 \\ &= 3.068 \times 10^{-3}\ \text{W}. \end{aligned}$$

This energy is concentrated in the retinal image of the solar disc, which has an area of radius

$$r = \frac{\theta}{2K'} = \frac{9.305 \times 10^{-3} \times 1000}{2 \times 60}$$

$$= 0.0725\ \text{mm}.$$

The energy density is therefore

$$d = \frac{3.068 \times 10^{-3}}{\pi \times 0.0000725^{2}}$$

$$= 1.62 \times 10^{5}\ \text{W-m}^{-2}$$

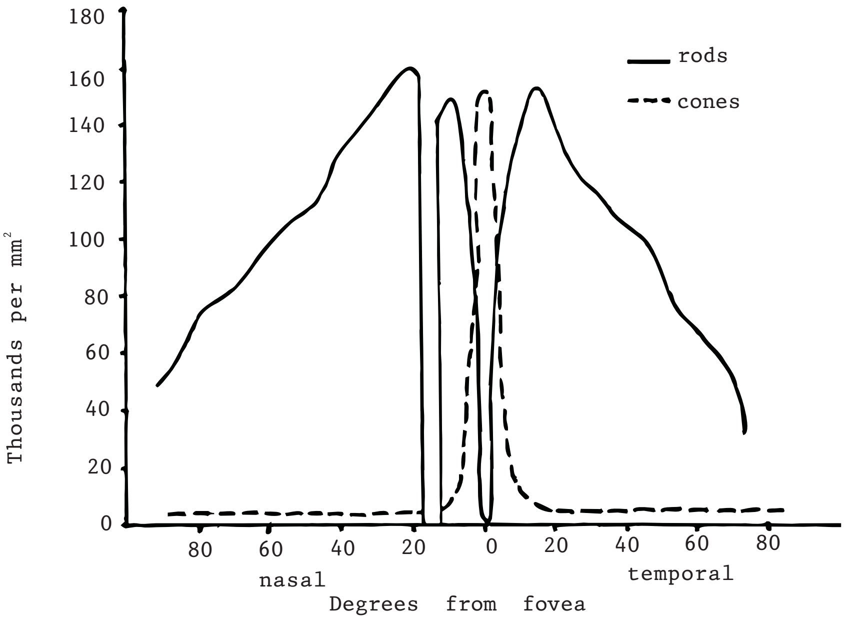


FIG. 3—Distribution of rods and cones on the retina (after Graham)

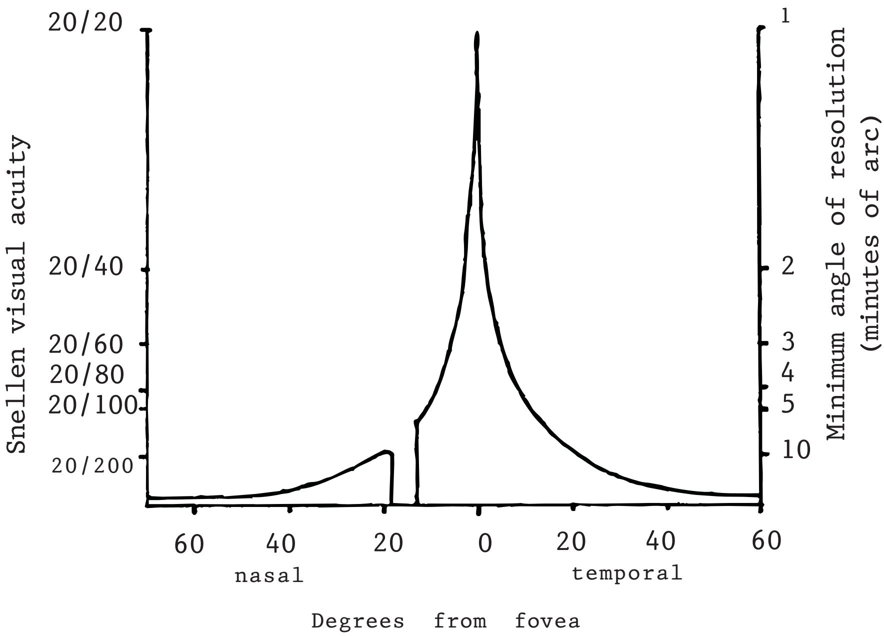


FIG. 4—Visual acuity and MAR as functions of position on the retina (after Graham)

which is quite sufficient to induce a thermal burn. This is a minimum value; Pitts (1959) has estimated that the transmittance may be as high as 90% in the long-wave part of the visible spectrum.

Jevons (1946), Duke-Elder (1954) and Penner and McNair (1966) have described the clinical findings in eclipse retinopathy. Patients reported dazzle, then a diffuse irregularly outlined undulating cloud before the eyes accompanied by afterimages, photophobia, and sometimes flashes of light and colouring of vision such that objects appeared red, yellow or blue. These symptoms occurred usually within hours of observing the partly eclipsed sun. Within 24 hours the cloud had condensed into a dense visual field loss of long duration, located in the central field. Accompanying this field loss was a loss of visual acuity. Blurring, flickering and disappearance of small letters, and sometimes distortion of objects near the centre of the visual field were noticed.

