POLARIS

Top 10 Desktop Apps for Astronomers
Compiled By: Norman McCall

While computers and specialized software are not strictly required for stargazing at the amateur level, there is no doubt that the stargazing hobby can be greatly enhanced with the use of computers and user-friendly software. Given the quantity of available apps it is difficult to select the best 10 that satisfy the needs of all astronomer. The list presents apps some of the best stargazing applications that cover the most ground, from planetarium simulations to an app that automatically searches for near-earth objects. If you don't have these apps, get them- you will wonder how you ever got by without them.

#1: PHD2 Auto Guiding

Looking to get into astrophotography, you are going to need to get into auto guiding. A great place to start is **PHD2**, the GoTo application for telescope guiding software on the market today. The application streamlines and simplifies the process of tracking a guide star, letting you concentrate on other aspects of deep-sky imaging or spectroscopy.
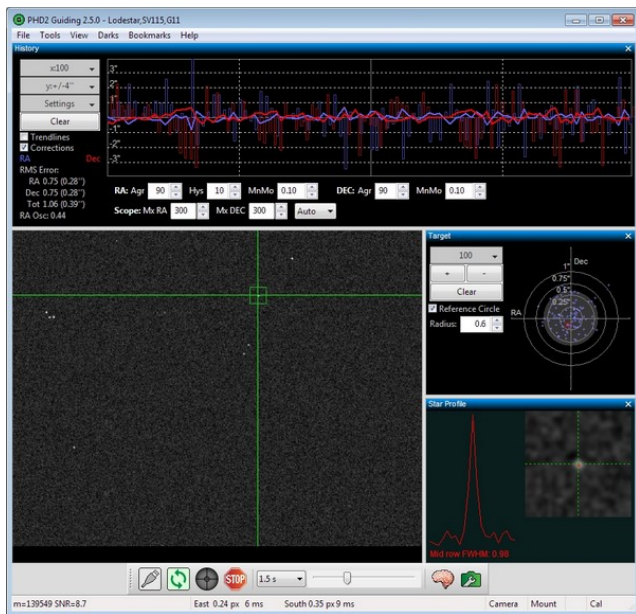

Due to it wide use, this programme is well supported by the user community and offers an integrated add-on package to CCDAutopilot, a program used to optimize your imaging systems, data collection and acquisition of calibration frames. On-line tutorials and help documentation are a mere mouse click away saving you valuable time and the pain of "pulling your hair out" resolving frustration of self discovery.

If you are planning to get into astrophotography, this is a must-have software application!

#2: AstroGrav Solar System Simulator

AstroGrav is a full-featured, high precision solar system simulator that calculates the gravitational interactions between all astronomical bodies, so that the motions of asteroids and comets are simulated much more accurately than with planetarium applications. The effects of general relativity and radiation pressure can be taken into account. Superb interactive 3D viewing allows you to easily rotate and zoom your view while the solar system evolves.
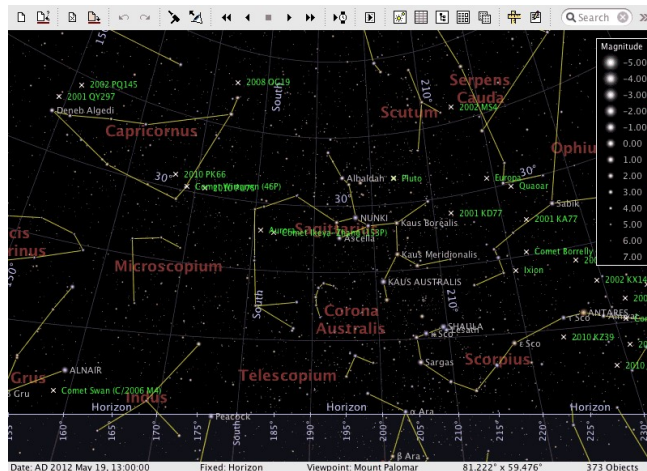
Apart from the solar system, you can also explore the gravitational effects of exoplanet systems, the collision of globular star clusters, or even watch the evolution of planetary systems from accretion discs. In fact, almost any situation in which gravity is the dominant force can be simulated accurately.

