

Astronomy Roundup 2007

Schedule and List of Abstracts

Version: June 15, 2007

## Schedule of Oral Paper Sessions

### Paper Session 1, Friday Afternoon, June 29<sup>th</sup>, 2007

Session 1: Variable Stars – I. Location: MacEwan Centre Hall A		
14:00 – 14:40	Jaymie Matthews	One Little Telescope, So Many Stars
14:40 – 15:10	David Turner	Research Breakthroughs from Pro-Am Collaborations
15:10 – 15:40	Coffee Break	
15:40 – 16:00	Daniel Majaess	Stellar Discoveries from Nova Scotia
16:00 – 16:20	Jerry Horne	An Examination of EV Lyrae
16:20 – 16:40	Gary Billings	Period change behaviour of the Algol-type eclipsing binary LS Persei
16:40 – 17:00	Poster Presenters	“1 minute, 2 slides” – Introductions to the poster papers.

### Paper Sessions 2 and 3, Saturday Morning, June 30<sup>th</sup>, 2007

	Session 2: Planets, SSSBs, and Meteorites Location: MacEwan Centre Hall A		Session 3: Variable Stars – II Location: Casio	
8:30 – 8:55	Julius Benton	Venus: Programs and Recent Observations	John Percy, et al.	Long-Term Photometric Variability of 13 Bright Pulsating Red Giants
8:55 – 9:15	Richard Schmude	Jupiter	Robert Dukes, et al.	Slowly Pulsating B Stars: A Challenge for Photometrists
9:15 – 9:40	Dr. Sanjay Limaye	Amateur Contributions to Planetary Space Missions	Gordon Sarty et al.	High Mass X-Ray Binaries for Small Telescopes
9:40-10:00	Julius Benton	Saturn: Programs and Recent Observations	Michael Koppelman et al.	A Multicolor Photometric and Fourier Study of New Field RR Lyrae Variables
10:00 – 10:30	Coffee break		Coffee break	
10:30 – 10:50	Richard Schmude	Remote Planets	Tim Crawford, et al.	Detection of the First Observed Outburst of DW Cancri
10:50 – 11:10	Mike Reynolds	Introduction to Meteoritics	Eugene Milone et al.	Infrared passbands for precise photometry of variable stars by amateur and professional astronomers
11:10 – 11:30	Michael Wilson	The Ironstone (Iron Creek) Meteorite, Alberta: was it a recent fall?	Richard Huziak	Suspected Variables in AAVSO Star Fields
11:30 – 11:50	Andrew Lowe	The Asteroid (117572) Hutsebaut -- Discovery and Orbit Improvement With Archival Images	Vance Petriew et al.	The AAVSO standard star database (VSD) and the variable star plotter (VSP)

Paper Sessions 4 and 5, Sunday Morning, July 1<sup>st</sup>, 2007

	Session 4A: Satellites and Occultations Location: MacEwan Centre Hall A		Session 5A: Education and Outreach Location: Casio	
9:00 – 9:30	John Westfall	Three Decades of Jupiter Satellite Eclipses	Pebble Richwine	Teaching Science using Authentic Research on Variable Stars
9:30 – 9:50	Alister Ling	Measuring Asteroids Shapes from a Backyard	Leslie Harvey	Educational Presentations for Sharing Throughout the Society
9:50 – 10:10	Guy Nason	Catching a Shadow: How Backyard Astronomers Improved Our Knowledge of Asteroid (25) Phocaea	Robert Dick	Defining a Great Sky (Defining Dark Sky Reserves and Preserves)
10:10 – 10:30	Tony George	Observation of an extremely short stellar occultation by asteroid (11072) Hiraoka	Bob King	What is a Dark Sky Preserve?
10:30 – 11:00	Coffee Break		Coffee Break	
	Session 4B: Telescopes and Observatories Location: MacEwan Centre Hall A		Session 5B: Looking at the Sky Location: Casio	
11:00 – 11:20	Murray Paulson	Optical Throughput Testing: The Good the Bad and the Ugly	Paul Gray	Dark Nebulae: Observations of the Dark Side
11:20 – 11:40	Robert Dick, et al.	Aerodynamic Studies of Observatory Domes (Dorothy's House?)	Alister Ling	Glasshenge: Lunar/Solar Alignments with Skyscrapers
11:40 – 12:00	David Lane	Automated Variable Star Observing and Photometric Processing at the Abbey Ridge Observatory	Frank Dempsey	Constellations and Skyclore of Native North Americans
12:00 – 12:30	Craig Breckenridge	The CGRT Robotic Telescope Project		

# Abstracts of Oral Papers

Paper Session 1: Variable Stars - I, Friday Afternoon, June 29<sup>th</sup> 2007

Friday, 14:00 – 14:40, MacEwan Centre Hall A

## **One Little Telescope, So Many Stars**

Jaymie Matthews (University of British Columbia)

This meeting coincides with a Canadian space astronomy milestone, marking four years that the MOST space telescope has been in orbit. In that time, MOST has more than lived up to its acronym by making major discoveries through ultraprecise photometry of the Microvariability and Oscillations of STars. Hundreds of stars. MOST has discovered new classes of pulsating stars among the hot massive B stars and nonradial oscillations in red giants which challenge theoretical expectations. By monitoring the acoustic beats of pre-main sequence stars, MOST is literally performing "ultrasound" on stellar embryos to test our models of star formation. MOST has measured the surface rotation profile of a young solar-type star, giving insights into what the magnetic field and spot activity of our own Sun may have been like when life first appeared on Earth. MOST asteroseismology of magnetic stars has resulted in the first direct tests of how magnetic fields interact with the stellar plasma, making such stars as magnetohydrodynamic laboratories. MOST measurements of the optical eclipse of an extrasolar planet lead to the albedo of a "hot Jupiter" and an understanding of its atmosphere, clouds, and even weather. MOST has begun the search for Earth-mass and -size planets around other stars. Not bad for a mission that was intended to last one year and study ten stars.