Early examination of the retina revealed a yellow spot at or near the fovea, which gradually developed into a reddish swelling. This resolved into a permanent lesion after several months, becoming either a dark pigmented spot or a macular hole.

The degree of recovery of vision was variable. Some improvement in visual acuity occurred within two months, but in most cases there was a permanent central field loss. Penner and McNair found no difference in the severity of visual impairment between a group of patients who viewed the partial eclipse of 1966 without protection, and a group who obtained partial protection by use of sunglasses or dense photographic negatives. About half of each group suffered a permanent reduction of visual acuity. Duke-Elder has noted that the chances for recovery of vision are better if the visual symptoms subside within a month of the injury, but some permanent visual disability is found in most of these patients. Similar observations have been made by Rosen (1948) and Das et al (1956).

Of special interest is the analysis by Hatfield (1970) of a survey conducted by the National Society for the Prevention of Blindness in the U.S.A. following the total eclipse of March 1970. The Society had launched an extensive public information programme prior to the eclipse, giving its recommendation "that a simple indirect viewing device based on the projection of the sun's rays through a pinhole in a piece of cardboard onto a second white cardboard be used, or better still, that the eclipse be watched on television. This precaution is based on the fact that infrared rays emitted by the sun continue to be emitted during an eclipse even though the dazzling visible rays are blocked."

Of 5000 ophthalmologists and 1900 hospitals contacted, 29 per cent replied by 1 July 1970, reporting 145 cases of eclipse retinopathy with symptoms ranging from temporary discomfort to serious permanent visual impairment. About 57 per cent of the cases were in states along or near the path of totality. Thus a significant fraction of cases was reported in states where only a partial eclipse could have been observed. Seventy-five per cent of the patients were between ages 10 and 29 years, and twice as many males were affected as females. The most frequently used protective device was one or more pairs of sunglasses. Some patients viewed the eclipse directly through a pinhole! Fifty-five per cent of the patients had a permanent visual impairment, i.e. reduced acuity in the affected eye.

Discussion

The risk of visual impairment due to inappropriate methods of observation of the eclipse is high. Clearly the safest procedure for observing the partial phase is to use a projection system, either through a telescope or through a pinhole, provided that precautions are taken to prevent casual observers from placing the eye in the projected beam. For those unwilling to endure the rigours of winter weather, it is possible that there will be television coverage of the eclipse, as in 1970 and more recent eclipses.

Photographers should be reminded that neutral density filters do not provide adequate protection for either their eyes or their equipment during the partial phase. Rangefinder focussing mechanisms as well as the lens aperture should be equipped with filters if direct photography is to be attempted. Safe visual and photographic filters have been advertised in various astronomical publications.

The Solar Eclipse Advisory Committee of the Astronomical League is preparing a "Solar Observing Safe Observing" guide for release to the public and the news media. Further information on this kit can be obtained from

Mr. Robert R. Young
Astronomical League
329 S. Front St.
Harrisburg, PA 17104

Even among groups most concerned with eye safety, there appear to be misconceptions regarding the eclipse. Hatfield has noted that "it is difficult to explain the large number of cases (of eclipse retinopathy) reported from states far from the path of the total eclipse." A clear description of the physics of an eclipse may be helpful in showing that the danger arises from observing the partly eclipsed sun, not the total phase itself. This may also dispell some of the "common knowledge" which surfaces when an eclipse is imminent.

Public communications should include the following information:

1. The date and time of the eclipse
2. The percentage of totality in your area
3. Duration of the various phases of the eclipse visible in your area
4. Advice to casual observers and photographers about eye protection. All clinical studies have shown that fully exposed and developed black and white film, sunglasses and neutral density filters provide insufficient protection for direct viewing. Projection methods should be stressed.
5. Sources of further information in your area, if available.

It is my hope that these comments will aid readers in the preparation of public announcements in advance of the eclipse. Let us hope that in 1979 there will be no reports of eye injuries among eclipse watchers.

Acknowledgements

The author thanks Dr. William Lyle, Dr. John Jantzi, and Messrs. Ken Hadley and Ron Ginter for their critical comments and suggestions during the preparation of this paper.

