

Saskatoon Skies

The Newsletter of the Saskatoon Centre of the Royal Astronomical Society of Canada

Vol. 46, No. 10

October 2015



Former editor and member, Ron Waldron, took these stunning photos of aurora from the front street in front of his home in the Hampton Village area of Saskatoon on the morning of Wednesday, Sept. 9th. Both photos were taken at 4:15 AM using a Canon Ti Camera using the stock 18 – 55 mm lens. Exposure time was 3 seconds each at ISO 800



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To view *Saskatoon Skies* in colour, see our Website:
<http://www.usask.ca/rasc/newsletters.html>

MEMBERSHIP? JOIN TODAY!

Regular: \$85.00 /year

Youth: \$45.00 /year

Family: \$80/year

The Saskatoon Centre operates on a one-year revolving membership. You will be a member for the next 12 months no matter when in the year you join. If you do not want to join at this time, ask to get onto our FREE 3-month Temporary Membership list. You will receive regular mailings of our Saskatoon Skies newsletter and will be invited to participate in Centre activities. Members are encouraged to renew early to avoid disruption in publications. Renew through the National Office at <http://www.rasc.ca/join-us>

Benefits of Membership in the Saskatoon Centre

- knowledgeable & friendly amateur astronomers
- use of the Sleaford Observatory
- use of the U of S Observatory (after training)
- Saskatoon Skies Newsletter
- Observer's Handbook
- Journal of the RASC (electronic format)
- SkyNews Magazine (bimonthly)
- use of the Centre library
- borrow the Centre's Data Projector to give astronomy outreach presentations – contact Les Dickson at astrochem@sasktel.net
- rent the Centre's Telescopes <http://homepage.usask.ca/ges125/rasc/telescopes.html>
- discounts to Sky & Telescope Magazine*
- free, no-cost, no-obligation, 3-month temporary membership if you don't want to join right now!

*New subscription or renewal of Sky & Telescope? Send new info or renewal notice, plus credit card # to Norma Jensen, 128 – 4th Street East, Saskatoon, SK S7H 1H8, or email her at norj@sasktel.net.

U OF S OBSERVATORY

The U of S Observatory is open to the general public every Saturday of the year. Admission is free. The observatory is located on campus, one block north of the Wiggins Avenue and College Drive entrance. On clear nights, visitors may look through the vintage 6-inch and tour several displays. Current events are recorded on the Astronomy Information Line at 966-6429.

Observatory Hours:

January–February	7:30-9:30 pm
March	8:30-10:30 pm
April	9:30-11:30 pm
May–July	10:00-11:30 pm
August	9:30-11:30 pm
September	8:30-10:30 pm
October–December	7:30-9:30 pm

SASKATOON CENTRE'S MAIN OFFICERS:

President – Jim Goodridge, 306-370-8530

Vice-President – **to be filled**

Secretary – Tenho Tuomi, 306-858-2453

Treasurer – Norma Jensen, 306-244-7360

Bottle Drive &
Canadian Tire \$
By Jim Goodridge

If you cannot make it to a meeting but would like to contribute your Canadian Tire money please call me at 306-370-8530

Newsletter Editor – **to be filled**

Copy & Collate – Les & Ellen Dickson

Labels & Temps – Mark de Jong

Web Posting – Gord Sarty

Saskatoon Skies is published monthly by the Saskatoon Centre of the RASC. Distribution is approximately 100 copies per issue. Saskatoon Skies welcomes unsolicited articles, sketches, photographs, cartoons, and other astronomy or space science material. Submissions should be sent by e-mail to the editor in msword or text format. Images: .jpg please, no larger than 1 – 1.5 MB, sent by e-mail as attached files. **Deadline for submission of all articles for an upcoming issue is the first Friday of the month!**

A separate by-mail subscription to Saskatoon Skies is available for \$15.00 per year. Saskatoon Skies is also posted on our Saskatoon Centre homepage as a .pdf file and can be downloaded free-of-charge. Members may choose to receive the newsletter by regular mail or via the Internet. Articles may be reprinted from Saskatoon Skies without expressed permission (unless otherwise indicated), provided that proper source credit is given. Saskatoon Skies accepts commercial advertising. Members can advertise non-commercial items free of charge.