Friday, 14:40 – 15:10, MacEwan Centre Hall A

## **Research Breakthroughs from Pro-Am Collaborations**

David Turner (RASC Halifax Centre and Saint Mary's University)

Professional-amateur collaborations are proving to be an exciting means of pursuing vital observing projects in areas where regular professional monitoring has declined or disappeared in recent decades. Such is the case for RT Aur, a bright Cepheid well established from a century of observation to exhibit a steady decrease in pulsation period. That is, until observations by AAVSO and Belarus observers revealed that it is actually undergoing a steady period increase superposed upon a sinusoidal trend! Or the case of a newly identified Cepheid variable with a smaller light amplitude than Polaris (!), studied with the aid of regular monitoring from RASCer Dave Lane's automated backyard observatory. Other examples include an eclipsing system that is not what it was long thought to be, and other cases of an ongoing nature. In an era where large-scale surveys are dominating fields once covered by dozens of individual observers, there is a growing need for links with keen observers of every stripe to fill the "discovery void" occasioned by the benign neglect of professionals.

Friday, 15:40 – 16:00, MacEwan Centre Hall A

## **Trumpeting the Success of the Abbey Ridge Observatory, Stellar Discoveries from Nova Scotia**

Daniel Majaess (RASC Halifax Centre and Saint Mary's University)

The detection of Canada's second and third supernova (SN 2005ea & 2005b, P. Gray and D. Lane) from the Abbey Ridge Observatory provided the motivation to expand the facility's functionality and develop a program of photometric monitoring. Our original aim was to investigate small-amplitude s-Cepheids which may offer new insight into the Polaris saga (Turner et al., 2005), however the campaign quickly expanded to also include: fostering light curves for new Cepheid candidates and those exhibiting exotic changes in period; variability studies of open clusters; modeling binary systems; and the fortuitous discovery of several new and exciting variable stars still undergoing classification from spectra taken during a recent visit to the DAO. Presented here are results obtained from differential aperture photometry which attest to the usefulness of small-telescopes (d~0.28cm) in determining important stellar parameters from light-curves, O-C analyses, and spectral energy distributions.

Friday, 16:00 – 16:20, MacEwan Centre Hall A

## **An Examination of EV Lyrae**

Jerry Horne (AAVSO)

Differential photometry of the previously little-observed EV Lyrae is presented and analyzed, from the 2006 observing season. This study utilized a 25cm SCT instrument to observe multiple orbital cycles and obtain B, V, and I band photometry. This allowed the development of a complete light curve of the system and the associated period and epoch. Visual band photometric observations were fit to a binary star model light curve using a commercially available modeling program. Stellar mass, radii, stellar type, and effective temperature have been derived for the primary and secondary stars in addition to the inclination of the semi-major axis.

Friday, 16:20 – 16:40, MacEwan Centre Hall A

## **Period change behaviour of the Algol-type eclipsing binary LS Persei**

Gary Billings (AAVSO and RASC Calgary Centre)

LS Persei is an Algol-type eclipsing binary, known to exhibit period change due to mass loss or transfer. Timings of its minima have been extended back to 1892 by archival observations in the Harvard College Observatory Photographic Plate Collection, and forward to 2007 by CCD observations. Over this interval, LS Per has undergone significant period decrease ( $\Delta P/P = -2.6 \times 10^{-4}$ ,  $dP/dt = -2.0 \times 10^{-8}$ ). Small period changes are hard to document due to the relatively large uncertainty of minima timings from plates and visual observations, but recent, higher precision, CCD timings establish at least one small period increase ( $\Delta P/P = +1.5 \times 10^{-5}$ ). The magnitude of this change, and the spectral type of the system, are compatible with the Applegate mechanism of periodic changes in the oblateness of the star which change the orbital period of the system. The ease with which high-precision minima timings can be obtained with a small telescope and CCD camera will allow early detection and close monitoring of future period changes.

Friday, 16:40 – 17:00, MacEwan Centre Hall A

## **One minute, two slides – Introduction to the poster presentations**

Poster Presenters

Quick overviews of each of the poster papers.