References

Borish, I. M., Clinical Refraction, 3rd Ed., Chicago/Professional Press, 1970, p. 1118

Das, T., M. S. Nirankari and M. R. Chaddah, Solar chorioretinal burn, Amer. Journ. Ophthalmol., **41**(6), 1048–1053, 1956

Duke-Elder, Sir Stewart, System of Ophthalmology, Vol. II, London/Henry Kimpton, 1961, pp. 80–81

Duke-Elder, Sir Stewart, Textbook of Ophthalmology, Vol. VI, London/Henry Kimpton, 1954, pp. 6494–6498

Graham, C. H., Vision and Visual Perception, New York/Wiley, 1965

Hatfield, Elizabeth M., Eye Injuries and the Solar Eclipse: Results of a Survey, Sight-Saving Review, **40**, 79–85, 1970

Jevons, N. A., A Case of Eclipse Blindness, Brit. Journ. Ophthalmol., **30**, 84–85, 1946

Penner, R. and J. N. McNair, Eclipse Blindness – Report of an Epidemic in the Military Population of Hawaii, Amer. Journ. Ophthalmol., **61**, 1452–1457, 1966

Rosen, E., Solar retinitis, Brit. Journ. Ophthalmol., **32**, 23–25, 1948

Tso, Mark O. M. and Francis G. LaPiana, the human fovea after sungazing, Amer. Acad. Ophthalmol. Otolaryngology Trans., **79**, OP788–OP795, 1975

Zagora, Edward, Eye Injuries, Youngfield/Thomas, 1970, pp. 438–439

Variable Star Observing
Part I

by C. E. Spratt
Victoria Centre

The observing of variable stars is a field in which the amateur astronomer can make a significant and valuable contribution to astronomy with limited equipment and ability.

The first step for those interested is to ascertain if you meet the following simple requirements:

a) a working knowledge of the constellations,
b) any sort of optical aid from binoculars up,
c) a reasonable observing location, having a dark sky that is free from surrounding lights,
d) a bit of patience,
e) a good star atlas such as Norton's or Becvar's.

If you meet or are willing to meet the above criteria, then you are on your way to the second step – that of finding the variable. It is here that many observers give up and go back to random observing of the moon and planets.

Assuming however, that the observer can meet most of the requirements, he can join the A.A.V.S.O. – the American Association of Variable Star Observers, a world-wide organization and certainly the best one for observing guidance and charts. The AAVSO sends ten charts and an observing manual to new members.

The observer can choose from his ten charts an easy star such as Chi Cygni, which is shown in the illustration, and for now within range of his small telescope. As this star is a long period variable, magnitude range 5.1–13.3 with a period of 407 days, it is visible in a 6-inch telescope for $\frac{3}{4}$ of its range.

To locate Chi Cygni, the observer would locate Eta Cygni, and work his way south, picking up the various bright stars, until he arrives to a triangle formed by 3 stars labelled 51, 61, and 64, which, with the decimal points omitted (to stop the decimal points being mistaken for stars they are omitted on all charts), means these stars are magnitude 5.1, 6.1 and 6.4 respectively.

From here the observer will work his way step by step over to a quadrangle formed by four stars labelled on the chart as 98, 105, 114, and 108 – Chi Cygni being in the middle.

The observer once he or she has located the variable – now has various methods of estimating the magnitude of the variable at that particular time.

Method 1

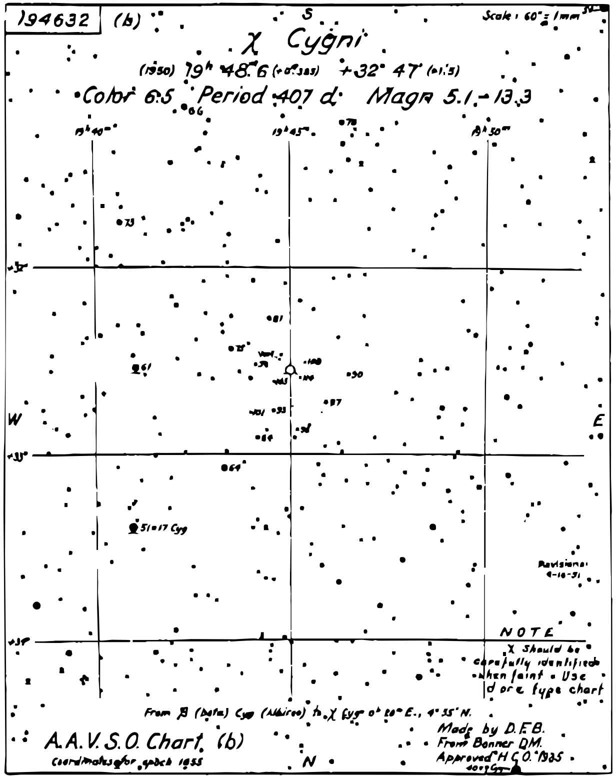
This is the AAVSO method and is recommended for the beginner.

