POLARIS

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How to Not "Dew" It

Compiled By: Norman McCall

So, you have just purchased your first telescope or have just upgraded your camera and you're out with for a pleasant summer evening of observing and plan to get a preview of a few nebulae, stars and star clusters. The sky is clear, the seeing steady, and you are prepared to stay up all night because you don't have to work tomorrow.

Then, as you're getting your best-ever view of M8, the Lagoon Nebula, or the M15 star cluster, you notice something strange. The dim stars begin to fade. The images of the bright stars suddenly have ghostly white haloes and the view is blurring over. And finally, you can barely see anything at all.

You look at the sky. Have clouds rolled in? No. The sky is still clear. Then you take a peak at the front lens of your telescope and find a thick layer of water – dew – has condensed on your lens! How could this have happened?

You know you don't dare wipe the dew off the lens for fear of damaging the soft anti-reflection coatings. And with no other way to remove the coating of water, your idyllic observing session has come to an early end. All you can do is pack up and go home, with your ambitious observing plan left undone.

Why Does Dew Form?

Dew forms when the temperature of your telescope's lens falls below the so-called "dew point" of the adjacent air. This phenonium is often seen when you take a bottle of cold beer out the fridge on a hot day and the water molecules from the surrounding air quickly condense onto the glass like an army of ants to a new-found food source. Similarly the dew does not "fall" like rain from the sky. Rather, it condenses from the surrounding air onto any object (a beer bottle) that's colder than the air's dew point.

Severely Frosted Telescope

The actual dewpoint depends on both temperature and humidity. When the humidity is 100 percent, the dew point is the same as the air temperature. At lower humidity, the dew point is below the air temperature.

When the temperature of your telescope's lens falls below the dewpoint, the moisture in the air will condense on the exposed surface. If the dewpoint is below freezing, you get frost instead of liquid water. *(See picture with frost on LX200 corrector plate)*

Why Do Telescopes Cool Below Air Temperature?

The front lens of refractors, the corrector plate of Schmidt-Cassegrain telescopes and camera lenses are all especially prone to dew. That's because they are fully exposed to air while pointing directly into the bitter cold of outer space which, being a few degrees above absolute zero, acts as an infinite heat sink causing them to radiate away their heat faster than surrounding objects.

In warm and humid conditions when the air is nearly saturated with moisture anyway, your telescope can quickly cool below the surrounding air temperature to reach the dewpoint temperature before the air does causing condensation to form. We have all noticed the same effect on a car's windows early in the morning where the front windshield, which points toward the cold sky all night, often has a thicker coating of dew (or frost) than the side windows.

Recognizing When Dew Might Form

To prevent dew from forming, it is good to know the dewpoint and use telltale indicators for how aggressive your prevention activities must be – prevention is always better than cure. For example, grass, car windows, and any exposed metal parts will signal the dew and the "frost monster" early allowing you time to take appropriate precautions.

It is also good to note that dew does not form as quickly when air is moving like when a light breeze is blowing. If the air is particularly still, there could be trouble ahead. Or, if you are fortunate enough to have access to a site of low humidity where the dew point is unlikely to be reached, dew might not even be a concern.

Dew Prevention Techniques

The goal of dew prevention is to keep condensation from forming on a lens or mirror surface. This is accomplished by keeping the temperature of the optics a few degrees above ambient and the critical dew point.

Dew Shield

The most basic approach is the dew shield which is automatically part of most refractor and Newtonian designs. Fortunately, it can easily be added to SCTs and other de-

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signs. The simple act of holding a pocket of air close to the telescope using a dew shield slows down the cooling of the optics, keeping the lens slightly warmer as the surrounding air cools and preventing or at least delaying condensation when the surface temperature drops below the dew point. As a rule of thumb, to be effective a dew cap should be at least 1 1/2 times as long as the telescope's aperture is wide.

Dew shield on C11 Schmidt-Cassegrain telescope

Dew Heaters

The other method is to add a dew heater which is almost always necessary in moist environments or where temperature variations are to be expected due to a longer observing session. These heaters consist of small heating elements or strips contained in straps that attach around the telescope's tube, secondary mirror, viewing eyepiece or camera lens. They connect to a small 12VDC controller which modulates current pulses to adjust the temperature as required to control the amount of heat generated.

Dew Heater with Ambient Sensor and Controller

Typically, the controllers can control 4 or more dew heaters each attached a different item on the telescope. It should however be noted that generating too much heat can create air currents in the optical tube which can cause turbulence and interfere with the seeing. Therefore, set the controller to the lowest setting required to keep the surface a degree or two above ambient temperature. Some of the more sophisticated vendors offer dew controllers with sensors (Google DewBuster) that measure the temperature of your OTA and the ambient air and then pulse the current to keep the OTA just above the dew point temp. For the dedicated observer, the added expense may be worth the investment.

