

Saskatoon Skies

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

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August 2019



Wow! A nine-shot panorama of noctilucent clouds and aurora from early July. Taken by Colin Chatfield.



Saskatoon Centre

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To view *Saskatoon Skies* digitally,
see our website:

<http://www.usask.ca/rasc/newsletters.html>

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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. 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)
- borrow the Centre's Data Projector to give astronomy outreach presentations – contact Les Dickson at astrochem@sasktel.net
- rent the Centre's Telescopes
<https://www.usask.ca/rasc/telescopes.html>
- discounts to Sky & Telescope Magazine*
- use of the Centre library

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 306-966-6429.

Observatory Hours:

January – February	7:30 – 9:30 pm
March	8:00 – 10:30 pm
April – August	9:15 – 11:45 pm
September	8:30 – 11:00 pm
October – December	7:00 – 9:30 pm

SASKATOON CENTRE'S MAIN OFFICERS:

President – Daryl Janzen
Vice-President – Jim Goodridge
Secretary – Marcel Müller-Goldkuhle
Treasurer – Norma Jensen
National Council Rep – Chris Martin

Bottle Drive &
Canadian Tire \$
By Les Dickson

If you cannot attend a meeting but would like to donate your Canadian Tire money please email me at astrochem@sasktel.net

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

Newsletter Editor – Kris Ohnander, Colin Chatfield

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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 at krisohn@gmail.com in msword or text format. Images: any format, less than 30MB, 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. Please email the editor at krisohn@gmail.com for rates. Members can advertise non-commercial items free of charge.

RASC CALENDAR OF EVENTS

August 12	Perseid Meteor Shower	Info Online
August 28 – Sept 2	Saskatchewan Summer Star Party	Rick Huziak
September 16	RASC General Meeting	Daryl Janzen
September 28	Observers Group at Sleaford	Larry Scott
October 14	RASC General Meeting	Daryl Janzen

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

September RASC General Meeting

for all members and guests, Room 175,

Physics Bldg. University of Saskatchewan

Join us on September 16, 2019 at 8:00PM

Presentation:

The 2019 General Assembly in Toronto – Les Dickson

Les Dickson will profile the well-attended 2019 RASC GA at York University.

This was a well-organized and very informative assembly, run jointly with the Royal Astronomical Society of Canada (RASC) and the American Association of Variable Star Observers (AAVSO).

Note: There will be an executive meeting at 7:00pm.

Last Call for the 2019 Saskatchewan Summer Star Party ... and we need your help!

– Rick Huziak

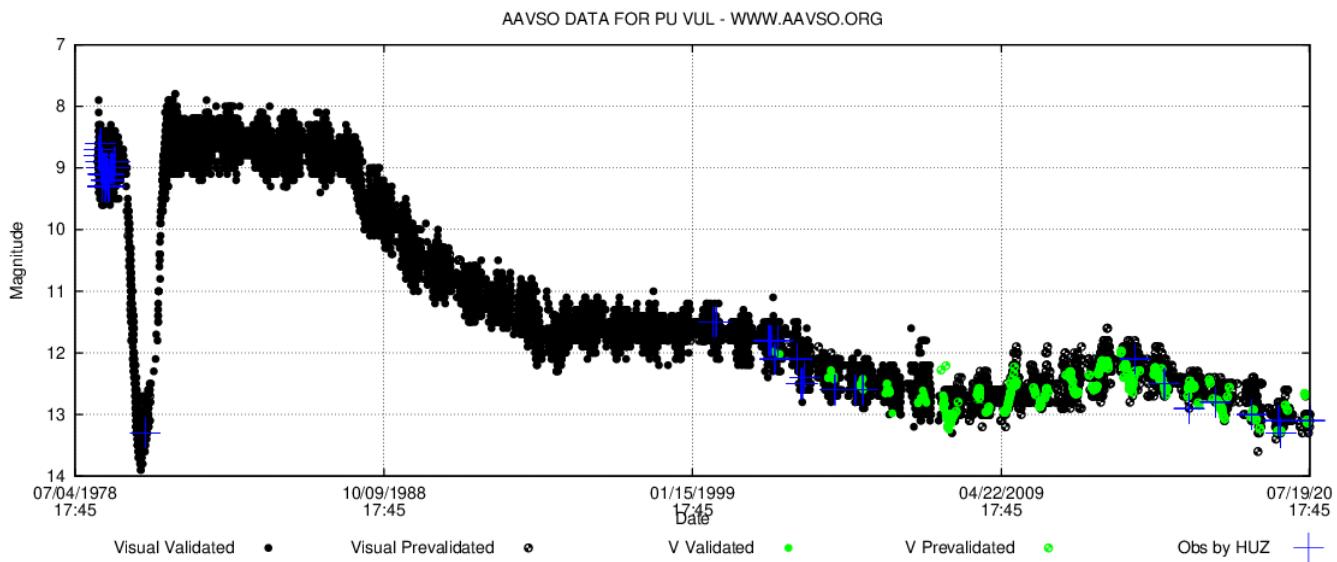
The 23rd edition of the Saskatchewan Summer Star Party is less than a month away. If you haven't signed up yet, you might want to do so. You would be observing from an amazing sky with 320 of your closest new friends. We are just about ready to go, with all speakers signed up and all events (mostly) planned. A full description of the SSSP is on our website:

<https://sssp.saskatoon.rasc.ca/>

As I have also asked in the past, volunteering to help for a few hours at the star party sure helps us out. The star party requires 50 volunteers to cover all the events. If you haven't already signed up, please let me or Greg Fusick know that you will be willing to help. For most volunteer jobs, we limit work to just 2-hour shifts so that you will have a lot of time over the week to enjoy the star party events.

The Amazing PU Vulpeculae

— Rick Huziak



On August 26th under the great skies of Grasslands National Park Dark-sky Preserve, I decided that I would make a brightness estimate of variable star PU Vulpeculae, also known as Nova Vul 1979. I've observed this star over 130 times over the years (blue crosses), making my first observations just after the nova was discovered in April 1979. That was just two years after I joined the RASC. One of my first memories of the RASC meetings was Gordon Patterson photographing the nova on Tri-X film and printing the images in his darkroom.

The nova itself wasn't all that spectacular for its brightness, reaching only magnitude 8.3, too dim for naked eye viewing, but its evolution over the next few years presented a mystery that is still only partly solved. Even now, my estimate on July 26, 2019 was at 13.1 magnitude. Over forty years, this erupting star has faded (cooled) only two-thirds of the way back to its quiescent (pre-outburst) magnitude of 15.1, though this is the brightness of the system of stars described below, and not of the outbursting white dwarf companion itself.

Nova Vul 1979 did, however, hold several surprises right off the bat. The first was that the star rose slowly to maximum after discovery and then oscillated from 8.3 to 9.3 magnitude over a long period of 268 days, but then didn't fade from the average magnitude of 8.7 at all for the first year! The star was thus classified as a "slow nova", and the star was recognized as basically unique. Then, after a year, the star quickly faded to nearly 14th magnitude, and even more surprisingly, after almost two years recovered back to a little more than the previous brightness, now oscillating between 8.1 and 9.1 magnitude for the next 6 years.

Novae generally work like this, though there are a few varieties: gas from a red giant or sub-giant that has swollen up beyond the Roche lobe limit spills gas into an accretion disk around a companion white dwarf. That gas heats up from rotational friction and some of it falls onto (or near) the surface of white dwarf. Once the friction and the accumulated mass heats the gas up to a critical temperature, the gas ignites into a runaway thermo-nuclear reaction that then ejects some of the hot gas from the white dwarf. This whole event can brighten the star system by 30 times to 100 times, depending on how much gas is ejected, and at what temperature and velocity is reached. As the gas cools, the nova fades, and at some point, the gas condenses to dust, which obscures the star for a bit until the dust disperses.

And so, the two-year fade was thought to be due to the formation of dust, but the data didn't really fit. There was no high ejection velocity, a surprisingly low 70 km/s, found from professional spectral measurements and X-ray observations. And a two-year fade is unreasonably long for dust condensation and dispersion. It was also determined through patrol plates that the star had actually begun its eruption in 1977 – two years before its official discovery by Japanese amateur astronomers.

And so, the mystery sat with the nova still bright for 6 more years. In 1987, the star finally started to fade, still oscillating as slightly different faces from the accretion disk are shown through precession. Then in 1993, the fading suddenly jumped downward by half a magnitude and then two years later, jumped back upward. Something strange has happened.

It was quickly realized that an eclipse of the nova had occurred by the red giant star, since some spectral signatures of the nova ceased for the two year duration. Furthermore, it was realized that the initial dip a year after the outburst was not a dust event, but the first observed eclipse! A period of $13.42 \pm .27$ years was quickly established as the orbital period for the star system. The width of the eclipse also established that that red giant star was a whopping 82 times the diameter of the Sun. So why was the second eclipse so shallow when compared to the first eclipse?

With the abnormally slow ejection velocity in the initial outburst, material expanding from the white dwarf did not have time to exceed the 82 solar diameters before it was partially eclipsed, and so the system dimmed to almost the brightness of the red giant alone, though some of the nova material edges shone past the red giant. By the second eclipse, thirteen years later, the expanding fireball had exceeded the diameter of the red giant, and so the obscuration was only partial.