AstroGrav is available for both Mac and Windows, and a free, but fully functional trial in several languages is available for download. The program is ideal for astronomer, teachers, student and anyone interested is studying how objects move and interact under the force of gravity.

#3: Stellarium Planetarium

While there are hundreds of planetarium software

suites available, **Stellarium** is the only free software that is also used in commercial planetaria all over the world today. **Stellarium** runs on all major operating systems, and in all cases, the rendered views are almost indistinguishable from what would be seen through a telescope, binoculars, or with unaided vision.

The following is a list of the highlight features of **Stellarium:**

- Catalogue of 600,000 stars and 80,000 deep-sky objects
- Asterisms, constellations and realistic view of the Milky Way
- Images of nebulae (full Messier catalogue)
- The planets and their satellites
- Equatorial and azimuthal grids
- Target FOV based on telescope, eyepieces, Barlow and reducer and camera sensor
- Powerful zoom and time control
- Fisheye projection for planetarium domes
- Spherical mirror projection for your own low-cost dome
- Telescope control

This is an excellent program for exploring the night sky based on your actual equipment including the ability to control you telescope! The best part is that it is totally free!

### #4: Where is M13? – A Three-Dimensional Galactic Atlas

Since views through telescopes are flat and one dimensional, this unique software program will help you get a sense of an object's location with respect to the galaxy's centre, and/or midplane. In this way, your observing sessions are greatly enhanced, because you get an almost 3D view of the relationship between a viewed object and the galaxy. **Where is M13?** also provides information on the galactic coordinates, luminosity, distance, and true size and angular diameter of objects. The software also makes a great educational and outreach tool as well, and runs on Linux, Mac OS X, and Windows.

#5: SharpCap Image Capture Application

SharpCap is a powerful, yet low-cost and easy-to-use astronomy camera capture tool. It can be used with dedicated astronomy cameras, webcams and USB frame grabbers.

Designed with a wide range of features, SharpCap is suitable for many types of astro-imaging including: Planetary, Lunar, Solar, Deep Sky and EAA (Electronically Assisted Astronomy). A clear and logical UI makes the program easy for beginners to use. Comprehensive documentation will also help those who are just getting started.
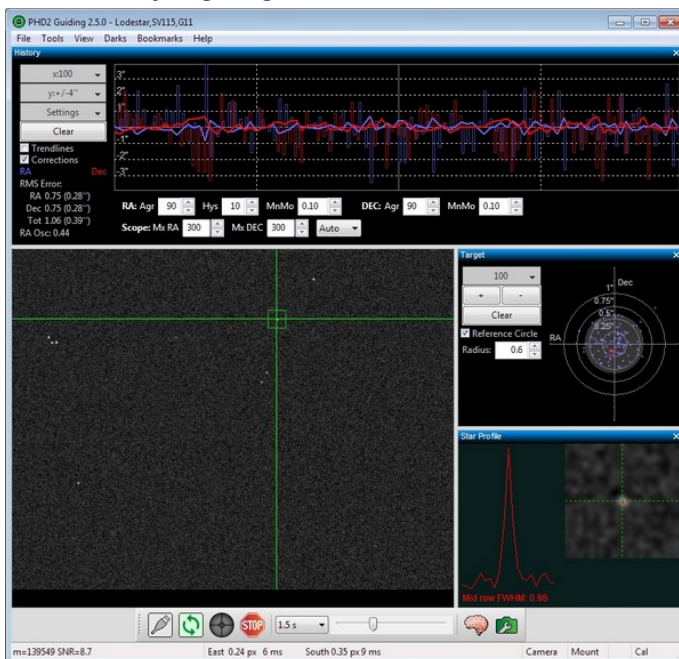
Key features include:

- Video capture to AVD and SER format
- Still image capture to PNG, FITS, TIFF and JPG
- Planetary, solar, and lunar imaging with support for USB 3.0 high speed cameras for lucky imaging applications
- Deep sky (long-exposure) imaging
- Live dark & flat frame correction
- Live stacking allows user to see live deep-sky images on-screen
- Polar alignment tools
- Full control of camera
- Histograms and display stretch
- Reticule display for calibrations
- Auto capture triggers
- Focus aids and assistance for planetary, stars and lunar images
- ASCOM focuser, filterwheel and mount support
- Plate solving to sync you ASCOM mount to correct position automatically
- Camera sensor analysis (read noise, and e/ADU) for astro cameras

Offering support for almost all webcams, most frame grabbers and others big name camera vendors, **SharpCap** cannot be overlooked by the beginner and serious astronomer as a serious contender.

#6: ConeSharp – Cone Error Correction Utility

ConeSharp is a small program designed to help you correct cone error on a telescope mounted on a German Equatorial mount.

Cone error describes a condition where the optical center of the telescope (OTA) is not parallel with the RA axis of the mount, and/or perpendicular (at a right angle) to the DEC axis of the mount.

Why is Cone Error a Problem?

If you have cone error your telescope isn't pointing in the direction that the mount is aiming for. What's worse, the er-

ror changes as you point in different directions. In theory, a 3 star align on a SynScan handset will correct for cone error, but my experience is that it doesn't always do a great job. Secondly if you are auto guiding, in additional to RA corrections, Dec adjustments are also required for both increasing amount of PEC error. Therefore, it is so much better not to have the error in the first place since, once corrected, you will most likely find a improved Polar Alignment, more accurate GOTOs become and more accurate auto guiding.

If you have never checked your German Equatorial mount for cone error, take **ConeSharp** for a spin.

#7: DeepSkyStacker

Stacking software for astro-imaging are not created equal, and while Photoshop or Registax do well in most departments, **DeepSkyStacker** was developed to satisfy the particular demands of deep sky imaging. The program takes much of the pain out of pre-processing, by allow the user upon completion of an astrophotography session to load all images (complete with: light, dark, flat and offset/bias frames) before heading to bed. The
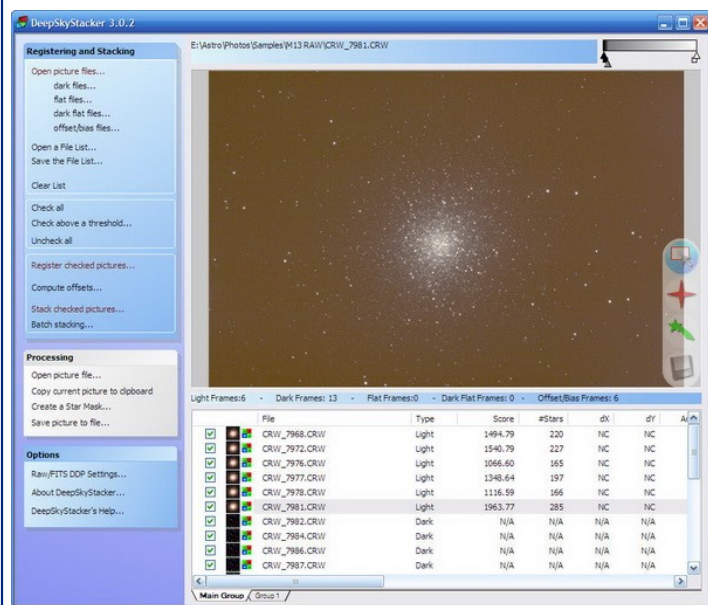
software (and a suitable computer) does the rest so that by the time you are fully awake the next morning, the images will be ready for post-processing. Files can be saved in both TIFF and FITS formats in either 16 or 32 bits.

#8: CCDStack

CCDStack provides you with an impressive set of tools required to stack, process, assemble and view your astronomical images. CCDStack uses sophisticated statistical concepts and methods to optimize stacking processes. CCDStack's intuitive interface is straight-forward with unique and insightful displays of images and data.

Once your images are loaded, processing can be performed on your images as one group of data. This allows for new, advanced image processing techniques not before available in commercial software.