**LIGHT POLLUTION
ABATEMENT**
WEBSITE AT:
www.ras.sk.ca/lpc/lpc.htm

RASC CALENDAR OF EVENTS

Oct 17	Observer's Group at Sleaford	Larry Scott
Oct 19	RASC General Meeting	
Nov 7	Observer's Group at Sleaford	Larry Scott
Nov 16	RASC General Meeting	
Dec. 12	Observer's Group at Sleaford	Larry Scott
Dec 14	Annual Christmas Social	

For a complete list of club events, please check out: <http://www.usask.ca/rasc/activities.html>



October RASC General Meeting

for all members and guests
beginning at 8:00 PM
Room 175 Physics Bldg
University of Saskatchewan
on

Monday, October 19th, 2015

The Saskatoon Centre welcomes

RASC National Director

RANDY ATWOOD

Guest Speaker

Note: There will be an EXECUTIVE MEETING beginning at 7:00 PM

Minutes of the Sept Executive and General Meetings – *Tenho Tuomi*

The Executive meeting opened at 7 pm with 6 members plus visitors present.

Moved by Ron Waldron and Les Dickson that minutes of the June 15 meeting be accepted as circulated. Carried.

Committee Reports:

- President's Report by Jim Goodridge. Room 175 at the Physics building has been booked for meetings for the following dates: (2015) October 19, November 16, December 21; (2016) January 18, February 22, March 21, April 18, May 16, June 20.
- Treasurer's Report by Jim Gorkoff in Norma Jensen's absence. Year-end is September 30. Please send all expense invoices for the current year before that.
- Membership Report by Mark de Jong. Currently 74 members. This number has not varied by much over several years.
- Observing Co-ordinator Report. Six came to Sleaford on Saturday.
- Newsletter Report. Les Dickson will do the next two newsletters before the election in November.
- Sleaford Site Report. Mice have been found in the Roll Off and the University will not be using it any more. The RASC/University Sleaford committee will be asked for a reduction in our share of the utility fees if we take over and clean the Roll Off and mouse proof it.
- Events Report. The Beaver Creek public star night with Meewasin went well on Saturday with seven scopes available. This could become an annual event. Co-ordinator needed for the December potluck supper.
- SSSP Update by Les Dickson. 340 attended the 2015 SSSP. There were some problems with speakers cancelling. For next year, most of the speakers are already lined up, might be a new art display with the photography contest, and working on an internet payment option.
- Sask. Light Pollution Abatement Committee Report by Rick Huziak. Progress is being made in Saskatoon policy writing, Swift Current light pollution problems, and NE Swale light pollution monitoring.

Other Business:

- Errol Frazer-Harrison, our new telescope rental curator, reports difficulty in getting back the 6" Rich Field Telescope which has been out on loan to the same person for four years.
- A nominating committee was formed for the November executive elections. Les Dickson volunteered.
- Randy Attwood, our RASC Executive Director will be at the Regina Centre meeting on October 16 and at our Centre meeting on October 19.
- Les Dickson read an appeal by the Victoria Centre for fundraising \$10,000 so that they can reactivate school tours to the Dominion Astronomical Observatory.

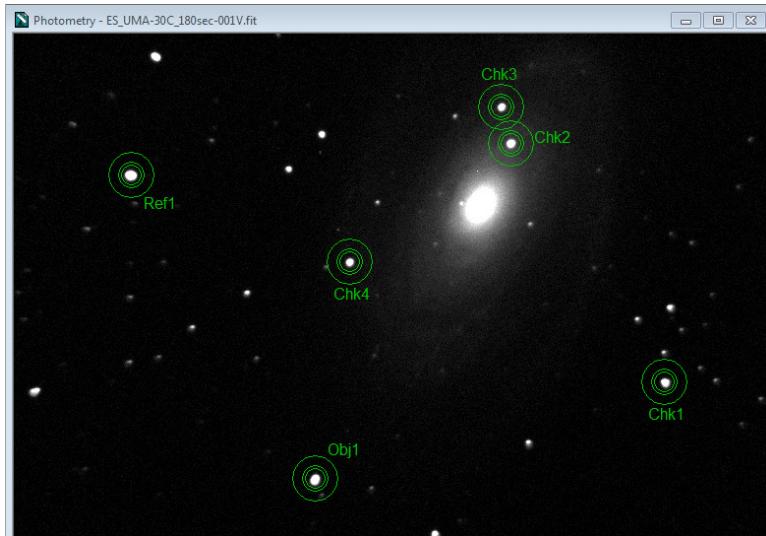
The Executive Meeting adjourned at 8 pm.