If you do not have a dew shield, leave the front cover on the objective or corrector plate when not in use; or pointing the telescope down from the sky will also help.

Tips for Eyepieces

Eyepieces are prone to dewing too. While warmth radiating from your face slows the dewing process, humidity from your eyeball and breath speeds it up. A tall rubber eyecup — the kind that extends above the eye lens all around — not only blocks stray light while you're observing but acts as a miniature dew cap holding a small “bucket” of warm air when you're looking away.

When possible, keep all accessory optics in a closed bag or a protective case when not in use. At the very least, leave the eyepiece cover in place until you are ready to use it in the telescope. In a cold environment, you may be able to add a chemical pocket warmer or use a towel to cover your eyepieces when not in use. Lastly, those nifty eyepiece holder trays built into telescope mount should only be used in the dry desert!

Storage of Equipment

After your night of observing or photography, it is very important to allow your equipment to thoroughly dry before it is put away in a closed storage container. If they are put away damp, the moisture has nowhere to escape may attack optical coatings and ultimately etch the glass itself. This can also happen if condensation forms and evaporates repeatedly in a sealed environment (or a telescope) over long periods of time. For this reason, the best telescope covering is cloth, which can "breathe" and let water vapor escape while keeping the dust off. And you may also want to leave the eyepiece holder covered only with cloth — just enough to keep dust and spiders out.

The usual advice is to store a telescope at the outdoor temperature to minimize tube currents when you set it up. But this old rule may need modification. Keeping the telescope a *little* warmer than the environment will tend to thwart condensation. An enclosed porch or attached garage may provide the extra few degrees you need. Really long-term storage should probably be inside your living space. Never leave a telescope in a damp basement, garage or, as a rule of thumb, any place where tools grow rusty. If your telescope is a permanent installation in an observatory, a 50W bulb shining on a telescope setup will evaporate moisture that does form on the equipment.

Silica gel desiccant will dehumidify the air in a tightly sealed enclosure or telescope. Every month or two, when the bag's indicator slip turns from blue to pink, heat the bag in a toaster oven at 300 degrees F for 3 hours to drive off the collected moisture. The more tightly you seal your tube or storage case, the less often you'll have to do this. Silica gel is available from many sources. (See: http://www.dehumidify.com/)

Summary

While water can be an insidious enemy for astronomers, a little knowledge and effective use of dew shields, heaters and caps keep it permanently at bay.

Speaker’s List for Monthly Club Meeting

Dec. 21st.	**Ryan Fraser** , Club member. Talk on Converting from CCD to CMOS Astro
Jan. 18th.	**Jim Goetz**, KW-RASC member. Talk on The RASC’s SRO Sierra remote observatory
Feb. 15th.	**Bjarni Tryggvason**. Talk on ISS projects
Mar. 15th.	**Member’s Night** (Talks to be confirmed)
Apr. 19th.	**Prof. Martin Houde**, Dept. of Physics & Astronomy Talk to be announced.
May 17th.	**Nicole Mortillaro** , Senior Reporter Science at CBC
June 21st.	**Brian *McCullough***. *Ottawa Centre Talk on Astro Sketching* a short talk Friday Night followed by a work shop on the Saturday for those who want to learn to sketch.
July 19th	Speaker to be announced.
Sept. 20th.	**Member’s Night**

Sky Events for Late November and Early December

Events

Nov. 23: Full Moon.
Nov. 27: Mercury in inferior conjunction
Nov. 30: Moon last quarter
Dec. 2: Venus greatest illuminated extent
Dec. 3: Venus 4° S of Moon, Mars 0.04° N of Neptune
Dec. 9: Saturn 1.1° S of Moon
Dec. 10: Pluto 0.7° S of Moon
Dec. 14: Geminid meteors peak, Mars 4° N of Moon
Dec. 15: Moon First Quarter, Mercury greatest elongation W (21°)

Planets

Mercury: Return to the morning sky.
Venus: Visible in bright morning twilight crescent Veus remains relatively close to Earth.
Mars: Makes exceptionally close pass just 0.04° from Neptune.
Jupiter: Re-emerges into morning twilight late in December.
Saturn: Too close to the sun to be seen.
Uranus: Well placed in the evening sky. .
Neptune: Setting in the westerns sky late in the evening.

R.A.S.C. London Centre Library — Books of the Month, November 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 November 2018 are as follows:

- *The Backyard Astronomer's Guide,* by Terence Dickinson & Alan Dyer. Revised Edition. 2002.
- *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.