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## Paper Sessions 2 and 3, Saturday Morning, June 30<sup>th</sup> 2007

Session 2: Planets, SSSBs, Meteorites  
Room: MacEwan Centre Hall A

Session 3: Variable Stars - II  
Room: Casio

Saturday 8:30 – 8:55

### **Venus: Programs and Recent Observations**

Julius L. Benton, Jr., A.L.P.O. Venus Section Coordinator

Venus is an inferior planet, meaning that it has a smaller interior orbit to that of the Earth, and it exhibits phases just like the Moon. Because Venus is comparatively near the Sun, it is characteristically very bright, and the high albedo produces an excessive amount of glare. The rather faint and elusive markings on the disk of Venus, normally of very low contrast, become difficult to see as a result. Considerable controversy exists over the true nature of these dusky amorphous or somewhat streaky atmospheric features reported over the years by visual observers. It is not at all unusual for two observers, working on the same date with comparable instrumentation, to see striking dissimilar atmospheric phenomena on the planet, which means that simultaneous observations by independent observers are extremely valuable. This report summarizes some of the most recent results of visual observations and digital imaging during the 2006-07 Eastern (Evening) Apparition of Venus. Long-established categories of features in the atmosphere of Venus, including cusps, cusp-caps, and cusp-bands, seen or suspected at visual wavelengths in integrated light and with color filters, are cited. In addition, sample images captured at visual, ultraviolet (UV), and infrared (IR) wavelengths during the apparition are included. Terminator irregularities and the apparent phase of the planet are discussed, as well results from continued monitoring of the dark hemisphere of Venus for the enigmatic Ashen Light, including attempts to image the dark side of Venus in the near-IR by amateur astronomers.

Saturday 8:55 – 9:15

### **Jupiter**

Richard Schmude, Jr., A.L.P.O. Jupiter Section Coordinator

Jupiter has developed some unique features in early 2007 including a festoon on the South Temperate Belt and some dark barges in the South Equatorial Belt. Some of the dark barges have a reddish color. I would like to discuss these features along with long-term changes in the width and latitude of the North Equatorial Belt.

Saturday 8:30 – 8:55

### **Long-Term Photometric Variability of 13 Bright Pulsating Red Giants**

John R. Percy and Cristina O. Nasui (University of Toronto), Gregory W. Henry (Tennessee State University)

Red giant stars cooler than 4000 K are unstable to pulsation; pulsating red giants make up 10 per cent of all the bright stars. We have merged long-term (typically 20 years or more) photoelectric V photometry of 13 bright pulsating red giants (TV Psc, EG And, RZ Ari, eta Gem, V614 Mon, RS Cnc, VY UMa, FS Com, SW Vir, R Lyr, EU Del, V1070 Cyg, and W Cyg), from a robotic telescope, and from the photoelectric photometry program of the American Association of Variable Star Observers (AAVSO), and analyzed each merged dataset using Fourier and self-correlation techniques. Several of the stars show two or more pulsation periods, and we have derived improved values of these. We have also derived improved values of the enigmatic long secondary periods which are present in several of the stars, and whose cause is unknown. Most of the stars also show very slow, small variations in amplitude and mean magnitude on time scales of thousands of days, whose cause is also unknown. We will also discuss, briefly, the nature and value of this project as an undergraduate research experience.

Saturday, 8:55 – 9:15

### **Slowly Pulsating B Stars: A Challenge for Photometrists**

Robert J. Dukes, Jr., Laney Mills, and Melissa Sims (Department of Physics and Astronomy, The College of Charleston)

Slowly Pulsating B Stars (SPB's), which are mid- to late-B stars, are some of the most difficult of the bright pulsating variables to observe, are some in the most need of observation, and are some which would benefit greatly

Saturday 9:15 – 9:40

## **Amateur Contributions to Planetary Space Missions**

Sanjay Limaye, University of Wisconsin - Madison

Recent improvements in skills and techniques employed by amateur astronomers are making their careful observations of planets such as Venus and Jupiter useful for scientific purposes and for supporting the planetary space missions. At present, imaging observations of Venus and Jupiter are expected to be particularly useful. Photometric observations of Uranus and Neptune are also useful to monitor long term changes on those planets. At present Venus Express and New Horizons are observing Venus and Jupiter respectively. In 2011, Juno, NASA's second New Frontiers mission will be launched to orbit Jupiter and investigate its deep atmosphere, magnetosphere and interior structure. The objectives of these missions will be presented, and as well as how amateur images are useful. Photometry of Uranus and Neptune will also be useful if consistent and careful observations are feasible over a long period.

Saturday 9:40 – 10:00

## **Saturn: Programs and Recent Observations**

Julius L. Benton, Jr., A.L.P.O. Saturn Section Coordinator

With its truly magnificent rings, the planet Saturn exhibits many features that invite well-organized visual observations and imaging projects by amateur astronomers. Using instruments of moderate aperture in good seeing conditions, a series of bright zones and darker belts can be seen extending across the globe of Saturn roughly parallel to the equator, as on Jupiter, and the rings are subdivided into three main components, the outer two separated by Cassini's division. Although Saturn requires about twice the magnification needed for studies of Jupiter, the planet is far from being a dull and unchanging world, and remarkable detail in the rings and on the globe is routinely revealed by amateurs who routinely image the planet using webcams and CCDs. A brief compilation of results gleaned from over half a century of ALPO studies of Saturn are cited, and a summary is given of current observing programs, including a continued appeal for more simultaneous visual observations, ideally concurrent with times when Saturn is being imaged. Several Professional-Amateur cooperative research programs are cited. Although the rings are slowly progressing toward their next edgewise orientation in 2009, with a current inclination of  $-15^\circ$ , good views are still possible of the southern hemisphere of Saturn's globe and the south face of the rings. Polar regions of the planet's northern hemisphere are also becoming increasingly visible. Some of the more interesting observations of Saturn during the 2006-07 apparition are described, with prospects for the 2007-2008 observing season.