In the light curve, a third eclipse happened in 2007, but its character is different yet, manifesting itself as a long shallow depression in the otherwise slow fade to near 13th magnitude, and a recovery to nearly 12th magnitude in 2013, followed by another fading immediately thereafter. Clearly now, the expanding hot gas has engulfed the red giant. In about 2007, CCD observations became commonplace, and the 268 day precession period (green data) becomes obvious.

If things continue as is, the fourth mid-eclipse should occur in 2020 at about magnitude 13.3 and a slight recovery should occur afterward, and this should continue until all gas is burned off over the next 40 years or so, and the accretion build-up process on the white dwarf starts anew. What is clearly seen

from the general light curve is that the amplitude of the oscillations is decreasing as the accretion disc cools and dims. The 13.42-year orbital period of the system also stands out clearly.

How do we know all of this? The visual light curve and alerts to the professional astronomers comes from the dedicated work of 306 observers who have made 29,039 observations of this star over forty years! Observers are amateur astronomers from the Association Francaise des Observateurs d'Etoiles Variables (AFOEV) and American Association of Variable Star Observers (AAVSO), and the observations were made mostly with eyeballs looking through small telescopes. Imagine following a star for 40 years! It is not only discovery that is important; the follow-up observations are incredibly important. If you want to look at the star with the same (Newtonian-view) chart that I have been using, go to www.aavso.org/vsp/ and request Chart ID 14817DY. You can also make your own custom chart at this website for your specific telescope. If you view this star, remember to estimate the brightness and submit it to the AAVSO like 306 others have done. The accompanying light curve covers 15000 days (~40 years). Black dots are visual observations and green dots are CCD observations.

If you want to envision what this star system would look like, I am reminded of the star Mira. Interferometric observations show that Mira is very much the same type of widely separated system, though Mira's accreting white dwarf star has not erupted. See: <https://cosmicpursuits.com/2297/mira-wonderful-star/>

Call for Meeting Speakers for the 2019-2020 Meeting Season – *Rick Huziak*

This is a general call for both minor and major speakers for our 2019 - 2020 RASC General meetings. In the 2018 – 2019 year we managed to fill all slots, but this year, we have only the September meeting main speaker booked. Main talks should be 30 – 45 minutes in length, and minor talks 5 to 15 minutes. We like to have one minor, one major talk per meeting, and include the short “What’s in the Sky this Month” talk each month.

Throughout the year, and often during the summer, members may have made interesting observations, taken astrophotos or even visited astronomical facilities during their vacation travels. All of this, or just your favourite space or astronomy topic, is of interest to our membership. So please consider giving the club a talk about your adventures. We will also be checking into University of Saskatchewan and associated speakers throughout the year.

If you would like to book a talk, please contact Rick Huziak rickhuziak@shaw.ca. If you don’t want to talk, Kris Ohnander krisohn@gmail.ca always needs newsletter content.

See everyone at the SSSP August 28 – September 2 and then again at the September 16 General meeting!

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. Chatfield, T.
Tuomi, L. Scott, G. Charpentier,
B. Johnson, L. Dickson, B.
Burlingham, Norma Jensen

Ron Waldron	108
Marcel Müller-	94
Goldkuhle	
Wade Selvig	75
Wayne	43
Schlakohl	
Ellen Dickson	34
Graham	9
Hartridge	

Chatfield BINOCULAR CERTIFICATE

Certified at 35 to 40 Objects:

T. Tuomi, R. Huziak

Jim Goodridge	12
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FINEST NGC CLUB

Certified at 110 Objects:

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

Larry Scott	110
Scott Alexander	97
Norma Jensen	83
Sandy Ferguson	23
George	13
Charpentier	

EXPLORE the UNIVERSE

Certified at 55 to 110 Objects:

T. Tuomi,

Wayne	55
Schlakohl	
Jim Goodridge	35

Isabel Williamson Lunar Observing Certificate

Certified at 140 Objects:

T. Tuomi, N. Jensen

HERSCHEL 400 CLUB

Certified at 400 Objects:

R. Huziak, D. Chatfield, T. Tuomi

Gordon Sarty	251
Scott Alexander	117
Larry Scott	45
Sandy Ferguson	18

HERSCHEL 400-II CLUB

Darrell	400
Chatfield	
Tenho Tuomi	378
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.astroloegue.org/al/obsclubs/herschel/hers400.html>

Binocular List is at: https://www.usask.ca/rasc/Chatfield_Binocular_List.pdf

"Isabel Williamson Lunar Observing Program Guide:

<http://www.rasc.ca/sites/default/files/TWLOP2015.pdf>

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