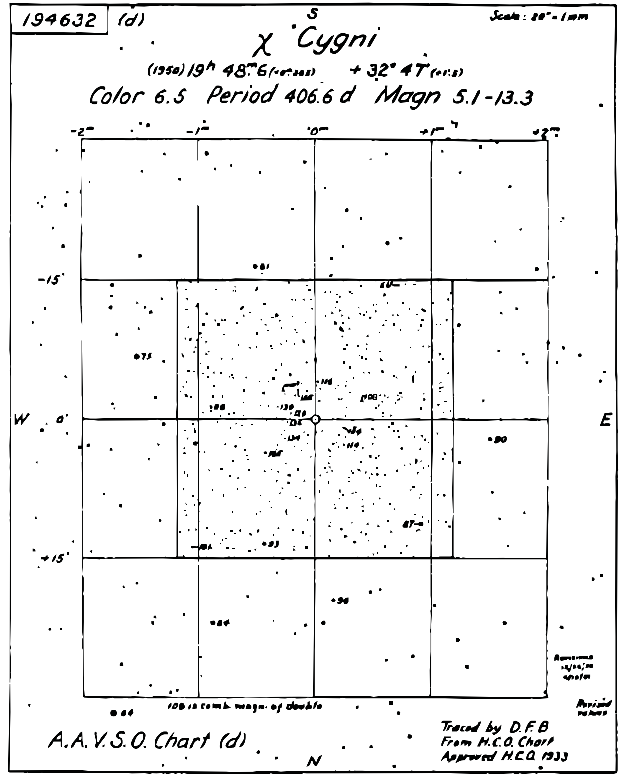
If the variable is brighter than the star labelled 10.8 but fainter than the one labelled 9.8 we could estimate its magnitude as 10.2. However, estimating it to be halfway between 10.8 and 10.5, record it as 10.7 – remembering that the human eye cannot distinguish between divisions of smaller than $^1/_{10}$th of a magnitude, and even then only with lots of practice.

Use at least two comparison stars, and, if possible, more. Record exactly what you see regardless of any apparent discrepancies in your observations.

If the variable is not visible, because it is extremely faint or because of haze or moonlight, note the faintest star visible and if that star is 11.4, record your observation of the variable as <11.4, the parenthesis meaning that the variable is fainter than 11.4 on that particular occassion. If the observer is working at the magnitude limit of his telescope and the sequence stars keep blinking in or out, by using averted vision (that is, not staring at the centre of the field), he will find the comparison stars and possibly the variable will become visible, as the edge of the retina of the observer's eye is more sensitive to light than the centre.

A word of caution – in extremely red stars, such as Chi Cygni, the observer can run into problems of overestimating the variable if the variable under observation is stared at too long. Prolonged staring at a very red variable activates the retina of the eye and the variable appears to brighten. The only solution is to use a quick glance – that is, not allowing the eye to stare at





Reproduced courtesy of AAVSO

the variable for too long. Another method – but not recommended, is to throw the eyepiece slightly out of focus, so that the variable and comparison stars exhibit extended disks. However, there is a pitfall here as in very red stars, the out-of-focus image will appear fainter than the actual image.

So far we have assumed that our prospective observer has a telescope. However, good estimates can be made using the naked eye or 7 × 50 binoculars on the brighter variables. Here again good estimates can be made, although the observer will have to roam further afield to pick comparison stars of approximately the same colour, this is important, since using very white comparison stars for a very red variable can result in somewhat inaccurate results. And it is quality of observations not quantity that count; when observing variables for the AAVSO or any other organization. Quality first, the quantity will come later when the observer becomes familiar with his areas.

In Method 1 we left our observer in the field of Chi Cygni, where he had just made a magnitude estimate of 10.2 for the variable – estimating it to be brighter than one comparison star of magnitude 10.8, but fainter than another of magnitude 9.8. The next method is more involved but also more accurate.

Method 2

Back in the Chi Cygni starfield – our comparison stars are again A(mag. 9.8), B(mag. 10.8). Assign steps of 0.2 magnitude between stars A and B. This makes five steps. If the variable were estimated to be 3 steps brighter than star B, it's magnitude would be $10.8 - 3 \times 0.2 = 10.2$. If it were estimated to be 2 steps brighter than A – it would have a magnitude of $9.8 - 2 \times 0.2 = 9.4$.

Method 3

Another method is the Fractional Method. The brightness of the variable is mentally placed between those of two comparison stars, one being brighter and one being fainter than the variable. The estimate is then expressed as a fraction of their difference in magnitude. Care is taken to choose comparison stars that do not differ in brightness by more than 0.5 magnitude. However, our two previous comparison stars A and B, differ by one full magnitude – thus we shall choose for this example those comparison stars labelled 9.3 and 9.8 on the chart. We shall also assume that Chi Cygni is between 9.3 and 9.8 in brightness, and we will label our two new stars A and B respectively.

Having divided the brightness interval between comparison stars A and B into five equal parts of 0.1 magnitude, and then estimated the variable as one fraction fainter than A or 4 fractions brighter than B, our notation would be A(1)V(4) B. The brighter comparison star is always given first. Since the magnitude of star A is 9.3 and that of star B, 9.8, the brightness interval is 0.5 magnitude. One fifth of this is 0.1 magnitude – adding this to 9.3 gives 9.4 as the brightness of the variable.

Sometimes the variable cannot be placed between any two comparison stars because it is too faint or too bright. Assuming that this is the case, we would have an estimate of A(2)B(3)V; that is, the variable is half again as faint as the difference between B and A; or put another way it differs from B by $1\frac{1}{2}$ times the amount that B differs from A. With magnitudes of 9.8 and 9.3 for the comparison stars we have; $9.8 - 9.3 = 0.5 \times 1\frac{1}{2} = 0.75$ for the difference in brightness of the variable from star B. Therefore variable is $9.8 + 0.75 = 10.55$ magnitude.