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**

Star Night, Byron Northview Public School, Tuesday, October 16th, 2018

Written by Robert Duff, as Reported by Peter Jedicke and Andrew Peters

Mostly overcast skies greeted 55 children and adults for the Star Night at Byron Northview Public School, Tuesday, October 16th, 2018, 7:00—9:00 p.m. The Star Night was requested by the Grade 6 teacher. RASC London Centre was represented by Dave McCarter, Peter Jedicke, Everett Clark, Mike Costa and Andrew Peters and his son Dylan. Everett Clark brought the London Centre's 8-inch (20.3cm) Celestron NexStar 8SE Schmidt-Cassegrain and Andrew Peters and his son Dylan brought their 25.4cm Orion XT10i Dobsonian. Mike Costa brought his 25.4cm home built Truss-Tube Dobsonian.

Dave McCarter gave an outdoor digital slide presentation on the August 21st, 2017, Solar Eclipse, which was well received. Since the sky was mostly cloudy, the only objects observed were the stars Arcturus, Mizar and Alcor, globular cluster M103 and the first-quarter Moon.

Andrew Peters reported that the southern half of the sky was cloud covered but that there were some open parts to the north and northeast. Andrew directed his 25.4cm Orion XT10i Dobsonian towards the open cluster M103 in the constellation Cassiopeia, showing the children the red giant in the cluster. He discussed how the red giant was a different kind of star from our Sun and those around it in the cluster. There were intermittent breaks and thinning in the clouds towards the south allowing Andrew to point his telescope towards the Moon and give the children a sense of its geography, although seeing conditions on the whole were poor. Andrew used a Celestron X-Cel LX 9mm eyepiece (133X) almost exclusively, but also used an Explore Scientific 24mm 68 degree eyepiece (50X) in his 25.4cm Orion XT10i Dobsonian.

Peter Jedicke reported one visitor bringing an entry level 50mm refractor, which he spent some time learning how to use. The star night was over by around 9:00 p.m. after an enjoyable and informative evening with the slide presentation and some observing through telescopes despite the mostly cloudy sky.

Cronyn Observatory Public Nights & Special Events, October 15th—November 7th, 2018 2018

By Robert Duff

Cronyn Observatory Weekday Public Night, Monday, October 15th, 2018

Partly cloudy later clearing skies with cold weather greeted 36 visitors to Western University's Cronyn Observatory Weekday Public Night, Monday, October 15th, 2018, 7:00 p.m. Graduate student Hadi Papei was the event coordinator. RASC London Centre was represented by Everett Clark, Bob Duff, Peter Jedicke and RASC Regina Centre member and RASC Past President (2014—2016) James Edgar, who was

visiting London. Peter took over the visitor count from Bob early in the evening and, since there was no slide presentation, directed them upstairs into the dome.

Hadi Papei operated the big 25.4cm refractor in the dome, showing visitors 7-day-past-new Moon, using the 52mm Erfle eyepiece (84X) and then Saturn, using the Meade 28mm Super Wide Angle eyepiece (157X) and later the 17mm Nagler eyepiece (258X). Everett and Bob set up the London Centre's 25.4cm Dobsonian on the observation deck. Bob, Everett and James took turns showing visitors The Moon, Saturn and Mars (17mm Nagler eyepiece, 66X). Bob later replaced the 18mm Radian eyepiece (62X) in the 25.4cm Dobsonian and gave the 17mm Nagler eyepiece to Hadi view Saturn through the 25.4cm refractor in the dome.

Everett invited visitors to "walk on the Moon and Mars" by placing the 2 round wood and clear plastic display cases containing tiny *"Moon Rock"* and *"Mars Rock"* meteorite samples on the observation deck in front of the 25.4cm Dobsonian. Visitors viewed Mars through the 25.4cm Dobsonian, with the 18mm Radian eyepiece (62X), and Bob showed a few visitors the yellow and blue double star Albireo and a couple of people the Andromeda Galaxy (M31). The visitors were gone by around 9:15 p.m., after an enjoyable evening learning about astronomy and observing through telescopes.

International Observe the Moon Night, Cronyn Observatory, Saturday, October 20th, 2018

Cloudy skies with rain, later partly clearing, greeted 99 visitors to the Cronyn Observatory for the 9th Annual International Observe the Moon Night (InOMN), Saturday, October 20th, 2018, 5:00—9:00 p.m. This event was hosted by Western University's Centre for Planetary Science and Exploration (CPSX), in partnership with the Department of Physics and Astronomy, Western Engineering's Rocketry, the Canadian Lunar Research Network, the Planetary Society—London Chapter, and the London Centre of the Royal Astronomical Society of Canada (RASC London Centre).