Saturday 10:30 – 10:50

## **Remote Planets**

Richard Schmude, Jr., A.L.P.O. Venus Section Coordinator

from being placed on a regular observing program by a single observer. They have characteristic periods on the order of 1-3 days with very small amplitudes ( $<0.03$  magnitudes in Stromgren  $v$ ). These characteristics present the challenge and as well as an opportunity since there are very few groups currently observing these stars.

While more rapid pulsators, such as the Delta Scuti and Beta Cephei stars, benefit from multi-longitude campaigns the SPB's do not lend themselves to this type of approach because of their relatively long pulsation periods which require observations spanning months rather than weeks over several years to adequately describe.

Our work with SPB's is supported by NSF grants.

Saturday, 9:15 – 9:40

## **High Mass X-Ray Binaries for Small Telescopes**

Gordon E. Sarty (presenter), Richard Huziak, Laszlo Kiss, Helen Johnston, Michael Ashley, Andre Phillips, Bogumil Pilecki, Paul Roche, Kinwah Wu

High mass X-ray binaries (HMXBs) are bright variable stars (10th or 11th magnitude) that are easily observed by the modern amateur astronomer with a small telescope and a CCD camera. HMXBs (the famous Cygnus X-1 is one) consist of an ordinary massive main sequence or giant star with a less massive exotic neutron star or black hole in orbit. The orbital period can range in value from about a day to several years. Such long periods, along with interesting higher frequency fluctuations, make HMXBs an exciting new variable star type for study by amateur astronomers. We will outline how AAVSO observers can collaborate with other large scale observing programs like ASAS and the Faulkes Telescope network to crack the mysteries of high mass X-ray binaries. These mysteries include the true galactic orbital period distribution, mass transfer mechanisms through disks and winds, and stellar pulsation modes which all may be studied with photometric light curves provided by amateur astronomers.

Saturday 9:40 – 10:00

## **A Multicolor Photometric and Fourier Study of New Field RR Lyrae Variables**

M. D. Koppelman (University of Minnesota), Richard Huziak (University of Saskatchewan Variable Star Research Group), Walter Cooney (AAVSO), Vance Petriew (AAVSO)

We present precision, multicolor light curves, new or updated ephemerides and Fourier components for 4 new or recently discovered RR Lyrae stars. We utilize  $[Fe/H]-\phi-P$  relations to determine the metallicity, with separate relations for the RRAb and RRc stars. Where possible we use a second method for determining  $[Fe/H]$  such as the amplitude in the Johnson B bandpass ( $A_B$ ). The metallicities are then used to calculate a second-order determination of the absolute magnitude ( $M_V$ ) and hence the distance (D).

Saturday 10:30 – 10:50

## **Detection of the First Observed Outburst of DW Cancri**

Tim Crawford, David Boyd, Carlo Gualdoni, Tomas

Uranus will reach its equinox later this year and it has continued its dimming trend. Brightness measurements made in 2006 will be summarized in this talk. One observer imaged limb brightening on Uranus and I will discuss this along with limb darkening. I will also present brightness measurements of Neptune made in late 2006. Neptune appears to have reached its peak brightness around 2003 and in the next few years it may begin to dim.

Saturday 10:50 – 11:10

### **Introduction to Meteoritics**

Dr. Mike Reynolds (Florida Community College at Jacksonville)

This paper will overview and introduce the field of meteoritics, with a focus on meteorites and meteoritic cratering. In his fast-paced PowerPoint presentation, Dr. Mike Reynolds will discuss how to distinguish a meteorite from meteorwong, the general classification of meteorites used by scientists, and will also show a variety of meteorites; these will be available to attendees to handle after the talk. Some of the recent "hot" topics in meteoritics will also be explored, such as recent fall and finds, Martian and Lunar meteorites, as well as Antarctic exploration and recovery of meteorites. Reynolds has been invited to give papers and talks on meteorites around the world, along with booksignings for his popular book on the subject, entitled Falling Stars.

Saturday 11:10 – 11:30

### **The Ironstone (Iron Creek) Meteorite, Alberta: was it a recent fall?**

Michael C. Wilson (Douglas College, British Columbia)

The Ironstone (Iron Creek) meteorite was of great religious significance to the Cree, Blackfoot, and Sarsi First Nations, who visited the site and left offerings. Hence it is discussed in their stories as well as in settler and scientific accounts. It was located on a hill near Iron Creek, a Battle River tributary in central Alberta. Despite (or because of) its religious significance it was removed by the missionary McDougalls and was sent to Victoria (Methodist) College, Ontario. It is now in the Royal Alberta Museum, Edmonton. Scholars have taken the date of its fall to be unknown and probably ancient, and it was apparently present by 1810. An historical account (from First Nations testimony) by U.S. Army Lt. James H. Bradley suggests an 18th century to earliest 19th century date for the fall of a large meteorite in Blood territory. Comparison of accounts indicates that this was the Ironstone. Other statements as to "the memories of people still living" also suggest such a date for the fall. First Nations recognized the direct celestial origin of meteorites at a time when Western scientists still debated such an origin. Dakota winter counts from the northeastern Plains indicate close attention to the sky. They record the famous Leonid meteor shower of 1833 and also that "a star sang across the sky," making a noise like thunder in the winter of 1821-22, which is too late for the Ironstone. The John K. Bear (Yanktonai) winter count records a "buzzing noise throughout the land," interpreted as a diurnal bolide, for the winter of 1741-42. Converging lines of evidence suggest that the Ironstone's significance for First Nations came from recognition of its direct celestial provenance, coupled with the relative recency of its fall.