If the estimated result is V(2)A(3)B, meaning the variable is brighter that A by $\frac{2}{3}$ of the amount by which A is brighter than B, the result would be; $0.5 \times \frac{2}{3} = 0.33$ magnitude brighter than A. Subtracting this from 9.3 we get 8.97 as the magnitude estimate for the variable.

If the variable happens to be or appear to be equal in brightness to one of the comparison stars, it should always be compared to at least one other star for accuracy.

In this technique, no knowledge of the magnitudes of the comparison stars is required at the time of observation. In a sense it is better not to know the comparison star magnitudes, since personal bias can influence the brightness estimates of the variable under observation. Final estimates can always be computed after the evening observing session.

Met hod 4

To further confuse the issue of methods of computing variable star estimates, there is another method called Pogson's Step Method. This is not recommended for beginners as it requires the eye to be trained to estimate differences of 0.1 magnitude. However, I have included here, as it has certain advantages over the previous methods mentioned.

In this method, the variable is compared to only one comparison star at a time. Using this method, an experienced observer, in some instances, can detect a previously unobserved variability in the brightness of the comparison star.

We use our two comparison stars A and B, magnitudes are again 9.3 and 9.8. Assuming our observer estimates the variable as two steps fainter than A and 2 steps brighter than B, we obtain A – 2 and B + 2 – or 9.5 and 9.6 as the estimates for the variable. The mean of these is 9.55 which is the estimated magnitude of the variable under observation.

Without going into further detail I will mention that there are other methods of visually estimating the magnitude of a variable using various comparison stars whose magnitude estimates may or may not be known to the observer at the time of observation – among these can be mentioned the interpolation methods of Herschel-Argelander, Perepelkin, Nijland, Schonefeld as well as E. C. Pickering and Hagen. All these mehtods have advantages as well as disadvantages so it is up to the observer to decide which method suits him for his equipment and experience as well as the degree of accuracy he wishes to meet.

Nouvelles des Centres Québécois

de Damien Lemay

CENTRE DE QUÉBEC

Une nouvelle chronique a fait son apparition dans le bulletin, il s'agit de: "Appel à tous". Cette dernière est réservée aux questions et demandes entre les membres. Les questions et demandes sont publiées dans le bulletin et les membres qui ont des réponses adéquates sont invites à répondre directement entre eux. En plus d'établir des contacts entre les membres, nous souhaitons que cette initiative produira des documents importants, dignes d'être publiés dans le bulletin pour le service de tous les membres.

Dans les prochains bulletins, nous verrons la publication d'un document de 20 pages par M. Alphée Nadeau du Cegep de La Pocatière. Le titre est: "Les éclipses totales du Soleil du XXième siède sur ordinateur à La Pocatière".

Le Cegep fournira sur demande les données relatives à toutes eclipses du Soleil (avec les coordonnées de la zone de totalité) visible au XXième siècle sur le continent nord-américain. Pour des renseignements immédiats, veuillez écrire a:

Responsable de l'Astronomie
Cegep de La Pocatière
140, 4ième avenue
La Pocatière (Québec)
G0R 1Z0

SOCIETE D'ASTRONOMIE DE MONTREAL

Le Québec Astronomique de juin 1978, "Special 10ième Anniversaire", nous apprend que le télémanipulateur de la navette spatiale est fabriqué au Canada. Cet appareil qui est fixé à la navette à l'épaule, articulé au milieu par un coude et se termine par une main opérant à l'intérieur de l'articulation d'un poignet, permettra à l'équipage de manipuler des objets dans l'espace. Ce projet qui comprend la conception et la construction du bras, est réalisée par la compagnie Spar Aerospace Products Ltd, de Toronto, sous la direction du CNRC (Conseil National de Recherche du Canada).

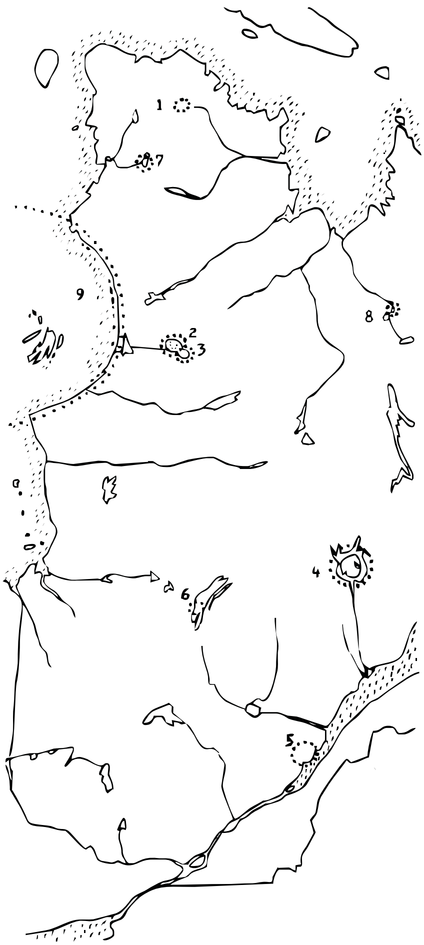
Résumé des caractéristiques techniques

Bras:	Longueur:	15.2 m
	Masse:	360 kg
	Force maximale:	6.8 kgf
Vitesse de marnieuvre:	Charge maximale:	3 cm/s
	Sans charge:	60 cm/s
Charge utile maximale:	Longueur:	18.3 m
	Diamètre:	4.6 m
	Masse:	29,500 kg

