NATIONAL NEWSLETTER

Service Award Presented to Norman Green

At the 1970 General Assembly in Edmonton in May, a Service Award was bestowed upon Rev. Norman Green, National Secretary of the R.A.S.C. As Rev. Green was taking a well-deserved holiday in England at that time, the award was accepted by the President of the Hamilton Centre for presentation upon Norman's return.

The Hamilton Centre held a testimonial dinner for Rev. Green on Saturday, June 13, at which time the award was presented. Following a sumptuous roast beef dinner, several members and guests told anecdotes about Norman's career as an amateur astronomer, a minister, an official of the Society, a teacher and a gentleman. They underscored Norman's great contribution to the Society and to the Centre.

Greetings were read from members who were unable to be present but who wished to pay tribute to Rev. Green. Indeed, it was felt that all members of the R.A.S.C. were present in spirit and that the Service Award came from the Society as a whole to honour Rev. Norman Green.

KENNETH E. CHILTON

The Transit of Mercury, May 9, 1970

This event was successfully observed by many of our members, including Hamilton Centre members Ken Chilton and John Macdonald, who were attending an astronomical symposium in Toledo, Ohio, at the time. Their observed and predicted times of third contact (interior egress) and fourth contact (exterior egress) are listed below. A second group, on top of the Hamilton escarpment, was unsuccessful, due to fog.

A group of Toronto Centre members was also hampered by fog; however, the sun broke through in time for the last phases of the transit to be seen. Alan Flancman obtained timings of the third and fourth contact, listed below.

	Third Contact			Fourth Contact		
Observer	Observed	Predicted	O–P	Observed	Predicted	O–P
Chilton	$7^h10^m07^s$	$7^h10^m25^s$	-18^s	$7^h13^m15^s$	$7^h13^m26^s$	-11^s
Macdonald						
Flancman	$7^h09^m09^s$	$7^h10^m22^s$	-73^s	$7^h12^m51^s$	$7^h13^m23^s$	-32^s

Transits of Mercury occur only when the planet is at inferior conjunction, and near one of the nodes of its orbit. The next transit, according to Ken Chilton, occurs on November10, 1973.

Mars: The Opposition of 1969

A reasonably favourable opposition of Mars occurred on May 31, 1969, and the red planet came under the close scrutiny of the observers of the Planetary Section of the R.A.S.C.

The observers, being well separated geographically, provided nearly continuous coverage, night by night, of the surface of Mars.

Although Mariners 4, 6 and 7 have shown Mars to be a cratered planet evidently devoid of vegetation, several changes were noted upon the Martian surface. We can only speculate as to the real nature of these changes, but a brief description here may be of benefit. Syrtis Major could be seen quite clearly on the night of July 12 but was conspicuous by its absence on July 13. The rotation period of Mars is $24^h\ 37^m$ while that of the earth is 23^h56^m, so that an observer could expect to see the same features on the Martian surface about 40 minutes later each night. However, Syrtis Major was not seen on the second night and we can but guess as to whether the change was in the feature or in the atmosphere above the feature. Other features to show changes were Nix Olympica, Hellespontus, Mare Acidalium, Sinus Sabaeus and Sinus Meridiani.

Disturbances in the Martian atmosphere were recorded on three occasions. On July 9, Barry Sherman of the Hamilton Centre recorded what appeared to be a large dust storm on the western limb of Mars. This storm lingered some time near the same Martian longitude and was recorded two nights later by Keith Hebil of the Montreal Centre. Earlier, on July 5, W. A. Fautley of the Hamilton Centre observed a strange horizontal line on the surface. This was confirmed by the author, but as the line was followed, it appeared to shift in latitude, indicating that it was an atmospheric feature. Another dust storm was seen by Barry Sherman on Aug. 24.

It is interesting to note the number of circular or elliptical features indicated on the observation forms. Since we know now that these are craters, one might speculate as to why the existence of craters on the Martian surface was not recognized long ago. As the observations arrived in the hands of the author, they were plotted on a map of the surface. The map does not differ radically from the established and accepted maps.

