March 9/69 A Rang.

OFFICIAL OBSERVING PROGRAMME

The Royal Astronomical Society of Canada-1968

Hamilton Centre

Notice: This book is the property of the Hamilton Centre and is being loaned to you to stimulate interest in observing and to help you make observations of scientific value.

Why Observe?

The average amateur astronomer may believe that there is no way that he can do something useful and at the same time enjoy himself with his telescope. He hears of all of the marvellous achievements of the professional astronomers with their large telescopes and subconsciously compares himself with them. This is a mistake. Naturally, amateurs should not try to duplicate the work done by the professional. He should remember that there are things that he can do <u>better</u> than the professional astronomer! There are disadvantages to large telescopes! But that is not within the scope of this book. Suffice it to say that most professional astronomers just do not have the time or inclination to do that which can be done by the amateur astronomer. In other words, there are certain fields of astronomy which are the exclusive province of the amateur astronomer.

It should be obvious that there are two reasons for being an observer. The first is the advancement of Astronomy as a science. (After all, that is the object of the Society--just look at the front cover of the RASC Journal!) The other is the satisfaction and enjoyment of taking a closer look at God's handiwork!

EQUIPMENT

There is one piece of equipment which is vital to any amateur astronomer and several non-essential pieces of equipment which can add to the enjoyment and value of Astronomy.

The essential equipment is the willingness to make observations on a regular basis. (This is where many of our older members let us down badly. Why is it that when a man gets to be 30, he would rather sit and watch television than enjoy his chosen hobby?) DON'T LET YOUR TELESCOPE SIT GATHERING DUST. USE IT!

Though a telescope is a handy piece of equipment, it is not essential. There are certain fields where the naked eye is better, meteor-watching, for instance. In certain other fields an accurate time-piece is a must.

If you have the zeal, the sky is the limit!

WHAT HAPPENS TO YOUR OBSERVATIONS ? ARE THEY USEFUL ?

The Centre provides report forms for the various observing disciplines. Examples of these may be found in the back of this book. The observer is to submit his observations for the month to the Director of the Section concerned. The contents of your observation are recorded in the files of the Centre. Your observation is then returned to you. When sufficient data has been collected and analysed, a scientific paper will be made up and published. Of course, the observer is invited to, at the same time, compile his observations and write up his own paper. It can be published in ORBIT, our Centre's publication, or it may be published in the RASC Journal. It is only by publishing the results of observations that they can be of any use.

HOW TO GET HELP

Should you need help on locating a celestial object or need more details on the methods of observing do not hesitate to contact the Director of the Section involved. They are, at the time of this printing, early in 1969:

Solar- R.McCallum	634-5848
Lunar- W.A.Fautley	383-4634
Meteors-J.G.Craig	383-0383
Messiers-B.Sherman	545-0258
Comet & Nova- L.V.Powis	689-4202
Aurora-R.McCallum	634-5848
Planetary-K.Chilton	388-0586

At present we have no Directors for the Variable Star Section or for the Occultation Sections. (Any volunteers?) Until then, you can contact the over-all Director of Observational Activities K.Chilton at 388-0586.

TIPS TO REMEMBER

Please keep your report forms legible! Your observation is of no use if no one can read it!

Get a partner! Not necessarily to observe with, but rather, to spur you on, to compare notes with and to remind you to observe.

Don't be afraid to depart from the programme. If you have an idea, speak up!

Observations That YOU can Make

Let us begin this chapter by stating that you can make observations of scientific import, no matter what optical aid you may possess. Yes, your 2,3 or 4" telescope or binoculars can add greatly to the accumulated knowledge of the skies. And to me this is what astronomy is all about. It seems a shame that any person should make or purchase a telescope and let it gather dust in the closet. Those who contribute the most to astronomy seem to be the ones who get the most out of it. So, you with your small telescope, don't be discouraged. You have a role to play. Remember that even the largest mountain is made of tiny atoms!

So what can you do?

Solar Observations:

By holding a sheet of paper behind the telescope while it is pointed at the sun, one can see and track the sunspots. You don't need a large instrument to do this. Mr.W.A.Fautley uses a lens 2" in diameter to make his daily record. When I observe the sun I put a sheet of heavy cardboard with a hole 3" in diameter over the end of my telescope. The sun is so powerful and emits so much light that you don't need a large aperture.