CCDStack provides all the tools you need to streamline your image processing workflow.

#9: MetaGuide Collimation, Guiding & More

Auto-guiding software is a requirement for astrophotography, but the problem is that while there are many auto-guiding applications available, there are very few that are free, and even

fewer that provide the accuracy and sharp focus of adaptive optics.

MetaGuide however, is both free and in the adaptive
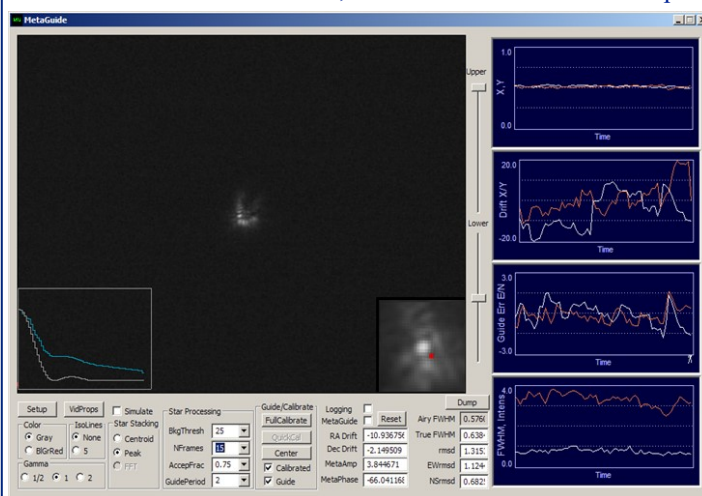
optics league. It is based on video imaging and provides precise collimation by using the in-focus diffraction patterns of stars. In addition, the software employs several novel approaches to auto-guiding that results in real and significant insights into the optics of any given telescope, as well as the tracking behaviour of the mount used. The following is an extract of a review of the software by an experienced observer:

"**MetaGuide** allows me to obtain sub-2″ full width at half maximum (FWHM) stars with a Celestron CGE and 11″ SCT at 2800mm focal length and 0.45″ per pixel. The key is an accurate and low latency centroid that can be chased aggressively to overcome gearbox and bearing noise. This pushes auto guiding of a mid-range mount into a realm of performance that normally requires adaptive-optics."

MetaGuide is free, extremely user-friendly, and fully compatible with any telescope, and almost all video cameras. However, for the auto-guide to work, you must provide either an ASCOM connection, or some other mode of mount control such as GPUSB, TOGA, AstroGene, or LPT.

#10: Peranso – Light Curve & Period Analysis Software

Peranso is a must-have app for amateur observers of variable stars, or other objects that vary in brightness. The user-friendly app allows in-depth analysis of light curves and luminosity periods. Data can either be large, multi-session sets, or a single observation, making this the most accurate and productive data analysis tool for amateur observers available today.

This app offers too many advantages and features to be listed here, so head over to their website (http://www.cbabelgium.com/peranso/) for an overview of features and requirements. Note that although **Peranso** was developed to run on Windows, it is possible to run the product on Mac and Linux machines by using appropriate Windows emulation software.

Apps — Honourable Mentions

Other astronomy apps worthy of honourable mention include:
- Celestia – real-time 3D Visualization of space
- OpTaliX – Software for Optical Design, and
- Asteroid Data Hunter.

Summary

Given the number of astronomy programs, hopefully this list of applications presents a good starting point to begin your journey.

Sky Events for Late May and Early June

May 22 Regulus 1.5° S of Moon (First Quarter)
May 27 Jupiter 4° S of Moon
May 29 Full Moon
June 1   Saturn 1.6° S of Moon
June 3   Mars 3° S of Moon
June 6   Last Quarter
June 13 New Moon
June 16 Venus 2° N of Moon

Planets
Mercury: After passing through superior conjunction on 6th, emerges into the
          evening sky. Still a good chance to see it low in NW evening twilight
Venus: Remains prominent in the evening twilight throughout the month.
Mars: Continues to dive ever south of the ecliptic throughout the month.
Jupiter: Moderately well-placed for observation throughout the hours.
Saturn: Reaches opposition on the 27th, just 6 days after the summer solstice.
Uranus: Visible in the morning sky among the stars of Pisces.
Neptune: Reaches its first stationary point on the 19th, among the stars of Aquarius.