The General meeting opened at 8:25 following a coffee break.

Jim Goodridge gave a talk on Good Deep Sky Objects for Beginners, starting with Astronomy as a Hobby.

Science or Sensation (Pt. 2b) – Vance Petriew

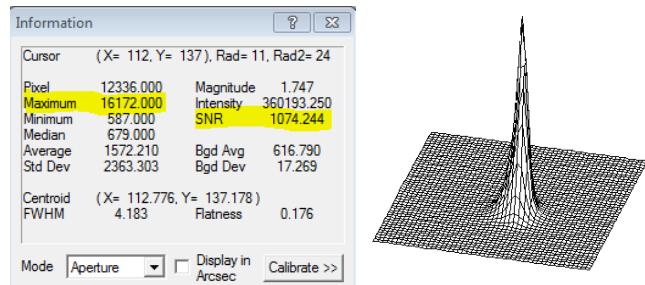
Editor's Note: Because of space limitations in last month's issue, the final part of Vance's article was divided into two parts – we are pleased to present the final part in the October Issue.



On my images, I use the Ref1 star as my measuring stick and its calibrated value is actually magnitude 10.511. Obj1 is the variable star, ES UMA, which I want to measure. I tagged a few other stars in the field as check stars (Chk1, Chk2, Chk3, and Chk4). I picked these to match other reference stars on the AAVSO chart because these stars are known to be of a constant brightness and will not change over time. This process of measuring the brightness of the stars in my image is called Photometry.

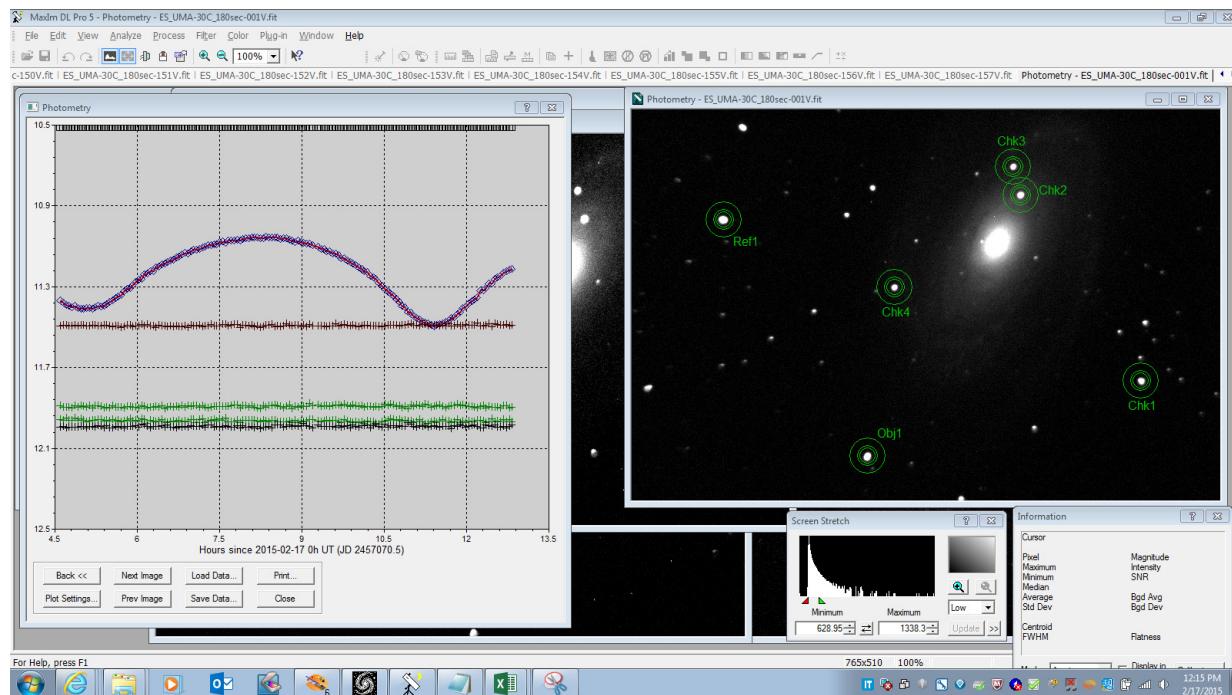
But before we do the actual measurements, let's back up a little bit and talk about exposure time. This is to explain point number 2 which I made earlier. From the AAVSO chart, I know which stars I want to measure so the next thing to do is figure out how long of an exposure I could go without having my pixel counts exceed 45000. To do so, I'll take a quick 10 or 30 second image and find out what the maximum pixel count is for the brightest of my tagged stars. Because I know my camera is linear, I can do some simple math to find my maximum exposure time. If the count in 10 seconds is 1000, then I know that my count will be 10,000 in 100 seconds. This also means that I could expose for 450 seconds before the star reaches my threshold of 45,000 counts.