To be truthful, observing sunspots is not of much value, as the sun is one of the most observed objects in the universe. There are 3 uses that immediately come to mind, however, that make this type of observation of value. Since sunspots are usually accompanied by radio emission, I know that the Director of Radio Astronomy of the Centre would be delighted to learn or be alerted of any large spots. This would also be true for the Chairman of the Aurora Section of the Observers Group, as an Aurora Alert could be sent out. Thirdly, some enterprising amateur might try to deduce,from his observations, the rotation of the sun at different latitudes and write a paper on it.

Of course this is not to say that an enterprising person could not build sophisticated solar equipment and make spectroheliograms etc. Go to it!

Remember,Solar observing can be dangerous. Don't look directly at the sun. (I don't trust filters either, as they have been known to crack.)

The Moon:

The Moon is the amateur astronomers chance to do really valuable work! True, there are those skeptics who point out that lunar Orbiter photos have done away with mapping the moon with telescopes. However, there are certain areas where Orbiter does not answer all of the questions. And these areas may be explored effectively by those of us with small telescopes!

I am going to enumerate these areas, but let me point out that these are by no means in the order of importance. Every one is important!

We still do not know what goes on in a single day in the crater Eratosthenes. Observers should sketch Eratosthenes at every opportunity right around from New Moon to New Moon (Sometimes you can see it in Earthlight!) If you don't know where it is,

either The Chairman of the Lunar Section or the Director of Observations will be most happy to show you where it is. A limited number of lunar maps is available.

With a small telescope, the observer can look for craters with conical bottoms. These have not all been detected, by any means. You can tell these by watching the interior shadow. If it is "circular", the shadow indicates that the crater has a round bottom. If the shadow is "pointed" ie: parabolic, the crater is conical. If you see one, telephone someone at once for confirmation!

With a little ingenuity one can build a "moon-blink" for detecting transient lunar phenomena. These are mysterious glows which appear on the moon for very short times. They are very important- the Manned Space-Craft Centre of NASA wants all of them reported to them. Specific directions on how to build one are available in printed form from the Editor of ORBIT, and need not be repeated here.

A catalog of "ghost craters is available. This is a fascinating study, which has never been done before. It needs doing. Observers are requested to time the interval between when the wall of a crater appears from over the terminator until its shadow disappears. I suggest that you ask for help in identifying the craters before embarking on this sort of program. I hope that you will ask! This work is very important.

Occultations are important too! An exact timing of the disappearance or reappearance of a star, when covered by the moon, gives a more precise knowledge of the moon's orbit. In these days of journeys to the moon, this becomes even more important. A list of stars to be occulted is given in the Observers Handbook and all timings will be sent to the proper authorities!

I am trying to entice some observers into participating in a very ambitious program-- that of making a topographic map of the moon, using our own observations. If you are interested in this let me know!

Mercury:

Mercury is a very elusive object and should be observed at every opportunity. We actually know little of Mercury.

It is a good idea to observe Mercury before the sky gets very dark. (Being so close to the sun, it is not hard for this!) Try to record as accurately as you can, the phase of Mercury. It may surprise you to know that the phase of Mercury is more important than you think! Keep an eye out for dusky markings. You can try guaging their intensity of these by using a scale where 0 = white and 5 = black. Most marking will be ½ or 1.

Venus:

The same techniques used on Mercury can be used on Venus. And, Venus presents a few other challenges to the observer. Not only can you look for markings and the phase, but you can also look for the "ashen light" by using a bar in the eyepiece to cover up the bright part of the planet. At times you can see the remainder ie: the dark side, shining at you!

Occasionally you might see the cusps or horns, extended further around the surface of Venus than you should. This is important and should be reported to the Chairman of the Planetary Section by telephone at once! (Even at 4AM)

A hint to remember: don't be disappointed if you don't see any detail on the planet. They are elusive--but keep looking! You will increase your chances by observing while the sky is still partially light.

Perhaps here I should digress long enough to tell you how I discovered Venus' moon! I looked at Venus one night while on vacation, using my 7 x 50 binoculars. There was a faint image beside Venus! Excitedly I called everyone within miles to have a look. It was later, with great consternation, that I learned that Venus was passing very near to Regulus! (Still, there are 50 or 60 people in the great state of Kentucky who believe that they were present at the discovery of the moon of Venus!)