Several naked eye observers focussed their attention on Mars during the summer. These were members of the Junior Section of the Hamilton Centre. Their project was to record the right ascension and declination of Mars on as many nights as possible. The results are within a standard deviation of 10 minutes of arc.

The next opposition of Mars, an extremely favourable one, occurs in 1971. Plans are being made to upgrade the calibre of observation, with a greater variety of techniques being employed. Whereas the 1969 opposition was observed primarily visually, in 1971 filters, photography and a colour comparison scale will be used. We hope that observers in every Centre will participate.

The author would like to thank the following observers for their help. *Edmonton Centre*: George Haeckel, Dennis Moore, Randy Moore, Richard Newman. *Hamilton Centre*: Bill Fautley, John Garden, Bill Keating, Barry Sherman, Robert Speck, Mike Spicer, Junior Section. *Montreal Centre*: Keith Hebil. *Ottawa Centre*: Tom Tothill.

HAMILTON KENNETH F. CHILTON

The Planet that Never Was

If you could have picked up a book on the solar system published around 1870, you would have found a strange list of planets indeed. Neptune had but recently been discovered, and Pluto was unheard of. But this would not have been the strange thing about the list. What would have struck you as odd, given your present-day knowledge of the sun's family, would have been the first planet on the list, nearest the sun—not Mercury, but Vulcan!

Vulcan was "discovered" by a Frenchman named Lescarbault in 1859. He claimed to have seen the planet passing in front of the sun's disk. This was not just a crazy surmise, for it had long been suspected that one, perhaps more small planets might revolve between Mercury and the sun. The reason for this deduction lay in the shifting of Mercury's orbit in such a way which only the existence of another planet could explain.

The famous Leverrier, Director of Paris Observatory and a discoverer of the planet Neptune, made a painstaking investigation into the whole matter. He, too, for a time, was convinced of the planet's existence. So sure were astronomers that there was a planet inside Mercury, they decided upon the appropriate name of Vulcan for the unseen world.

Reams upon reams of paper went into the wastebasket. Miles of pencils (or would it have been quills?) were worn out. Bushels of hair were torn from heads that could ill afford the loss. But nary a planet was to be seen. Vulcan remained elusive, thereby handing out headaches to scientists of the day.

As we know, for practical observations of such objects, there is no better time to observe an inner planet than at the time of a total eclipse of the sun. Repeatedly, during such periods, excited announcements were made to the effect that the planet had been sighted, but the haste and excitement that must surely grip the observer during the few precious minutes of totality must have caused the identification of some other body as Vulcan—a faint star, perhaps a comet.

Be that as it may, the planet was never found, and is now never expected to be. If it were in existence it would certainly have shown up on one of the numerous photographs taken at eclipse time, or have been noted in transit across the sun's face.

It was Einstein, eventually, who explained away the perturbation in Mercury's orbit which had led to the belief in an inner planet. Actually, Leverrier's failure to find Vulcan was of greater importance scientifically than success would have been.

In the latter event, we should have had ten planets in the sun's family instead of nine. But had Vulcan actually been where it was supposed to have been, it would have meant a serious flaw in Newton's theory of gravitation and Einstein might not have given us an acceptable theory of relativity. Had that been so, we might today be as far from the Space Age as we were B.E. (Before Einstein).

ST. JOHN'S — MRS. DORA RUSSELL

Lunar Occultations

The moon often passes between the earth and a star; the phenomenon is called an occultation. During an occultation a star suddenly disappears as the east limb of the moon crosses the line between the star and observer. This is referred to as immersion (I). The reappearance from behind the west limb of the moon is called emersion (E). The times of occultations are different for different places on the earth. Because the moon moves through an angle about equal to its own diameter every hour, the longest time for an occultation is about an hour. The time can be shorter if the occultation is not central. Occultations are equivalent to total solar eclipses, except that they are total eclipses of stars other than the sun.