R.A.S.C. London Centre Library — Books of the Month, March 2018
By Robert Duff

As always, these "Books of the Month" are available for loan to members, to be returned at the following monthly meeting.
The books for May 2018 are as follows:

- *Cataclysmic Cosmic Events and How to Observe Them,* by Martin Mobberley. c2009. (Astronomers' Observing Guides)
- *Clyde Tombaugh: Discoverer of Planet Pluto*, by David H. Levy. – Cambridge, Mass.: Sky Publishing Corp., c2006.
- *Here be Dragons: the Scientific Quest for Extraterrestrial Life,* by David Koerner & Simon LeVay, c2000.

For a complete listing of our RASC London Centre Library collection please click on the Library menu at the top of the RASC London Centre main Web page: http://rasclondon.ca/

If there is a particular book or video you wish to borrow, contact Bob at 519-439-7504 or by e-mail at **rduff@sympatico.ca**

Exploring the Stars Events & Cronyn Observatory Public Nights, Exploring the Stars & Special Events, April 28th — May 5th
By Robert Duff

Cronyn Observatory Special Event: Little Astronauts' Space Expedition, April 28th, 2018

Cloudy skies and windy weather greeted a group of Western University Alumni and their children, which included 67 visitors (about 40 children and 27 adults), for the Special Event, Little Astronauts' Space Expedition, Saturday, April 28th, 2018, 1:00—3:00 p.m. Welcoming them and conducting the event were graduate students Viraja Khatu and Dan Hatfield; PhD graduate and Centre for Planetary Science and Exploration (CPSX) Outreach Program Coordinator Parshati Patel; and Professor Jan Cami. RASC London Centre was represented by Henry Leparskas and Bob Duff.

Professor Jan Cami started with a slide presentation *"Space & Astronomy @Western"* and the visitors were then divided into 3 groups to rotate between different stations. Viraja Khatu gave 3 demonstrations of the *"Crater Experiment"* on the floor of the lecture room. There were tours of the dome and demonstrations of the *"Transit Demo"* and *"Spectroscopy*

Demo" in the downstairs *"Black Room"* and tours of the *"1940s Period Room."*

When the visitors arrived upstairs in the dome, Parshati Patel gave a talk on the history of the observatory and technical aspects of the big 25.4cm refractor in the dome. Since it was cloudy, the observatory's 90mm Coronado H-Alpha Solar Telescope was set up on the Sky-Watcher EQ5 mount for display in the dome. Parshati invited the visitors to climb the observing ladder and view the communications tower in south London through the 25.4cm refractor (Meade 28mm Super Wide Angle eyepiece, 157X). Professor Jan Cami explained the 2 clocks on the east wall of the dome and the difference between Standard and Sidereal Time as the visitors lined up to view through the 25.4cm refractor.

On the observation deck outside the dome, Bob Duff supervised as visitors viewed the wind turbine on the Engineering building through the observatory's Meade 8-inch (20.3cm) Schmidt-Cassegrain (26mm Tele Vue Plossl eyepiece, 77X) and the London Centre's 25.4cm Dobsonian (17mm Nagler eyepiece, 66X). Bob later redirected the 20.3cm Schmidt-Cassegrain towards the communications tower at the request of a young visitor.

Downstairs in the *"Black Room"* Dan Hatfield did the *"Transit Demonstration"* activity, with the *"Transit Demo"*

model—showing how the transit detection method worked for finding extra-solar planets, and the *"Spectroscopy Demonstration,"* with the visitors putting on *diffraction grating* glasses to view the spectra of 4 gas discharge lamps, including hydrogen, helium, neon and mercury. Henry Leparskas gave them a tour of the historic *"1940s Period Room,"* a recreation of Dr. H. R. Kingston's 1940 office, with his brass refractor and the *Sotellunium*—a mechanical eclipse demonstration model built by W. G. Colgrove—on display.