The event organizer was Outreach Program Coordinator for Western University's Centre for Planetary Science and Exploration (CPSX) and Western University PhD graduate in astronomy, Parshati Patel. She was assisted by astronomy graduate student Shannon Hicks and Hadi Papei, and undergraduate student Dana Beaton. Planetary Society—London Chapter, Outreach Coordinator Kayle Hansen was at the information booth, a table with give-away items (including copies of the magazine "Planetary Report") just inside the lecture room on the right-hand side.

RASC London Centre was represented by Everett Clark, Lynn Jones, Bob Duff, Peter Jedicke, Mark Tovey and Edith Tovey. Since it was raining, Everett set up the observatory's Meade 8-inch (20.3cm) Schmidt-Cassegrain (20mm Plossl eyepiece, 100X) inside the dome so as to view through the door to the observation deck, showing visitors a no parking sign, the TV screen in the Western Sports & Recreation Center and finally, a red light on the communications tower in south London. He also set up the London Centre's 25.4cm Dobsonian inside the dome for demonstration. Peter gave one telescope talk in the dome and Bob also talked to visitors and answered questions. Lynn brought her counter and counted 82 visitors by 7:20 p.m. before leaving, and Bob continued the count for a total of 99 visitors by the end of the evening.

The program included (1) Public Talks (6:00 p.m.), (2) Moon Trivia (6:30 p.m.) and a (3) Raffle Draw (7:00 p.m.). There were various Moon themed hands-on activities (5:00—8:00 p.m.) including (1) Stomp Rockets, the (2) Impact Cratering Demo and (3) the Edible Rock Analysis downstairs in the *"Black Room"* and the (4) Moon themed Virtual Reality Station in the historic *"1940s Period Room."*

The Public Talks in the lecture room included (1) *"To the Moon and Back Again,"* by PhD graduate student Gavin Tolometti (6:00 p.m.); and (2) *"Titan: an Earth-like Moon with the Potential for Life,"* by PhD graduate student Joshua Hedgepeth (6:30 p.m.).

Since the Moon themed Virtual Reality Station was disabled with a software problem, undergraduate student Dana Beaton demonstrated the "*Sotellunium"*—a mechanical eclipse demonstration model in *"1940s Period Room,"* a recreation of Dr. H. R. Kingston's 1940 office. He also showed some planetary images on a laptop computer. Mark and Edith Tovey showed visitors the *"1967 Period Room"* a recreation of the early control room of the Elginfield Observatory to celebrate the 150th anniversary in 2017 of Confederation in 1867—Canada 150. Both "*Period Rooms"* were designed by Mark Tovey.

Shannon talked with visitors and answered questions in the dome and Everett invited visitors to "walk on the Moon and Mars" by placing the 2 round wood and clear plastic display cases containing tiny *"Moon Rock"* and *"Mars Rock"* meteorite samples on the floor. There were 5 *"Star Finder"* planispheres handed out to visitors, including 3 by Shannon and 2 by Everett. The sky partially cleared around 8:45 p.m. and Everett moved the 25.4cm Dobsonian out onto the observation deck and Everett, Shannon and Bob showed 8 visitors Mars and the 4-day-past-first quarter gibbous Moon. The visitors were gone by around 9:00 p.m. and the observatory was closed down after a very enjoyable evening learning about the Moon despite the cloudy, rainy weather.

Exploring the Stars, 10th London Guides & Pathfinders, October 22nd, 2018

Clear skies greeted 16 visitors (10 children and 6 adults) from the 10th London Guides and Pathfinders, for Exploring the Stars at Western University's Cronyn Observatory, Monday, October 22nd, 2018, 6:30 p.m. They were greeted by graduate students Shannon Hicks and Hadi Papei. Shannon gave the digital slide presentation *"The Scout / Guide Astronomy Badge"* with the title slide *"The Basics"* and fielded questions.

Shannon brought everybody upstairs into the dome and gave them a talk on the technical aspects of the big 25.4cm refractor. Hadi showed them Saturn through the 25.4cm refractor, using the 17mm Nagler eyepiece (258X). On the observation deck outside the dome, RASC London Centre member Bob Duff showed them the 6-day-past-first quarter gibbous Moon through the London Centre's 25.4cm Dobsonian, using the 18mm Radian eyepiece (62X). Shannon took the group back downstairs for the activity *"Telescope Kits,"* assembling small telescopes from small reusable kits on a table set up at the front of the lecture room.