Ce même numéro, dans un article signé Roger Gagnon, traite des cratères météoriques du Québec. Une impressionnante photo du satellite Landsat nous montre le réservoir circulaire du complex hydroélectrique de Manic 5. Il semble que nous ayons eu notre part de ces phénomènes géologiques (ou astronomiques?), car malgré l'érosion répétée des époques glacières, il a été possible d'établir la liste suivantes.

1. Lac Chubb, ou cratère du Nouveau Québec.
2-3. Lac à l'eau Claire (paire de cratères).
4. Lac Manicouagan.
5. Baie St-Paul
6. Ile Rouleau, Lac Mistassini
7. Lac Couture, Ungava
8. Lac La Moinerie
9. Partie est dela Baie D'Hudson (incertain).

La S.A.M. songe à organiser un voyage de groupe au Yucatan pour visiter plusieurs Sitesmystérieux, telsque: Tulum, Chitzen Itza, Palenque Y Kokunlich, Urewal et Edzna. Le voyage aurait lieu à la fin de l'hiver et durerait 2 ou 3 semaines. Les personnes intéressées sont priées de laisser leur nom et numéro de téléphone au secrétariat, et dès que le nombre atteindra 15 ou 20, plus de détails seront fournis sur les prix. On peut rejoindre le secrétariat par téléphone: (514) 254-1224, ou par écrit à: 3860 est, Rachel, app. 1, Montréal, H1X 1Y9.



Carte du Québec montrant les endroits d'impacts de météorites.

The Society's Library

Frederic W. Troyer

The Library has recently received a number of books through gifts or bequests, particularly from two Toronto members, the late Ruth Northcott (former Editor of the *JOURNAL*) and the late Robert B. Johnston who was well-known as an active observer of variable stars. These books and other recent acquisitions are now available on the shelves.

Members desiring to borrow these or other books by mail are reminded that the Council last year approved some minor amendments in the borrowing procedure, including a provision that members requesting books from the Library, to be sent by mail, should send 50 cents per book to help defray the costs of packaging and postage. Also please note that because of customs difficulties we cannot ship books outside of Canada. Unless other arrangements are made at the time of borrowing, books are lent for one month only but a renewal for a further month can usually be arranged provided there is no request on hand for the book in question.

The Society's Library is located at our headquarters on the fourth floor at 124 Merton Street, Toronto M4S 2Z2. For members living in the Toronto area, who wish to visit the Library in person, it is open during the Society's office hours on weekdays. Occasionally the Library is open on Sunday afternoons, usually the first Sunday in the month. It is suggested that members wishing to drop in on these special occasions telephone the National Office (1-416-484-4960) a few days ahead to make sure that we will be open.

The list of new books, with the call numbers which are required (as well as author and title) when books are requested by mail, follow:

Donated by Robert B. Johnston

527 U	Useful Tables from the American Practical Navigator – United States Hydrographic Office
523.84 G	Dwarf Novae, The – Glasby, John S.
523.84 5	Variable Stars – Strohmeier, W.
523.0165	Radio Astronomy – Smith, F. Graham
523.01 E	Internal Constitution of the Stars, The – Eddington, A. S.
523 P	Introduction to Astronomy – Payne-Gaposchkin, C.
523 5	Universe, the – Struve, Otto
523 N	Astronomy – Nicolson, I.
523.11 S	Structure of the Universe, the – Schatzman, E. L.
523.5 W	Between the Planets – Watson, Fletcher G.
523.84 C	Studies of Long Period Variables – Campbell, Leon
523.89 B	Atlas of the Heavens-Catalogue 1950 – Becvar, A.
522.67 T	Astronomical Spectroscopy – Thackeray, A. D.
530.1 H	Physics and Beyond – Heisenberg, Werner
523 L	Beyond the Known Universe – Levitt, I. M.
520.45	Beyond the Observatory – Shapley, Harlow
531.51 S	Physical Foundations of General Relativity, The – Sciama, D. W.
523.13 S	Intelligent Life in the Universe – Shklovskii, I. S. and Sagan, C.
523 S	Cosmic Connection, The – Sagan, Carl
523.11 F	Redshift Controversy, The – Field, G. B., Arp, H. and Bahcall, J. N.
523 C	Violent Universe –Calder, Nigel
523.8 P	Starlight – Page, T. & Page. L. W. (editors)
523 K	Cosmic Cycle, the – Kurniker, Max Waldemar
523.113 B	Milky Way Galaxy, the – Bova, Ben
523 K	Design of the Universe – Kahn, Fritz
523.01 R	Selected Papers On Cosmic Ray Origin Theories – Rosen, S.
523 A	Pictorial Astronomy – Alter, D. & Cleminshaw, C. H.
523 H	Depths of the Universe, The – Hale, G. E.
523.8 G	Stars in the Making – Payne-Gaposchkin, C.
523 M	Planetary and Stellar Worlds, The – Mitchel, O. M.
520.4 A	Tragedy of the Moon, The – Asimov, Isaac