The elongation of the moon is its angular distance from the sun, in degrees, counted eastward around the sky. Thus, elongations of 0°, 90°, 180° and 270° correspond to new, first quarter, full and last quarter moon. When elongation is less than 180°, a star will disappear at the dark limb and reappear at the bright limb. If the elongation is greater than 180° the reverse is true.

The sudden disappearance of a star behind the limb of the moon during an occultation is evidence that the moon has very little atmosphere. If there were one, the star would be expected to fade gradually as the moon's limb approaches it, just as the sun fades gradually at sunset. Occultations also indicate that stars have small angular diameters. If a star had an appreciable angular size it would require a perceptible time to disappear behind the moon as is observed for solar eclipses. Measurements have been made which place the disappearance of the star at a few hundredths of a second. If occultations can be timed accurately, the exact profile of the moon can be determined and its exact orbit can be calculated.

Occultations of brighter stars are listed in advance for each year in the OBSERVER'S HANDBOOK. Knowing the latitude and longitude of your observing station an approximate occultation time may be calculated using the equations given in the HANDBOOK. All times should be recorded to 0.1 second and all timing errors should be held to within 0.5 second if possible. The method of timing is as follows: Using as large a telescope as is available, with a medium power eyepiece, the observer starts a stopwatch at the time of immersion or emersion. The watch is stopped again on a time signal from a WWV or CHU station. The elapsed time is read from the stopwatch and is then subtracted from the standard time signal to obtain the time of occultation. The position angle P of the point of contact on the moon's disk reckoned from the north point towards the east may also be estimated.

The following information should be included:

(1) Description of the star (catalogue number) (2) Date (3) Derived time of the occultation (4) Longitude and latitude to nearest second of arc, height above sea level to the nearest 100 feet (5) Seeing conditions (6) Stellar magnitude (7) Immersion or emersion (8) At dark or light limb; Presence or absence of earthshine (9) Method used (10) Estimate of accuracy (11) Anomalous appearance: gradual disappearance, pausing on the limb.

Since observing occultations is rather easy, provided the weather is good and the equipment is available, timing occultations should be part of any amateur's observing program. All occultation data should be sent to the world clearing house for occultation data: H.M. Nautical Almanac Office, Royal Greenwich Observatory, Herstmonceux Castle, Hailsham, Sussex, England.

LONDON EDWARD KIPP

Lunar Occultations: Recent Developments*

Prediction Accuracy. The margin of error of predictions has been significantly reduced in the past two years. The 1968 predictions for the writer's telescope had a stated probable error of between 14 to 18 seconds of time for most stars; others had even greater uncertainty. In fact, observations showed that nearly all occultations occurred within 5 seconds of time from prediction.

Improvements in 1969 reduced the probable error to an average of 9 to 12 seconds of time, with observations being only 3 or 4 seconds from prediction. The 1970 lists are computed to a much closer tolerance, most of them expected to be within 4 seconds of time from observation. Over 20 observed occultations to date have all been recorded, with no more than 2.5 seconds error. One was at the predicted time and nine others were within one second.

Refinements to the orbital elements of the moon are mainly responsible for the increased accuracy of predictions. Another very important factor is the great increase in the number

*This paper was presented at the Session for Papers, 1970 General Assembly, Edmonton, Alta.

of occultations observed, especially of the fainter stars now included in the Zodiacal Catalogue. The systematic observation of the occultation of a star refines the star's actual position, which is reflected in a much improved prediction for the next occasion the star is due to be occulted. In other words, an amateur measures a star's position every time he observes an occultation.

Passage of the Moon Through the Pleiades Star Cluster. This event occurred many times during 1969 and also again in 1970. Special efforts were successfully made, mainly by amateur astronomers, to record as many occultations as possible, to enable Miss Joan Bixby of the U.S. Naval Observatory to check the accuracy of Dr. Watts' lunar limb maps. Canadian observers were instrumental in making several hundred observations of these cluster stars for this program.