So let's take a look at the counts in my M81 images. The brightest star that I'll be measuring is the 105 reference star. Below is a snapshot of the actual values in my 3-minute exposure. I also included a 3D profile of the reference star so you can see how the background sky is flat with the star poking up. You can also see that the star is not saturated because it does not have a flat top. Both of these are good!

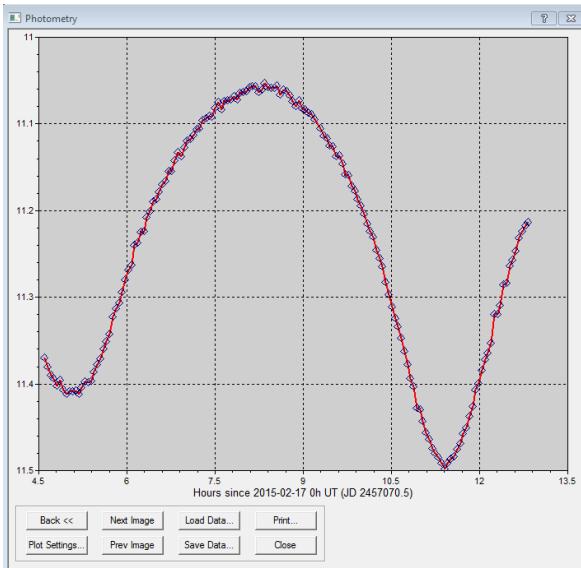


It appears that my maximum pixel value for the 105 reference star has a count of 16,172. This is about 1/3 or the way to my 45,000 limit so all is good. Simple math says I could bump up my exposures up to 8 or 9 minutes and still be safe. The second highlighted number I look at is the SNR which is just over 1000. For best results, the reference stars should be exposed so they have at least a Signal-to-Noise Ratio of 300. Some quick math tells me I could probably drop my exposures down to 1 minute for this star and still get good data. However, because the variable I'm measuring is fainter than the reference star, I really need to be looking at the SNR of my variable. If possible, set the exposure time so that the SNR of the variable star is above 100. In looking at the maximum pixel value in my images for ES UMA, I see the variable has a count of 12,000 at its brightest and 8100 at its faintest with an SNR of 275. Perfect!

Now let's do some photometry and see what the variable star is doing. Below is a screen shot showing the measured values of my tagged stars in each of the 157 images. It's immediately apparent that one star has a wavy line while the others are straight. The wavy line is indeed the variable star, ES UMA. The straight lines are my reference and check stars which do not change brightness.