523.7 B	Sun, The – Branley, Franklyn M.
523.84 G	Variable Stars – Glasby, J. S.
523.51 M	Meteorites – Mason, Brian
523.349 C	Moon Rocks – Cooper, Henry S. F.
523 H	Revolution in Astronomy, The – Hodge, Paul W.
523.11 B	Mystery of the Expanding Universe, The – Bonnor, William
522.2 K	Telescopes in Space – Kopal, Zdenek
523 W	New Wilderness, The – Wilks, Willard E.
523.1 B	Iron Sun, The – Berry, Adrian
523.13 C	Extra-Terrestrial Intelligence – Christian, J. L. (EDITOR)
523.017 G	Non-Solar X- and Gamma-Ray Astonomy – Gratton, L. (EDITOR)
523.84 A	Variable Comments, Vol. 4– A.A.V.S.O.
523.5 W	Between the Planets (Revised Edition) – Watson, Fletcher G.
523.01 A	Atoms, Stars and Nebulae (Revised Edition) – Aller, L. H.
523.2 W	Earth, Moon and Planets – Whipple F. L.
523.8 K	Stars, The – W. Kruse and W. Dieckvoss
520.9 B	Astronomical Knowledge of the Maori, The – Best, E.
520.9 G	Dialogue Concerning the Two Chief World Systems – Galilei, Galileo

Donated by Ruth Northcott

523.89 M	Field Book of the Skies (4th Edition) – Mayall, R. N. and Mayall
523.89 M	A Beginner's Guide to the Skies – Mayall, R. N. and Mayall
523.89 B	A Popular Guide to the Heavens – Ball, R. S.
523 B	New Handbook of the Heavens – Bernhard, Bennett & Rice
520 D	Astronomy (4th edition) – Duncan, J. C.
520 B	Astronomy (8th edition) – Baker, R. H.
523.01 5	Astronomical Physics – Stratton, F. J. M.
523 M	Sky Observer's Guide, The – Mayall, Mayall, & Wyckoff
523 P	Orion Book of the Sky, The – Pecker, J. C.
523 F	Splendours of the Sky – Federer, C.
523 W	Astronomy Charted – Wright, R. A.
520 W	Principles of Astronomy – Wyatt, S. P.
523.84	A Binary Stars, The – Aitken, R. G.
55 1.565 M	Nature of Light and Colour in the Open Air, The – Minnaert
520.9	A World of Copernicus, The – Armitage, A.
523.89 K	An Easy Pocket Star Guide – Kingston, H. R.
551 G	Biography of the Earth – Gamow, G.

Miscellaneous

523 P	Contemporary Astronomy – Pasachoff, J. M.
522.63 P	Handbook of Astrophotography – Patterson, G. N.
925 E	Albert Einstein-Philosopher Scientist – Schilpp, P. A. (ed.)
551.5 J	Practical Hints for Amateur Weather Forecasters – Jameson, P.
523 M	A Key to the Heavens – Mattersdorf, L.
523.016 K	Big Ear – Kraus, J.
522.19	Royal Greenwich Observatory – W. H. McCrea
522.2 I	Amateur Telescope Making, Book 1 – Ingalls, A. G. (ed.)
520 E	A Universe to Explore – Ewers, R. O. and Ewers, L. M.
520.9 K	Astronomical Revolution, The – Koyre, Alexandre
523.43 R	Exploring Mars – Richardson, R. S.
523.844 K	1st suppl. to the 3rd Edn. of the General Catalog of Variable Stars – Kukarkin et al (ed.)
523.844 K	2nd Suppl. to the 3rd Edn. of the General Catalog of Variable Stars – Kukarkin et al (ed.)
523.78 A	Report on Experiments Conducted during the Total Solar Eclipse, March 7, 1970– Ashenhurst, P. (ed.)
523.2 A	Moon, The (Vol. 1, No. 1) – Alfven et al (editors)

Canada-Wide Science Fair

by Dr. D. G. Turner
Laurentian University

The 17th annual Canada-Wide Science Fair was held this year in Sudbury using the facilities of Cambrian College and Laurentian University. The 300 students and chaperon-delegates had a busy week of exhibit demonstrations and tours from May 7 to 13, but to many the highlight was a visit to Laurentian University's Doran Planetarium on the evening of May 10.