Amateurs Assisting in the Reduction of Occultation Observations. Her Majesty's Nautical Almanac Office, Greenwich Observatory, is engaged in the huge task of reducing all lunar occultations observed during the years 1900 to 1946 to improve the residuals. The U.S. Naval Observatory is reducing all observations since that date, and found that the volume of new observations was completely overloading the staff available for the work. An appeal to select amateurs to assist them by completing the tedious but meticulous listing of the lunar limb elevation at the point of occultation was not in vain. For each observation, three maps from Dr. Watts' volume of lunar limb elevations are carefully consulted and the elevation at the particular libration period is obtained, generally to an accuracy of 0.01 second of arc. These volunteers have reduced the back-log and now more help could be used to transfer this data to computer cards, if volunteer key-punch operators can be found. Any volunteers? If you can help, please contact Dr. T. Van Flandern, U.S. Naval Observatory, Washington, DC., 30290, U.S.A.

Current Scientific Data being obtained from reductions.

1) Studies of Dr. Watts' limb corrections, including lunar radius, axis angle shifts, ellipticity of the datum, and variations of these with the librations of the Moon.

2) Corrections of orbital elements and constants of the lunar theory, in order to develop a more accurate lunar ephemeris, and to resolve unexplained discrepancies between theory and actual observations. J. S. Griffith's paper "The Position of the Moon" (*J.R.A.S.C.*, **64**, 5 (1970)) discusses these difficulties.

3) Corrections to the fundamental co-ordinate system (the FK4 catalogue) including the equator and equinox location, the obliquity of the ecliptic, and other astronomical constants.

4) Determination of the location of the lunar centre of mass in relation to Dr. Watts' limb correction datum.

5) Correction to individual star positions and proper motions, and the establishment of a dynamical co-ordinate system on the celestial sphere.

Geodetic Application of Grazing Occultations. The possibility of using widely separated gazing occultations to confirm geodetic datums of different land masses around the world is being actively investigated. It is hoped that a minimum of two teams of at least four observers each, separated by as much as 1,000 miles, can observe the same grazing occultation. The objective is for each expedition to observe the star occulted by the same lunar limb features over about 5° of the moon's edge.

The writer has checked the remaining 1970 grazes for western Canada and north-western U.S.A. and a 4th magnitude star, ZC541 grazes the moon on December 11 (U.T.) for observers along a line from the Winnipeg area, to near Regina, to the Calgary vicinity, a

distance of about 900 miles. This will be a real challenge to interested R.A.S.C. members as it is a 97 per cent sunlit moon. Anyone interested should gain all the experience possible in observing stars near the almost full moon in preparation for the above event. Good slow motion gear is essential and fairly high power must be used to reduce glare. It can be done, as the writer has observed a 7.1 magnitude star occulted by a 99 per cent illuminated orb.

Importance of Continued Observation of Occultations. A series of observations from one station over a number of years is a very valuable contribution, even if only half a dozen occultations each year are made. This is much more important than if an observer makes 50 or more in a few months, without any subsequent observations.

CALGARY F. JOHN HOWELL

Total Solar Eclipse: July 10, 1972

Si Brown of the Montreal Centre, apparently the victim of a chronic case of eclipse fever has been doing some very valuable spadework for the 1972 solar eclipse. Although the Society has not yet made any official plans for this eclipse, it is certain that some form of co-ordinating committee will be set up to plan a national effort. Si Brown has already investigated a number of observing sites in detail and has exchanged several letters with Mrs. Fidler and I. Most likely the Society will establish at least two meteorologically-independent sites, so as to minimize the chance of a total washout.

Si has supplied the following article; interested members and Centres are urged to contact him and begin planning a national eclipse effort.—*Editor*.

The total solar eclipse of July 10, 1972, will likely be the astronomical event of the year for Canadian observers. I recommend that the Society consider the establishment of two, possibly three, nationally designated, co-ordinated and operated sites in the eastern Maritimes for the observation of this phenomena. It is hoped that Centres participating in such a national expedition will find it substantially more enjoyable, economically advantageous and better co-ordinated than the numerous small groups that have maintained such programs in the past. All interested Centres or individual members are strongly urged to contact me at 8018 Querbes Avenue, Montreal 303, Quebec, within the following month in order that their particular suggestions and queries can be considered and responded to before final evaluations are made.