When we take a closer look at the wavy line, we get the following graph. Each dot on the graph represents one image of 3 minutes in length. The cool part is that we can actually measure the variable's brightness accurately enough to detect the change every 3 minutes from exposure to exposure. You will also notice there is a little bit of scatter in the points. This is normal. The higher the SNR, the less the scatter will be (unless clouds decide to show up).



The next step is to save the data and submit these measurements into the AAVSO (American Association of Variable Star Observers). The AAVSO will gladly accept these measurements and store them in their database for anyone to use. Anyone can submit data; no membership required. The data that I submitted on this star is available through the AAVSO's Light Curve Generator (<http://www.aavso.org/data/lcg>). Just enter in ES UMA into the star field and plot the last 300 days of data to see my data long with everyone else's data (of which there is none for this star).

The Science can stop here if you wish or you can keep going. I kept going because there is more information that can be gathered from this set of images. One thing that is important when doing Science is to have an accurate time measurement. I set the time synchronization on my computer to automatically update from a Network Time Protocol server on the Internet every day. That way I know that my computer clock is accurate to within at least 1 second.

If we look at the plot, we can see that ES UMA makes two dips. The deeper dip is called the primary eclipse and the shallower dip is called the secondary eclipse. Because we have an accurate clock on the computer, we can get a good measurement of when these dips reach their bottom. This measurement is called the Time of Minimum (ToM). If these two stars are orbiting around each other and nothing is happening, they should beat like a clock and the ToM should be predictable for many years into the future with no change in the orbital period.

To find out when this star is predicted to be in its primary eclipse, we can check the Variable Star Index (VSX at <http://www.aavso.org/vsx/>). If you visit the website, do a search for ES UMA and then click on the Ephemeris button. This will give you the predicted eclipse time for this star in both Julian Date and Universal Time.

Looking at my plot, I can see that the secondary eclipse was around 5:00 UT or 11:00 pm CST. The primary eclipse happened around 11:30 UT, or 5:30 am CST. There is a way to accurately measure both ToM's but I will not cover that in this article. If we check the ephemeris (predicted times) for this star, VSX says that the primary eclipse should have happened at 5:04 UT. Hmmmm....that means we have a mystery to solve! It was the secondary eclipse that matched the prediction in the ephemeris, not the primary eclipse. Therefore the prediction is out by 1/2 a cycle.

Ephemeris for ES UMa (HJD/UT)	
2457070.711	17 Feb 2015 05:04
2457071.240	17 Feb 2015 17:45
2457071.769	18 Feb 2015 06:27
2457072.298	18 Feb 2015 19:09
2457072.827	19 Feb 2015 07:50
2457073.356	19 Feb 2015 20:32

There are three possible reasons why the ephemeris prediction does not match what was observed:

- 1) The prediction is out by 1/2 a cycle
- 2) The measured period of the star is inaccurate and needs to be adjusted
- 3) The period is changing over time.

The most likely reason is #1 which is probably a result of #2. But in order to find out, I browsed some online sources and discovered that the real reason is #1. A quick email to the VSX administrators solved this mystery. But what would it mean if #3 was the correct answer? Why would the period of two stars orbiting around each other change?

Some binary stars orbit around each other so closely that their surfaces can touch and astronomers call these systems, Contact Binaries. Mass can transfer across from one star to the other causing a change in the center of mass. This changes the Time of Minimum (ToM) which shows up as a change in the orbital period over time. ES UMA is exhibiting a bit of this behavior but it will probably take another 10+ years of good timings to confirm.

There is a scientific paper on this star which you can read by typing this into a search engine: 2010ASPC..424..198K

In the article, the authors have solved some of the parameters of this binary star system and come up with the following light curve and model. If you compare my light curve to one below, the shapes match exactly although I like my curve because it is much cleaner. In order to explain the shape of the light curve, the authors had to add a cool star spot to make their model match the observed light curve.