MARS:

Mars presents many opportunities for valuable observations. However, the observer may become discouraged, for when you first look at Mars, all you see is the pale pink disc, and nothing else! There is one noted member of the RASC who never has seen surface deatail on Mars using my 12½" telescope, though I do! The explanation lies in the fact that it is necessary to stare at Mars for 5 or 6 minutes continuously before all of the detail appears. This makes it very difficult to sketch the planet as one must stare, sketch, stare,sketch etc... this is very time consuming. It is well worth the effort though.

As a part of the National Observing Programme, I obtained a set of coloured chips, the kind used by paint dealers to demonstrate their wares. By comparing these to the colours on Mars, we can get a pretty accurate picture of the Martian colours. The results obtained so far have been very surprising. If anyone asks, I will endeavour to get them a set of chips and assist them in this work.

Dedicated observers can make timings of central meridian transits. Now that sounds horribly technical and complicated but it isn't. Imagine a line running from the north Martian Pole to the south Martian pole. Just note the time to the nearest minute that a feature crosses the line, as the planet rotates. Then using the table on p.61 of the Observers Handbook, calculate the longitude. As an example, say that a feature crosses the line at exactly 2100 E.S.T. on March 24,1969. The figure given for Mar.24 is 94.4°. But the top of the page says that this is for 1900 E.S.T..It also says that the longitude increases by 14.6° per hour. Therefor we must add $2 \times 14.6^{\circ} = 29.2^{\circ}$ to 94.4°. (2x because there are 2 hours between 1900 and 2100) The Martian longitude of our feature is $29.2 + 94.4 = 123.6^{\circ}$. Easy wasn't it?

Observers with 10 or 12" scopes, or larger, should try to keep and eye on the moons of Mars. Their orbits are not yet fully understood and any accurate positional drawings can be very helpful. You should try to estimate how far the moon is from the planet in terms of the planet's diameter.

All reports will be gratefully received.

Jupiter:

Jupiter presents a myriad of details. Here, again, staring is the order of the day. Some belts appear right away, but you will be surprised if you stare awhile. A good drawing is valuable. But you should remember to use the special Jupiter Report Form rather than the ordinary Planetary Report Form, as the Jupiter report form takes into account the polar flattening. The Jupiter Form may be used for Saturn if you wish but Saturn's flattening is not so pronounced as Jupiter's.

No decision has been made at this time regarding whether intensity estimates or paint-chip comparisons are more valuable.

Central Meridian timings are extremely important. Use the tables on p.60 of the Observers Handbook. Be sure to read the directions carefully, but generally the same procedure as for Mars can be followed.

I have a great deal of fun checking out the predictions for the phenomena of Jupiters satellites as given on P.56 of the Handbook. Sometimes these are surprisingly in error! This is something that you can do with binoculars! Any great discrepancies should be reported by telephone. All observations should be recorded on Jovian Satellite Report Forms and submitted regularly as statistical analysis of these may lead to an important discovery.

Another fascinating idea is to insert a piece of Polaroid in the optical train of your telescope and rotate it slowly. Sometimes the satellites disappear from view, showing that they shine with polarized light. The reason for this is unknown and is why the previously mentioned phenomena checks are important. There seems to be some connection between the position and the amount of polarization!

Be sure to ask about any aspect of observing Jupiter as I am sure that you realize its importance.

SATURN:

Members of our Centre have made a valuable contribution to the annals of Astronomy with their past observations of Saturn. Even though regular routine observing may not seem very exciting, it is very important, as it accomplishes two things. It lets us know what is happening on the planet, and it is the only way that one can recognize anything unusual that does happen on the planet.

The observer with the small telescope can help out!

Here's what to do when you step to the eyepiece. First, inspect the planet generally for a while until your eyes get dark-adapted. Then look for the shadow of the rings on the globe and the shadow of the globe on the rings. Try to note any irregularities. Have a look at the globe to see any changes in the shape, width, or latitude of the belts and zones. Keep an eye peeled for spots, either dark or bright, and streaks. Try to see the crepe ring, inside of the two brighter rings. Look for Cassini's division between the two rings. Note any bright or dark spots on the rings. Lastly examine the surrounding field for stars which could be occulted by either Saturn or the Rings. (If you see one, alert the Chair-

-man of the Planetary Section immediately. I got quite excited once at the prospect of an occultation and watched studiously for several hours, realizing that the phenomena connected therewith would be extremely important! Finally I ended up realizing that the "star" was Hyperion, one of Saturn's moons.) Now, what do you do at this exciting juncture? Try to g ge the difference in magnitudes of the star as it is occulted by the rings. Measure the time of immersion and reappearance of the star, at the ring, at the actual globe and at the following portion of the ring!