There were only five exhibits related to astronomy, and not all of these were considered to be of solely an astronomical nature. The entry selected as winner of the RASC Award was that of Gareth Jacobs and Peter Potts entitled "The Derivation of Meteor Orbits from Double Station Photographic Techniques". These two grade 11 students from Ontario's Bruce Peninsula spent many cold evenings in March beside their 35mm cameras, which were equipped with wide angle lenses and rotating sectors, photographing the sky from their two separate stations. At 3:15 a.m. on March 20 they obtained simultaneous records of a Virginid meteor, and, using these to determine its velocity and radiant, were able to calculate the properties of its orbit. The results were typical of the orbits of periodic comets.

A close second choice for the RASC Award was the entry by Susan Piotrowski of Mississauga, Ontario, entitled "Construction of a Solar Spectrograph for the Qualitative Analysis of Fraunhofer Lines". This exhibit won for Susan a bronze medal in the Senior Physical Sciences Division as well as the Spectroscopy Society of Canada Award and an award from the Molson Companies Donation Fund. It is a pleasure to extend congratulations to Gareth, Peter, and Susan for their award-wining exhibits.

Call for Papers—1979 General Assembly, London

Robert W. Cornforth

It is perhaps common knowledge by this time that the London Centre shall host the General Assembly of the Society in 1979.

A very important and informative segment of the General Assembly, one which offers you as a member and amateur astronomer the opportunity to air your views on your favourite astronomical subject and to hear those of your peers, are the Paper Sessions, which are an integral part of every General Assembly.

I have been assigned the honour and pleasure of organizing and conducting these sessions for the London Centre's 1979 G.A.

This short note is sent to ask your support to make these sessions the success they have enjoyed in previous years. I am therefore asking you to submit a paper for inclusion in the agenda of these sessions.

At Press Time, the General Assembly Committee is planning two Paper Sessions, on Saturday, May 20 and Sunday May 21 at 0900 hours.

The rules for submission of papers are simple.

1. Papers should be no more than Ten (10) minutes in length to allow ample time for discussion.
2. Original papers may cover any subject matter of Astronomy, e.g., observational, theoretical, historical, instrumental, etc.
3. Those wishing to present a paper should send an abstract of no more than 150 words in length including title and author's name, address and centre affiliation to ROBERT W. CORNFORTH, 211 GRAHAM STREET, WOODSTOCK, ONTARIO, N4S 6K5 before April 1, 1979, to insure inclusion in the programme.
4. A list of slides, films or other lecture aids should accompany point #3 above.

We of the London Centre have put in a lot of work in our effort to make this the best General Assembly yet. I am hoping to see a wide range of papers over the whole spectrum of astronomical thought.

I look forward to seeing you—remember, London's Fine in '79!

DUE$ DUE

All members are reminded that their 1979 fees were due on October 1, 1978. Members of Centres should remit directly to their Centre's Treasurer; unattached members should send their fees to the National Office, 124 Merton Street, Toronto, Ontario, M45 2Z2. Please include apartment numbers and your postal code.

Fees are $16.00 for regular members and $10.00 for members under the age of 18 years as of October 1, with proof of age required to be eligible for the student rate. As well, some Centres have special fees in addition to the above. Please consult your local treasurer for further details.

Treasurers of Centres are reminded that all membership fees received up to December 31 must reach the National Office by January 15 in order to permit membership lists to be updated in time to mail the February issue of the *JOURNAL*. It will not be possible to retain membership and receive the publications of the Society unless such fees are received by January 15.

PRE$IDENTIAL PO$T$CRIPT

Dr. John R. Percy
NATIONAL PRE$IDENT

You will notice that, for the first time since 1974, the membership fees have increased. This modest increase of 25 per cent over 5 years is partly to cover inflation, partly to provide additional revenue to the centres, and partly to cover the cost of expanded national services. Since 1974, for instance, the *OBSERVER'S HANDBOOK* has expanded from 107 to 140 pages, the *NATIONAL NEWSLETTER* has nearly tripled from 32 to 88 pages, and even the *JOURNAL* has increased slightly in size. The national office has also established a program of "special projects" grants for the centres.

1978 has been a very exciting year for the RASC. We have a record high total membership, a new centre established in Moncton, two new national awards to reward achievements by amateurs, a new publication planned for 1980, and some commendable accomplishments by our members in the fields of comet-hunting, telescope-making and astrophotography. I hope 1979 will be equally exciting and rewarding for all of you. I look forward to seeing you at the 1979 General Assembly in London, and to visiting your centre during my term of office.

Jean Vallières, lauréat 1976

Le prix du loisir scientifique, décerné annuellement par la F.Q.L.S. pour souligner les travaux de recherch et d'animation d'un amateur, a été remis à Jean Vallières par le président de la fédération, Serge Hamel, lors de l'assemblée générale de la F.Q.L.S. Membre de la Société d'astronomie de Montréal, Jean Vallières est actuellement président de l'Association des groupes d'astronomes amateur du Québec. Depuis une vingtaine d'années, il a réalisé de nombreux projets de recherche et de vulgarisation; on lui doit entre autres l'Annuaire astronomie de l'amateur et le volume "Initiation à l'astronomie".