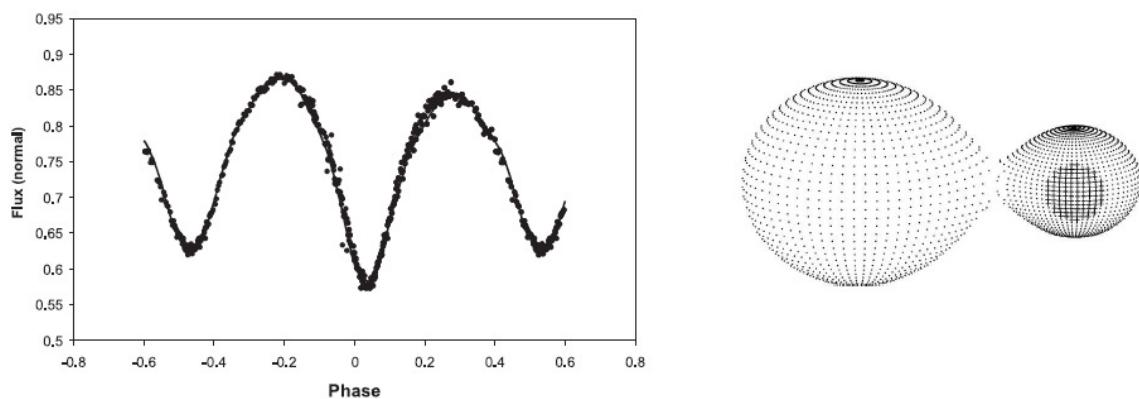


Figure 1.: *Left:* Light curve solution. *Right:* System's configuration.

The last item of Science that I performed on this data was to use a blink comparator and compare my M81 image to that of the Digital Sky Survey. The purpose of this was to look to see if there were any new supernova that have recently gone off in this galaxy. Blinking the two images together showed nothing different so there are no supernova in M81 this night.

There is definitely Science that can be done from your backyard no matter how light polluted it is. Bit by bit, the professionals are contributing to the greater knowledge of astronomy with each imaging session they do and each scientific paper they write. Amateur astronomers have the ability to do the same thing. Astronomy is one of the few sciences where both amateurs and professionals collaborate together to unravel the mysteries of the universe. The AAVSO is one such organization that brings amateurs and professionals together to study variable stars.

Personally, I have chosen to do Science because I find it easier and less tasking on the equipment and therefore less expensive to do. I also think that doing Science is more off the beaten path than what most amateurs do which is another reason why I find Science more interesting and rewarding. However, it's also fun to do some Sensation once in a while and I really enjoyed creating the 7.2 hour exposure of M81. So whether you want to do Science or Sensation or both, I wish you the best. If you have any questions, feel free to contact me: vance.petriew@sasktel.net

Observer's Group Report – *Larry Scott*

Although I missed it, there were some exceptional auroral displays during the week prior to the September Observer's Group. Several members reported some of the best aurora they had ever seen.

On Friday, Sept. 11th we had four members at Sleaford on a beautiful fall evening. Sky conditions were good with a little aurora washing out the sky at times. The following night found eleven members and guests out for another great evening. The temperature that Saturday reached 29 °C and conditions were clear and dry with only a little grain dust in the air to brighten the sky. I had some guests out and had a very enjoyable time touring them around the sky. Saturn was low in the sky after sunset but was a big hit nevertheless. After dark we did a tour of various showpiece deep sky objects with the telescope and naked eye observing of meteors, satellites, and our Milky Way.

September closed with a beautiful lunar eclipse on the evening of the 27th. We had clear skies and people were out all over the city to enjoy it.

Next Observer's Group was scheduled for October 17th but that date has been chosen for the Open House. As I don't like to schedule anything on the long weekend, we'll just be catch as we can for observing. If there's a clear night between October 5th and 19th, I may well be found at Sleaford. Hope to see some of you there.