I cannot say enough regarding the importance of intensity estimates of the features of the rings and globe. The idea is to estimate the brightness of each portion of the globe and rings using pure white = 0 and the black background of the sky = 10. For the difference between steps on the scale, we use the outer portion of ring B as a standard = 1. (Observers who have done this in the past should note that this is a change from our previous method as we used 2 for the rings. This change is to bring us in line with other groups who are attempting the same type of work.) You may find a certain sameness in your observations, night after night, but there are changes and these can be recognized only by their difference from the normal.

Another interesting project is to check the magnitudes of the satellites of Saturn, a project for those with slightly larger telescopes, say from 10" up. This project may be of value as certain of the satellites may vary. There are two ways of making estimates. The first, which is less satisfactory, is to say that Titan is 8.3 and go from there. The other is to use a variable star chart of the area (or a good atlas if the chart is not available.) The positions of the brighter satellites are given on p.58 of the Observers Handbook. Naturally, the Director of Planetary Observations would be most happy to help anyone with this project.

URANUS, NEPTUNE & PLUTO

These three planets remain largely beyond the reach of amateur telescopes as far as valuable work is concerned. Largely, but not entirely. Remember that Neptune and Pluto were discovered largely through orbital irregularities. Therefore, observers who track down these planets should try to indicate as exactly as possible the position of the planet. A watch should be kept for any surface markings, especially on Uranus. According to the Observers Handbook. Ariel, Titania, Oberon, and Triton should be visible in a 12" telescope. Thus, users of such instruments could glimpse them, noting carefully the position and magnitude of these satellites.

ASTEROIDS:

Asteroid watching can be fun as these tiny bodies usually have enough orbital motion for a change in position to be noted during one nights viewing. Facts about the brighter asteroids are on page 70 of the Observers' Handbook. As well, the positions of

certain of the other asteroids are available upon request. Observers will please note precisely the position of the asteroid and try to make a magnitude estimate.

METEORS & FIREBALLS:

The major meteor showers as given on p.71 of the Handbook are usually observed as a group by the Centre, weather and lunar phase permitting. The Director of the Meteor Section should be contacted for details.

There are a great many minor meteor showers, the details of which are not given in the Handbook. Information on these may be had by contacting the Director of Observational Activities.

From time to time, you may see an exceptionally bright meteor, or fireball. Note carefully the direction of travel, using background stars, trees, or buildings. Make a "guesstimate" as to the magnitude. Note any bursts, noise, or other phenomena. Phone the Director of Observational Activities right away.

COMETS:

Believe it or not, here is a field where the amateur with his 3", 4" or binoculars can shine.(No pun intended.) Those interested in searching for new comets should equip themselves first with a good star atlas. This is practically a must. Recommended are the Atlas Coeli, and the Bonner Durchmursterung. Also, it might be a good idea to have a list of the positions of the Messier Objects, as these are often confused for comets, especially at low pow er. (In fact, this is really the reason for which Messier drew up his original list- they kept getting in the way of his comet searches.)

A hint for searchers: Pick certain areas of the sky and familiarize yourself with them through constant observation, just one or two to start and then slowly expand. This is better than trying to sweep the whole sky. Eventually you'll learn the whole sky, but don't try it all at one crack. Pick your area within 90° of the sun, as this is where comets are brightest. Your chances of making a discovery in this zone are mathematically greater than in other parts of the sky.

If you should chance upon some unknown object, call the Director of the Comet and Nova Section immediately. If there is no answer, phone the Director of Observational Activities. Should there be no answer there,phone the David Dunlap Observatory. We would prefer that you phone one of the aforementioned Directors before calling the observatory, as they get quite annoyed at false alarms.

Observing known comets can be fun and of scientific value. Magnitude, structure, length of tail, and position of the comet should be noted and drawn.

AURORAE:

The purpose of the work of the Aurora Section is to record as fully as possible the details of auroral displays. However interest in auroral observing has always been rather low. I don't know the reason for this. But what is needed in this section is an enthusiastic Director. Until we find one, information may be had from the Director of Observational Activities.