Gomez, Walter MacDonald II, Arto Oksanen

Using data gathered by amateur astronomers from several nations, reported to AAVSO, the first observed "bright" outburst of the intermediate polar DW Cancri was detected on January 25<sup>th</sup>, 2007 at V = 11.36. This represented a brightening of ~4 magnitudes from both recent measurements and the long-term state. The outburst was of a relatively short duration showing a fading of ~2.25 magnitudes in ~27 hours and another ~1.25 magnitudes within another ~30 hours. Follow up observations shows the asynchronous rotation period of the magnetic white dwarf star of this system to be 38.6 minutes, in agreement with previous studies. Additional data analysis showed a strong secondary period signal at 70.07 minutes, which is quite close to the spin-orbital beat period of 69.9 minutes of a prior study. Whether or not the outburst was the result of disk instabilities or caused by a mass transfer event no conclusion could be reached.

Saturday 10:50 – 11:10

### **Infrared passbands for precise photometry of variable stars by amateur and professional astronomers**

Eugene F. Milone (University of Calgary) & Andrew T. Young (San Diego State University)

The infrared wavelength region is a rich one for variable star studies, especially of cooler stars, but the difficulty of obtaining IR observations has made it hard to explore. Typically telescopes with IR detectors are located at high elevations, to minimize water vapor absorption. However, the IAU's Infrared Working Group (IRWG) has designed and tested a set of infrared filters less sensitive to water vapour, permitting observations to be obtained at any site where precise optical photometry can be carried out. Data acquired with these filters can be corrected readily for atmospheric extinction, unlike the situation with older IR filters. We demonstrate the advantages and performance of the IRWG filters with data from the 1.8-m telescope of the University of Calgary's Rothney Astrophysical Observatory.

Saturday 11:10 – 11:30

### **Suspected Variables in AAVSO Star Fields**

Richard Huziak (RASC Saskatoon Centre and AAVSO)

The master listing of stars observed by the AAVSO is listed in the "Validation File". The file lists commonly observed variable stars but also lists many \_obscure\_ stars within the fields of view that observers over the years have suspected of being variable. Over the century-long history of the AAVSO over 1200 such suspects have been added, but this population has never been investigated in detail. Our project first identified each suspect with a catalogue name and position, then using CCD cameras we are now sorting out the true variables from non-variable stars. A small but significant percentage of these stars turn out to be variable, sometimes of surprisingly large range. Unfortunately, some of these variables have been used as comparison stars by visual observers over the years. And now with the fields being explored by CCD camera users, even small-range unrecognized variables stars can cause confusion and skewed data. It is thus important to identify the field suspects and eliminate them as comparison stars.

Saturday 11:30 – 11:50

### **The Asteroid (117572) Hutsebaut -- Discovery and Orbit Improvement With Archival Images**

Andrew Lowe (RASC Calgary Centre)

An asteroid was discovered by the author on March 8, 2005, using a 10" telescope at the RAS Observatory in Mayhill, New Mexico. The telescope was operated remotely through an Internet-based control system. The asteroid, designated 2005 EX33 by the Minor Planet Center, was observed on several nights to determine a provisional orbit. Surprisingly, although the asteroid was fairly bright, it had been discovered near the furthest point in its orbit from the sun. Since the orbit was quite eccentric, this suggested that the object could have been quite bright in earlier oppositions when it was closer to the sun. A search was undertaken of 2005 EX33 from on-line CCD images from the NEAT program and from digitized plate libraries.

Additional images were found in the archival data back to 1950, and the improved orbit was good enough that 2005 EX33 was assigned the number (117572) only seven months after the initial discovery.

Saturday 11:30 – 11:50

### **The AAVSO standard star database (VSD) and the variable star plotter (VSP)**

Vance Petriew (RASC Saskatoon Centre and AAVSO) and Michael Koppelman (AAVSO)

The AAVSO is refining its electronic chart plotting system in order to eliminate the manual task of creating paper-based charts. We will demonstrate the system, discuss the status and to-do list and show a technical peek into the inner-workings of the system.

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## Paper Sessions 4A and 5A, Sunday Morning, July 1<sup>st</sup>, 2007

### Session 4A: Satellites and Occultations Room: MacEwan Centre Hall A

Sunday 9:00 – 9:30

#### **Three Decades of Jupiter Satellite Eclipses**

John Westfall (A.L.P.O.)

The history of the ALPO Galilean Satellite Eclipse Timing Program, started by Joseph Ashbrook in 1975 and continued by the speaker from 1980 to the present. A description of Jupiter Galilean satellite eclipse phenomena, followed by a summary of the methods, results and applications of visual timings of their eclipses.