The visitors were gone by around 3:00 p.m. after a very interesting and enjoyable visit to the observatory, despite the cloudy sky.

Exploring the Stars, Good Neighbours, Saturday, April 28th, 2018

Cloudy skies greeted 11 visitors (5 adults and 6 children) from the group Good Neighbours, for Exploring the Stars at Western University's Cronyn Observatory, Saturday, April 28th, 2018, 7:00 p.m. Graduate student Jeff Vankerkhove presented the digital slide presentation *"Constellations"* and fielded questions. Jeff followed this with the activity *"Telescope Kits,"* with the visitors assembling and testing the telescopes from small reusable kits. This was followed by a tour of the dome and demonstrations of the *"Spectroscopy Demo"* and *"Transit Demo"* in the downstairs *"Black Room"* and a tour of the *"1940s Period Room."*

RASC London Centre was represented by Everett Clark, Henry Leparskas and Bob Duff. Everett and Bob directed the big 25.4cm refractor (32mm Erfle eyepiece, 137X) towards the communications tower in south London. The London Centre's 25.4cm Dobsonian (17mm Nagler eyepiece, 66X) was set up on the observation deck and directed towards the wind turbine on the Engineering building.

Downstairs in the *"Black Room"* Jeff did the *"Spectroscopy Demonstration,"* with the visitors putting on *diffraction grating* glasses to view the spectra of 4 gas discharge lamps, including hydrogen, helium, neon and mercury, followed by the *"Transit Demonstration"* activity, with the *"Transit Demo"* model—showing how the transit detection method worked for finding extra-solar planets. Henry gave them a tour of the historic *"1940s Period Room,"* a recreation of Dr. H. R. Kingston's 1940 office, with his brass refractor and the *Sotellunium*—a mechanical eclipse demonstration model built by W. G. Colgrove—on display.

When the visitors arrived upstairs in the dome, Bob gave a talk on the history of the observatory and technical aspects of the big 25.4cm refractor, calling their attention to and explaining the Schmidt camera and Cassegrain reflector telescope piggybacked on the main telescope. He also showed them the 2 clocks on the east wall of the dome and explained the difference between Standard and Sidereal Time. Jeff and Bob supervised as the visitors climbed the observing ladder to view the communications tower through the 25.4cm refractor (32mm Erfle eyepiece, 137X). Henry and Bob supervised as the visitors viewed the wind turbine through the 25.4cm Dobsonian (17mm Nagler eyepiece, 66X) set up on the observation deck.

The visitors enjoyed their visit to the observatory and were gone by around 9:00 p.m. after a very interesting evening of astronomy despite the cloudy sky.

Exploring the Stars, London 68th Beavers, Wednesday, May 2nd, 2018

Partly cloudy skies with hazy clouds greeted 24 visitors (17 children and 7 adults) from the London 68th Beavers for Exploring the Stars at Western University's Cronyn Observatory, Wednesday, May 2nd, 2018, 6:15 p.m. Graduate student Viraja Khatu presented the digital slide presentation *"The Scout / Guide Astronomy Badge,"* with the title slide *"The Basics,"* and fielded questions. Viraja followed this with the *"Crater Experiment"* activity, placing a pan filled with flour on the floor, into which was dropped various size balls to demonstrate impact cratering.

RASC London Centre was represented by Heather MacIsaac and Bob Duff. Bob directed the big 25.4cm refractor (Meade 28mm Super Wide Angle eyepiece, 157X) towards the communications tower in south London. He also set up the London Centre's 25.4cm Dobsonian (17mm Nagler eyepiece, 66X) on the observation deck outside the dome and directed it towards the wind turbine on the Engineering building. Heather set up her Celestron NexStar 90SLT 90mm Maksutov-Cassegrain (32mm Plossl eyepiece, 39X) and directed it towards the communications tower.