VARIABLE STARS:

Variable star observations are handled rather well by the American Association of Variable Star Observers and it would be rather redundant for us to try to match their programme. However, there are certain stars whose periods are rather irregular and our Centre has "adopted" some of them for study. Information on how and what to observe are available on a sheet from the Director of Observational Activities.

Anyone who is really keen on observing variables, as I am, should contact the AAVSO.

MESSIER OBJECTS:

(Written by Barry Sherman, Director of the Messier Section)

The Messier Catalog of Star Clusters and Nebulae contains a number of the best known objects for observation. His original list was published in 1784 in the "Connaisance des Temps". Since that time, thousands of deep space objects have been discovered and plotted.

The newly formed Messier Section has planned a program for observing and recording the visual impression of these Messier Objects. We hope to obtain a record of drawings and comments on the 107 objects. Very few records of this type have ever been made.

It is known that the eye strives to recognize geometrical patterns and emphasize some features more than others. From the record we will be able to obtain conclusionsfor visual techniques and help to improve our present techniques.

Most of all, this program is designed to introduce amateur astronomers to deep space objects.

I know that most amateur astronomers believe that they don't have the equipment to observe deep space objects. This is untrue!! Messier himself used a 4" telescope of inferior quality. I have observed 50 "M objects" with my own 4".

All reports should be made on the report forms provided. See the instructions which follow.

A list of the "M Objects" can be found on p.96 of the observers handbook.

CONCLUSION:

Since you are a member of an astronomical society, it is more or less expected that you are interested in making a contribution. You can do this by observing. All you need is a little enthusiasm, stick-to-it-iveness and patience. "It is better to give than to receive."

The Report Forms

Types:

1. Lunar
2. Planetary-for use on all planets except Jupiter
3. Jupiter- same as planetary except that it takes into effect the polar flattening of Jupiters disc.
4. Messier-
5. Jovian Satellite
6. Variable Star

General notes:

Planetary report forms may be used in either of two ways. The circle may represent the disc of the planet or the field of view. Using the secon of these, the form may be used for observing comets and asteroids.

Please remember to submit your observations each month. They will be returned to you after analysis. Observations not reported are not observations!

Instructions for filling in the blanks:

Date: Use a double date- i.e. June 20-21 is that night which started at sunset on the 20th and ends at dawn on the 21st.

Time: Always use EASTERN STANDARD TIME. This may be difficult to remember during the summer time. (I always leave one clock in my house on Standard Time all year long to avoid confusion.)

Telescope: Specify type and size.

Magnification: power used. Focal length of telescope divided by focal length of eyepiece.

Seeing: This refers to the steadiness of the atmosphere. Rate on a scale where 1=poor and 10=excellent. The average night will be 5.

Transparency: Rate on a scale of 1-5 as follows:
1= very hazy, impossible to observe well.
2= hazy, objects not always sharp and clear
3= average
4= very good- objects visible to magn.6 with naked eye.
5= excellent- a perfectly clear night.

Field of view: the number ofdegrees covered by your scope.

Right Ascension: please record in hours and minutes.

Declination: please record in degrees and minutes.Dont forget + or - in front of it.

Phenomenon: This refers to the phenomena of Jupiters satellites which appear in the Observers Handbook (Te, OD, SI etc.)

1st Contact: The time when the phenomenon started.

2nd Contact: The time when it ended. These contacts should be as accurate as possible.

Predicted time: This may be read directly from the Handbook, referring to phenomena of Jupiter's satellites.

Co-longitude: This is on the Lunar report form. It refers to the number listed under that column in the Observers Handbook in the Month by Month section. An explanation may be had by referring to p.61 of the Handbook.

Co-ordinates: Also on the Lunar report, refers to the lunar latitude and longitude of the feature observed.

IF YOU HAVE ANY QUESTIONS ABOUT THE PROPER USE OF THE FORMS CALL THE CHAIRMAN OF THE SECTION CONCERNED

The Last Word:

We have tried to lay out for you the what, why and how to observe. Remember that the routine work of keeping an eye on celestial objects is very important. Don't let George do it. George may be clouded over!

If you have a telescope or are expecting to complete one in the near future would you please make sure that it is registered with the Director of Observational Activities, if you have not already done so?

Good luck and good seeing!!

This paper was written and published by K. E. Chilton

March, 1969

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