“Blood” Moon at Wanuskewin – *Ron Waldron*

“Blood” Moon Attracts 300 to Wanuskewin

When Wanuskewin Heritage Park invited me to be the guest speaker highlighting the last total lunar eclipse until 2018, I began to prepare and so did they. Nothing in our preparations, however, prepared us for the number of visitors that came. Sunday, September 27th was clear and warm and the numbers on their Facebook page indicated that 500 people said they were coming. They quickly switched the speaking area to the largest room they had and I arrived at 6:15 PM to be ready for the 7 PM talk. I began speaking right at 7 PM even though people were still arriving because I knew the moon was rising at 7:05 PM and the edge of the umbra would start covering the moon just minutes after that. After the 20 minute talk, the now standing room only crowd followed me outside where I began photographing the waxing partial phases of the eclipse and they settled in with blankets and lawn chairs to view. At 8:30 PM after I took a few photos of totality, I invited the crowd to view the eclipsed moon through my 80mm Antares refractor. The line formed and continued till totality ended at around 10 PM. The night was truly amazing. The organizers told me it was the largest evening crowd in the history of the Park. They are anxious to know when the next special event in the sky is so they can try to have crowds like that again.

It just goes to show that proper advertising combined with excellent sky conditions and a noteworthy event in the night sky can produce results.

Observing Clubs and Certificates

Join the Club! Observe all 110 Messier, 110 Finest NGC, 400 Herschel I or II, 140 Lunar, 154 Sky Gems or 35 Binocular objects, or Explore the Universe and earn great OBSERVING CERTIFICATES!

MESSIER CLUB

Certified at 110 Objects:

*R. Huziak, G. Sarty, S. Alexander,
S. Ferguson, D. Jeffrey, D.
Chatfield, B. Christie, K.
Noesgaard,
M. Stephens, B. Hydomako, T.
Tuomi, L. Scott, G. Charpentier,
B. Johnson, M. Clancy, L.
Dickson, B. Burlingham, K.
Houston, Norma Jensen*

Ron Waldron	108
Wade Selvig	75
Garry Stone	57
Bernice Friesen	45
Wayne	43
Schlakohl	
Barb Wright	40
Ellen Dickson	34
Jeff Swick	24
Graham	9
Hartridge	

Chatfield BINOCULAR CERTIFICATE

Certified at 35 to 40 Objects:

*M. Stephens, T. Tuomi, M.
Clancy,
R. Huziak, K. Maher*

Jim Goodridge	12
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FINEST NGC CLUB

Certified at 110 Objects:

*R. Huziak, D. Jeffrey, G. Sarty,
D. Chatfield, T. Tuomi*

Larry Scott	110
Scott Alexander	97
Norma Jensen	83
Sandy Ferguson	23
Kathleen Houston	23
George	13
Charpentier	
Mike Clancy	7

EXPLORE the UNIVERSE

Certified at 55 to 110 Objects:

*M. Clancy, T. Tuomi, K. Maher,
B. Gratias*

Wayne	55
Schlakohl	
Jim Goodridge	35
Sharon Dice	31

Isabel Williamson Lunar

Observing Certificate

Certified at 140 Objects:

T. Tuomi

Norma Jensen	140
Jeff Swick	29

HERSCHEL 400 CLUB

Certified at 400 Objects:

*D. Jeffrey, R. Huziak, D.
Chatfield, T. Tuomi*

Gordon Sarty	251
Scott Alexander	117
Sandy Ferguson	18
Larry Scott	20

HERSCHEL 400-II CLUB

Darrell	400
Chatfield	
Tenho Tuomi	398
Rick Huziak	246

LEVY DEEP-SKY GEMS

Certified at 154 Objects:

Tenho Tuomi	150
Darrell	70
Chatfield	



The Messier, Finest NGC and David Levy's Deep-Sky Gems lists can be found in the *Observer's Handbook*.

The Explore the Universe list is available on the National website.

On-line Messier and Finest NGC lists, charts and logbooks: <http://www.rasc.ca/observing>

On-line Herschel 400 List: <http://www.astroleague.org/al/obsclubs/herschel/hers400.html>

Binocular List is at: http://homepage.usask.ca/%7Eges125/rasc/Chatfield_Binocular_List.pdf

"Isabel Williamson Lunar Observing Program Guide:

<http://www.rasc.ca/observing/williamson-lunar-observing-certificate>

Program details can be found at: <http://www.rasc.ca/williamson/index.htm>