I have painstakingly scrutinized seven potential sites; three are being tentatively considered: Pointe-des-Monts, Que., Shippegan, N.B., Charlottetown, P.E.I. Detailed analyses are available upon request. *Write now*! Don't let this event succumb to the apathy of the past.

MONTREAL SI BROWN

Meteor Observations Continue in Ottawa

NRC meteor station, Ottawa, Number 4, is located near Shirley Bay on the Ottawa River, The facilities of the radio-quiet site have again been loaned this year to the amateur meteor observers of the Ottawa Centre through the kind co-operation of the Defence Research Board.

The observing program began as a project of the International Geophysical Year, and

although the IGY visual meteor program ended in 1967, the "Quiet Site" group has carried on observations under the fine leadership of Les MacDonald. The Perseid results in that final year climaxed a most successful IGY program. 1808 meteors were clocked by this group on the night of August 12–13, a number that, in the three years since, has not been exceeded.

However, observing equipment has improved significantly since that time. In contrast to an era of cots and groundsheets, the group now operates from an eight-man observing platform. The plywood structure is octagonal in shape and entirely enclosed so as to afford some protection from the elements. It has power for heaters and the like but the more intricate equipment is housed in a small van about fifty feet from the platform. The observers are connected by underground cable to a tape recorder in the van where, on one track, all voices are recorded, and on another, CHU time signals are fed in. In this way, an entire night's observations can be recorded without the use of a manual timer. Meteor plotting is also carried out and the platform is equipped with red neon lights to facilitate this.

The group is continuing observations this year, practising the standard procedure for observing as outlined in the IGY General Instructions. To date (May 5) 832 meteors have been logged with the hope that 1000 may be observed before the summer observations begin. This would put us a long way toward setting a new record this year. We would like to see 5000 before December 31. Wish us luck because Ottawa area clouds have promised stiff opposition!

We are truly dying to hear from other groups and their methods of meteor observing. How about talking shop and dropping us a line at 2456 Beaver Avenue, Ottawa 8?

OTTAWA — KEN HEWITT-WHITE

From the Library

It has often been pointed out that a man's library indicates his interests and even reveals aspects of his personality. Stan Horton, a valued member of the Toronto Centre who died this past spring, left several cartons of books to the R.A.S.C. National Library. Having known him only by sight, I have found myself in the position of wondering about him as I leafed through the books in an attempt to catalogue them. Do the several books on meteorology, navigation, and ham radio indicate that he was a flyer? Surely the children's books on astronomy show a love of youngsters and a desire to foster in them a knowledge of the skies. Inserted in most of the books there were numerous clippings from papers demonstrating his awareness of current affairs in the astronomical community. Amongst these, I was pleased to find a photograph as I remember him at a star night, wearing a wool cap and a warm smile. As a reminder of his generosity to the Society, we are having this picture framed and hung in the Library. During his lifetime he reached thousands of people through his devoted service at public star nights and now, we hope, his educational endeavours will extend across country as his books reach many more.

TORONTO — R. PETER BROUGHTON

Proposal for Joint Newsletter

Mr. Martin G. Connors, of the London Centre, has sent along a rather detailed proposal for a joint Newsletter for the RASC Centres in southwestern Ontario. Since it is the function

and policy of this NEWSLETTER to encourage such co-operation, and since other Centres might be interested in this proposal, a brief summary follows:

The advantages: encouragement of co-operation; co-ordination of activities; lower cost due to mass production; wider appeal to advertisers; service to Centres not presently publishing a Newsletter.

The structure: a joint Editorial Committee, one member from each Centre (present Newsletter Editors ?), who would solicit contributions and advertising; rotating chairmanship and production headquarters; shared financing.

The format: ditto process; light paper; mailed from production headquarters (mailing cost 5 cents).