When the Beavers arrived upstairs in the dome, Bob gave a talk on the history of the observatory and technical aspects of the big 25.4cm refractor telescope. He also showed them the 2 clocks on the east wall of the dome and explained the difference between Standard and Sidereal Time. Viraja supervised as the visitors climbed the observing ladder to view the communications tower through the 25.4cm refractor (Meade 28mm SWA eyepiece, 157X). The Beavers also viewed through the telescopes set up on the observation deck. Bob showed them the wind turbine on the Engineering building through the London Centre's 25.4cm Dobsonian (17mm Nagler eyepiece, 66X). Heather showed them the communications tower through her Celestron NexStar 90SLT 90mm Maksutov-Cassegrain (32mm Plossl eyepiece, 39X). The visitors were gone by around 8:15 p.m. after a very interesting and enjoyable visit to the Cronyn Observatory.

Cronyn Observatory Public Night, Saturday, May 5th, 2018

Partly cloudy skies greeted visitors to Western University's Cronyn Observatory Summer Public Night, Saturday, May 5th, 2018, 8:30 p.m. They were welcomed by graduate student Hadi Papei, who was in charge of "crowd control" and counted 36 visitors for the evening. Earth Sciences graduate student Arya Bina made 2 presentations of his digital slide presentation *"The Periglacial Landscape of Mars: a Climate History from an Earth Spectacle"* and fielded questions. Professors Jan Cami and Els Peeters were also there and did demonstrations of the *"Transit Demo"* and *"Spectroscopy Demo"* in the *"Black Room."*

Graduate student Keegan Marr was telescope operator for the big 25.4cm refractor in the dome. RASC London Centre was represented by Everett Clark, Steve Imrie, Bob Duff, Henry Leparskas, Peter Jedicke, Heather MacIsaac and Dale Armstrong. London Centre member Richard Gibbens was also there and listened to the slide presentation. Keegan located Venus in the big 25.4cm refractor, using the 32mm Erfle eyepiece (137X) and with Bob Duff's assistance swapped in the Meade 28mm Super Wide Angle eyepiece (157X) for a better view of the planet. Venus appeared as a gibbous disk with blue and orange colour fringing due to atmospheric dispersion near the western horizon.

Everett Clark had set up the observatory's Meade 8-inch (20.3cm) Schmidt-Cassegrain (12.5mm Ortho eyepiece, 160X) on the observation deck outside the dome and directed it towards the Canadian flag flying above University College to the northeast. Steve Imrie supervised as visitors viewed the flag through the 20.3cm Schmidt-Cassegrain. Heather MacIsaac set up her Celestron NexStar 90SLT 90mm Maksutov-Cassegrain (32mm Plossl

eyepiece, 39X) and to show visitors the communications tower in south London.

Downstairs in the *"Black Room"* Professors Jan Cami and Els Peeters did the *"Transit Demonstration"* activity, with the *"Transit Demo"* model—showing how the transit detection method worked for finding extra-solar planets, and the *"Spectroscopy Demonstration,"* with the visitors putting on *diffraction grating* glasses to view the spectra of 4 gas discharge lamps, including hydrogen, helium, neon and mercury. Henry Leparskas gave them a tour of the historic *"1940s Period Room,"* a recreation of Dr. H. R. Kingston's 1940 office, with his brass refractor and the *Sotellunium*—a mechanical eclipse demonstration model built by W. G. Colgrove—on display. Henry also showed them the *"1967 Period Room,"* recreating the early control room of the Elginfield Observatory to celebrate the 150th anniversary of Confederation—Canada 150. Both *"Period Rooms"* were designed by RASC London Centre member Mark Tovey.

The visitors were gone by around 11:00 p.m. after an enjoyable evening at the observatory despite the partly cloudy sky. Dale took some pictures with Peter, Henry, Bob, Heather, Jan and Els in front of the 25.4cm refractor telescope, using a couple of flashes with gel filters so as to illuminate the dome in purple light. Before leaving the dome Jan and Peter cut some new handles for the 25.4cm refractor from purple foam tubing to replace the orange handles installed by Peter some years earlier. The purple handles match the "Western" purple the telescope was painted for the 2015 Cronyn Observatory 75th Anniversary.