Sunday 9:30 – 9:50

#### **Measuring Asteroids Shapes from a Backyard**

Alister Ling (RASC Edmonton Centre)

Amateur astronomers around the world regularly contribute to improving shapes and sizes of asteroids by timing their occultations of background stars. This increasingly rewarding activity has come about thanks to improved stellar positions and orbital elements, and ease of access to predictions through the internet. Whether you have a 5-inch scope and a stopwatch or a large computerized observatory, you're invited to join in the fun (and sometimes frustration!) of shadow chasing

Sunday 9:50 – 10:10

#### **Catching a Shadow: How Backyard Astronomers Improved Our Knowledge of Asteroid (25) Phocaea**

Guy Nason (RASC Toronto Centre)

For a few seconds on 2006 October 03, the asteroid (25) Phocaea intercepted

### Session 5A: Education and Outreach Room: Casio

Sunday 9:00 – 9:30

#### **Teaching Science using Authentic Research on Variable Stars**

Pebble Richwine (University of Arizona)

A in-depth case study of high school students completing "In the Hunt for Variable Stars" shows statistically significant gains in students' knowledge regarding astronomy and variable stars. A mixed method approach using quantitative and qualitative evaluations illustrate students' ideas and beliefs about astronomy and the nature of science.

Sunday 9:30 – 9:50

#### **Educational Presentations for Sharing Through the Society**

Leslie Harvey (RASC Toronto Centre)

For several years the Toronto Centre has held presentations as part of their public education and outreach programme. At the time, I would like to share what our Public Education Committee has done with the rest of the Society in hopes that others will take the package to their communities and share it with the public. I have developed various presentations for Scouting, Guiding and Schools that are based (reflect directly) on their specific programmes. All of the material has permission from their author or is public domain. My overview will include portions of the PowerPoint presentations, documents, and other images that can be used by other members of the Society for educating the public

Sunday 9:50 – 10:10

#### **Defining a Great Sky (Defining Dark Sky Reserves and Preserves)**

Robert Dick (RASC Ottawa Centre)

Momentum is building as more Dark Sky Reserves (DSRs) and Dark Sky Preserves (DSPs) are being established across Canada. Using present DSRs and DSPs as a practical guide, the RASC has been developing a



the light from an 8th magnitude star as seen along a path that crossed western Quebec, eastern Ontario and the eastern United States. Several observers, including RASC members, timed this occultation. Their data were collected and analyzed by the International Occultation Timing Association (IOTA), with the result that astronomers' knowledge of the size, shape and orbit of the asteroid were improved. My presentation will briefly describe the mechanics of asteroidal occultations; will look at the techniques used for this event -- including video-recordings from two different locations that will illustrate how the occultation varies with distance from the path centreline; and will discuss the results as published by IOTA.

Sunday 10:10 – 10:30

### **Observation of an extremely short stellar occultation by asteroid (11072) Hiraoka**

Tony George (IOTA)

On May 23rd, 2006 I observed the occultation of the 10.6 magnitude star TYC 0789-00349-1u by the 7 km diameter asteroid (11072) Hiraoka. The event lasted 0.23 seconds -- 0.03 seconds longer than the predicted maximum duration of the event. This is the shortest single-chord event ever accepted by the International Occultation Timing Association (IOTA) for submittal to the Minor Planet Center. This observation was the culmination of many years of occultation experience coupled with the steady improvement of equipment and techniques. In this presentation, I will show the types of equipment needed for recording such events, highlight the procedures needed to verify the event, and then present the safeguards used by IOTA to assure the event is not due to spurious noise or other effects. The presentation will show that extremely small asteroids can be observed and measured with amateur equipment from the backyard of our homes.

unified policy for all future DSRs and DSPs. Based on consultation with the promoters of existing DSRs and DSPs as well as Parks Canada; the RASC presents a draft policy for defining these areas. These designations require more than just a dark sky to qualify. They must be backed by a commitment and a policy to protect and sustain the nocturnal environment within their bounds by working with surrounding townships and municipalities. Dark Skies are important to astronomers, but they are much more important to our ecosystem. The relationships between these imperatives are also presented and discussed.

Sunday 10:10 – 10:30

### **What is a Dark Sky Preserve?**

Bob King (Chair – Light Pollution Abatement Committee, RASC Calgary Centre)

Dark-sky preserves (DSPs) are being created in many places in Canada and elsewhere, yet there is no consensus as to what a DSP is or even what it should be called. Without guidance as to what sites can qualify, DSPs potentially can be created anywhere, perhaps even where the sky is not very dark. Well crafted criteria for sky brightness and policies for site preservation will ensure the meaning and purpose of a 'Dark-Sky' designation is protected.

The brightness of the night sky over a particular site depends on atmospheric phenomena (aurora and airglow), extra-terrestrial sources (unresolved stars and galaxies; galactic background and zodiacal light), and human activity (light pollution). The contributions of these factors to sky brightness are reviewed as are the difficulties of evaluating sky brightness. Protecting the dark-sky requires effective policies and technical standards for outdoor lighting that address the astronomical, educational, and environmental purposes of the site. These factors relate directly to public comprehension and the support of local authorities.

Examination of these considerations distinguishes two classes of night-time protection. Specific recommendations are presented for these classes, which are determined by the site's visual sky brightness and purpose, and the degree of environmental protection provided.

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## Paper Sessions 4B and 5B, Sunday Morning, July 1<sup>st</sup>, 2007

Session 4B: Telescopes and Observatories  
Room: MacEwan Centre Hall A

Sunday 11:00 – 11:20

### **Optical Throughput Testing: The Good, the Bad, and the Ugly**

Murray D. Paulson (RASC Edmonton Centre)

Many years ago Peter Ceravolo got up on his soapbox and decried the irregular quality of commercial optics available to the amateur community. I am interested in light and its measurement and what happens to it as it passes through an optical system. I have not concentrated on optical quality, but rather on optical throughput. How much does that old mirror reflect? Or how much light actually gets through an eyepiece are questions that I sought to answer. I have developed instrumentation to conduct this measurement and I have some rather interesting results on mirrors, refractors, eyepieces and Binoviewers. Bring your favorite piece of optics and we will scrutinize it during the informal evening sessions.