Bob later used the CEMAX 2X Barlow lens (borrowed from the observatory's 90mm Coronado H-alpha Solar Telescope) together with the 18mm Radian eyepiece to double the magnification in the 25.4cm Dobsonian (124X) and showed the visitors the Moon, Mars and Saturn. The Guides and Pathfinders were gone by around 8:30 p.m. after expressing their thanks for a very enjoyable evening learning about astronomy, assembling telescope kits and observing through telescopes under clear skies.

Cronyn Observatory Public Night, Saturday, October 27th, 2018

Cloudy skies and rain greeted 24 visitors to Western University's Cronyn Observatory Public Night, Saturday, October 27th, 2018, 7:00 p.m. Graduate student Ben George presented the digital slide presentation *"Solar Activity & Solar Weather"* and fielded questions. Ben also gave 2 demonstrations of the *"Spectroscopy Demonstration,"* downstairs in the *"Black Room,"* with the visitors putting on *diffraction grating* glasses to view the spectra of 4 gas discharge lamps, including hydrogen, helium, neon and mercury.

RASC London Centre was represented by Everett Clark, Peter Jedicke and Bob Duff. Graduate student Shannon Hicks was telescope operator and gave the visitors a talk on the technical aspects of the big 25.4cm refractor in the dome, which remained closed due to rain. The 17mm Nagler eyepiece (258X) was used for demonstration. She pointed out the Schmidt camera and Cassegrain reflector telescope piggy-backed on the 25.4cm refractor and explained the difference between a refractor and reflector telescope. She then invited the visitors to view through the observatory's Meade 8-inch (20.3cm) Schmidt-Cassegrain (20mm Plossl eyepiece, 100X) set up by Everett Clark inside the dome so as to view out the door to the observation deck. Bob Duff supervised visitors as they viewed the computer screen visible in the Western Sports & Recreation Center windows and, later, the red lights on the communications tower in south London, through the Meade 8-inch (20.3cm) Schmidt-Cassegrain (100X).

Peter Jedicke listened to Ben's slide presentation and later talked to people upstairs in the dome. Shannon talked to visitors and brought out the 2 round wood and clear plastic display cases containing tiny *"Moon Rock"* and *"Mars Rock"* meteorite samples, which were placed on the floor for people to "walk on the Moon and Mars." Bob talked to people and kept a visitor count throughout the evening. The visitors were gone by 9:00 p.m. after an enjoyable evening learning about astronomy, despite the cloudy, rainy weather.

Exploring the Stars, Strathroy Community Christian School, Wednesday, November 7, 2018

Cloudy skies and rainy weather greeted 11 visitors, including 10 students—six from Grade 7, two from Grade 6 and two from Grade 8—and one teacher, from the Strathroy Community Christian School, for Exploring the Stars at Western University's Cronyn Observatory, Wednesday, November 7, 2018, 1:05—2:25 p.m. They were welcomed by graduate students Shannon Hicks and Ben George. Shannon presented the digital slide presentation *"Our Star: The Sun"* and fielded questions. Ben introduced the activity *"Telescope Kits"* and Shannon assisted as the students assembled and tested the telescopes from small reusable kits.

The observatory's Meade 8-inch (20.3cm) Schmidt-Cassegrain was set up inside the dome, which remained closed due to the rainy weather. RASC London Centre member Bob Duff installed the 20mm Plossl eyepiece (100X) and directed the 8-inch (20.3cm) Schmidt-Cassegrain so as to view out the door to the observation deck, towards the flashing white lights on the communications tower in south London.

When everybody arrived upstairs in the dome Shannon introduced Bob and he gave a talk on the history of the observatory and technical aspects of the big 25.4cm refractor, using the 32mm Erfle eyepiece (137X) for demonstration. He explained and demonstrated the use of the 2 small finder telescopes mounted on the big telescope, when asked by the teacher. Bob explained the Schmidt camera and Cassegrain reflector telescope piggy-backed on the 25.4cm refractor, as well as the 8-inch (20.3cm) Schmidt-Cassegrain, and the difference between a reflector and refractor telescope. He opened and closed the shutter on the Schmidt camera to demonstrate how it worked. Shannon rotated the dome for demonstration. Bob also explained the 25.4cm refractor's equatorial mount and the 2 clocks on the east wall and the difference between Standard and Sidereal Time.

Bob then invited the students to view the flashing white lights on the communications tower in south London through the 8-inch (20.3cm) Schmidt-Cassegrain (20mm Plossl eyepiece, 100X), visible from inside the door to the observation deck. The visitors were gone by around 2:25 p.m. after an enjoyable afternoon learning about the Sun and telescopes, despite the cloudy, rainy weather.