Session 5B: Looking at the Sky  
Room: Casio

Sunday 11:00 – 11:20

### **Dark Nebulae: Observations of the Dark Side**

Paul Gray

In the early 1990's a group of members from the Halifax Centre led by Doug Pitcarin began a project to observe and compile a list of observable dark nebulae. After much frustration due to lack of good charts and resources the project faltered. During the summer of 2000 the author had revisited the idea and received support from the then past and current editors of the RASC Observer's Handbook. After observations of a couple hundred dark objects by multiple observers through many instruments, a new section was added to the 2004 Observer's Handbook. The project however is far from complete with the author now taking on the challenge of observing all of E.E. Barnard's dark objects. This talk will detail some of the more interesting observable dark nebulae but will highlight some the more interesting and unexpected finds.

Sunday 11:20 – 11:40

### **Aerodynamic Studies of Observatory Domes (Dorothy's House?)**

Robert Dick (RASC Ottawa Centre and Carleton University) and Daniel Feszty (Carleton University)

Airflow over domes induces forces that cannot be ignored in the design of an observatory. They tend to lift and push the dome off its mountings. Although simple calculation methods can be applied to very simple geometries, real situations are often too complex. The design of a 5-metre dome was analysed using computational fluid dynamics (CFD) to assess the lift and drag forces induced by a range of wind speeds. We present the effect of wind direction with respect to the axis of the observing slit and the effects of the open and closed slit door, and surface gore ridges on these forces. We present flow visualizations and generalized results of the CFD simulation for a range of dome dimensions so that the results may be applied to most observatory domes in amateur and professional observatories.

Sunday 11:40 – 12:00

### **Automated Variable Star Observing and Photometric Processing at the Abbey Ridge Observatory (ARO)**

David Lane (RASC Halifax Centre and AAVSO)

In the second half of 2006, the author's backyard observatory began observing (mainly Cepheid) variable stars in collaboration with David Turner and Daniel Majaess of Saint Mary's University. This paper will describe the automated variable star observing and photometric processing software (Abbey Ridge Auto-Pilot and accompanying scripts) developed for and in use at ARO. This software completely automates observing the fields, taking calibration frames at night's end, calibrating the images, combining sequentially-taken images, astrometrically solving the images, and doing the aperture photometry of the selected stars. At the end of the night, the resulting calibrated images and Excel-compatible photometric data are automatically uploaded to an internet server and human-readable summary emails are sent to the observer. As input to the software, the observer provides two types of text files. The first type contains the list the fields to be observed on a given night. The second type is a simple database of information about the fields, including such things as: the equatorial coordinates of the field; the exposure details in each filter; the equatorial positions of the target, reference, and check stars; and the aperture photometry settings.

Sunday 12:00 – 12:30

### **The CGRT Robotic Telescope Project**

Craig Breckenridge (RASC Vancouver Centre)

The Vancouver Centre of the RASC has been fortunate in partnering with one of our members to set up and operate a remote telescope at New Mexico Skies near Alamogordo, New Mexico. This partnership has opened up opportunities for our membership to learn new skills and have access to state of the art equipment. In addition to learning how to operate a remote telescope, we have learned quite a bit about the many requirements to setting one up. The images we have been taking will form a library of astronomical objects that we can use in presentations to our membership and for public outreach activities. Because of the extreme high caliber of instruments involved we are also able to partner with local universities to assist in data collection for student projects. We hope to make the telescope available to high school students through the Science Fair program. We are joining with several different groups on this project and these will be outlined in our presentation which will give an overview of the equipment, location and people involved.

Sunday 11:20 – 11:40

### **Glasshenge: Lunar/Solar alignments with skyscrapers**

Alister Ling (RASC Edmonton Centre)

Pictures and time lapse video are used to demonstrate one way of enjoying simple astronomy: the beauty of watching moonsets and moonrises behind a city foreground, sometimes colourfully and dazzlingly reflecting the rising or setting Sun. With a little algebra, Google maps, and planetarium software, you too can plan to be in the right place at the right time.

Sunday 11:40 – 12:00

### **Constellations and Skylore of Native North Americans**

Frank Dempsey (RASC Toronto Centre)

Constellations of North American Indians are presented along with some associated skylore for a sample of native groups across the continent. Similarities and differences in the interpretations and mythologies for various constellations (due to geographical and language variations) are pointed out, along with some perspectives on the social, economic and spiritual connections between native communities and the stars. Although many native legends illustrated the resonance between the cycles of the cosmos and the rhythm of life on Earth, many of the constellation figures in the sky also were living beings that were closely associated with the creation legends and played some part in stories that illustrated important cycles, provided guidance for proper behaviour for ethical and sustainable survival, emphasized participation with nature for the mutual benefit of all living things, and provided calendars of agricultural and ritual importance. By illustrating a sample of various constellations from the perspectives of widely separated native peoples, some common themes in native skylore can be highlighted.

# Abstracts of Poster Papers

MacEwan Centre, Hall B

## **Student Data: The Impact of Authentic Science Inquiry Experiences Studying Variable Stars on High School Students' Knowledge and Attitudes about Science and Astronomy, and Beliefs Regarding the Nature of Science**

Pebble Richwine (University of Arizona)

A in-depth case study of high school students completing "In the Hunt for Variable Stars" shows statistically significant gains in students' knowledge regarding astronomy and variable stars. A mixed method approach using quantitative and qualitative evaluations illustrate students' ideas and beliefs about astronomy and the nature of science.

## **Digging in the Astronomical Data Mine: A Search for Variable Stars**

Theo Jones and Pebble Richwine (University of Arizona)

Professional astronomers have collected massive amounts of data and much of it goes unanalyzed because they don't have time to process it all. Some of this data is on Internet databases. This two-phase project shows how amateur astronomers can use archival computer images from one such database, Stardial, to search for and study variable stars, producing data useful to professional astronomers. Project goals were to use archival data to find and analyze variable stars, i.e., stars that change their brightness over time. During a preliminary study, I analyzed Stardial images for three known variables: V558 Aquila, NSV12374, and GX Aquila, all located near right ascension 19h 45 m, with declinations 0 to -7, and graphed light curves for them. I then used Stardial images to survey between right ascension 20h and 21h, declination 0 to -7 with the goal of finding undiscovered variables. I hypothesized that since this area was near our galactic center, a place where variables might be expected, and it hadn't been extensively studied, variable stars, including undiscovered ones, would be found there. I found 34 variable stars. Twenty were known, catalogued on databases. Fourteen weren't catalogued and were possible undiscovered variable stars. My next step is to observe that area, completing photometry on each variable found

## **Jupiter: Photometry**

Richard Schmude (A.L.P.O.)

The writer and his students have measured the brightness of Jupiter since 1999. Although Jupiter appears to undergo small changes in brightness, it has shown no evidence of large 10-30% changes in brightness. Jupiter may be a little brighter in one hemisphere; however due to that planet's ~3 degree tilt this is difficult to confirm. Results in blue, green, red and infrared light will be presented.

## **Mars Imaging 2005**

Murray Paulson (RASC Edmonton Centre)

The 2005 apparition of Mars was a wonderful opportunity to image our photogenic neighbor. Using a 5" refractor and the Phillips Toucam I imaged the red planet on every available occasion over the apparition. My final result was a series of over 100 images of the planet covering from August 2005 to January of 2006. The best of these have been assembled into mosaic covering the apparition and showing the changing face of Mars.

## **Is This an Impact Site?**

Pat Matsalla (RASC Calgary Centre)

An examination of a LandSat satellite image of West Central Alberta revealed a circular feature. Air photographs and topographic maps were obtained and a field trip conducted. Fractured fine-grained sandstone was observed. A gravitational survey was obtained. Non-proprietary seismic was examined. Of the various pieces of evidence examined, several items pointed to an impact site while other items disproved the existence and still other pieces of evidence were inconclusive. The ultimate proof of the existence of an impact site can be a long and involved process and in some cases, many unresolved questions remain.

## **Local Light Pollution Experiment Results at Queen's University, May 2005**

Kevin Kell, Kim Hay, Hank Bartlett (RASC-Kingston Centre)

Does local lighting from the University buildings surrounding the Queen's Ellis Hall Observatory affect the sky brightness as seen from the telescope and the observing deck, as compared to the rest of the surrounding City of Kingston lighting? With the cooperation of the University Physical Plant, the RASC-KC and Queen's Astronomy department personnel made CCD measurements, light meter measurements and digital images of the sky while exterior and interior lights within approx 200m were turned off. A series of measurements at various azimuth and altitudes were taken and every 45 minutes a series of lights were turned on, until at 02:00 local time, all lights were on including the local sports field. The CCD data from the 16" telescope and digital camera imagery (fixed aperture and exposure time) show that the night sky brightness worst case difference was approx 2.3 magnitudes per square arcsecond, from University Light Sources alone.

## **Celebrating the International Year of Astronomy 2009 in Canada**

Scott Young (RASC President)

2009 has been designated the International Year of Astronomy, and astronomy groups around the world are making plans to celebrate! It's the 400th anniversary of Galileo's first telescope views – an experience that every RASCer can relate to. The IYA09 Working Group includes members of the RASC, the Canadian Astronomical Society, and representatives from the Canadian Space Agency, the Canadian Association of Science Centres, and scientists and engineers in many "allied sciences". How can we celebrate IYA, and how can the RASC benefit from the international attention on our hobby?

## **Astronomy in Saskatchewan Parks: A User's Guide**

Mike and Anna Clancy

Join the authors for photos and chat about the many parks in Saskatchewan that offer either assistance to astronomers (Dark Sky Preserves, for instance) or programs for astronomers of all ages. Saskatchewan is blessed with 34 Provincial Parks, 101 Regional Parks and 2 National Parks. They cover the province from Clearwater Provincial Park in the north to Rockin Beach Regional Park in the south, from the Cypress Hills Interprovincial Park in the west to Duck Mountain Provincial Park in the east. There's hiking, birding, boating, fishing, beaches, water and trees, and (of course) those glorious horizons and clear night skies. As you travel home from Calgary, you might want to take the time to enjoy Saskatchewan's many parks; with 10,800 campsites there is one that suits your needs – you just need to find it! For those interested, the authors will sign copies of their book "A Users Guide to Saskatchewan Parks" the fifth title in the Discover Saskatchewan series.