REFLECTIONS / REFRACTIONS

University Lowbrow Astronomers

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Dew Free Astronomy the Lowbrow Way

By Christopher Sarnecki

In this brief article we'll explore some of the basic principles of dew formations and low-tech solutions for keeping optics; that is lenses, mirrors, and eyepieces dew free. Before we get started, it should be noted that batteries, used to power dew zappers, and I don't get along. I have learned the hard way how not to treat the ubiquitous 12-volt, rechargeable lead-acid battery. Typically I drain batteries well below their 80% capacity, which if you know anything about rechargeable lead-acid batteries, will soon kill their ability to be rechargeable. Besides, using batteries to power dew zappers is not the Lowbrow way to keep your optics dew free. OK. I know that is a provocative statement, but I strive to keep my observing kit efficient and as lightweight as possible. Everyone knows we Amateur Astronomers pack way too much stuff in to a night's observing run. With the solutions presented here, maybe you'll agree that with a little preparation, you too can keep your optics dew free the Lowbrow way.

Next one needs to know a little about the physics of dew formation. Telescopes and optics act like heat sinks. That is, during the day they soak up thermal energy, or heat from the surrounding air. At night, telescopes and optics give off this thermal energy by radiating heat back into the surrounding cooler air. As we observe, the outside air temperature will continue to fall throughout the night. Our lenses, mirrors, eyepieces are constantly chasing this falling ambient air temperature as they radiate their stored heat into the surrounding colder air. As the nighttime air temperature drops, so does the temperature of your telescope and optics. When the temperature of your optics falls below a certain temperature (i.e. - the dew point temperature), the water vapor in the air changes into liquid water and forms on the surface of cold objects. In observing when our optics reach the dew point temperature, dew typically results, and your observing session may be over. The dew point temperature is a function of how much water vapor (humidity) is in the air. The higher the humidity level in the air the more potential for dew formation given the same temperature of the air. The dew point temperature on those humid late summer nights will occur at a warmer temperature than cooler less humid fall evenings because there is more potential for the water vapor to condense into dew. Dew can form at any time of the year except when the temperature is below freezing. Dew formation does occur when the temperature is below freezing, it's just called frost.

What to dew (pun intended)? Well one way to prevent dew from forming is to keep the temperature of our telescopes and optics from falling below the dew point temperature. Metal and other dense materials like glass (think lenses, mirrors, eyepieces) are great conductors of thermal energy. That is, dense materials like metal telescopes and optics made from glass easily radiate their stored thermal energy into the surrounding cooler air than less dense material. This thermal energy radiation can eventually drop the temperature of the scope and optics the dew point temperature. By contrast, less dense materials are slower to radiate their stored thermal energy. Years ago while our firm was designing the replacement observatory for U of M's Angel Hall, I asked our Mechanical Engineer what was the best, most cost effective way to prevent dew formation on the inside of the metal dome of the observatory. The solution was simple. In order to limit dew formation, all we needed was to add a thin layer of less dense material to the inside surface of the dome. This less dense material, or insulation slowed the transmission of the observatory's thermal energy into the surrounding colder nighttime air. Now it should be mentioned that I am not suggesting we overly insulate our scopes and optics. What we can do is to add a thin layer of insulation to our scopes and optics that will slow the radiation of the stored thermal energy. Telescopes perform best when the optics are close to the ambient air temperature surrounding the telescope. Too much insulation will inhibit the cooling of the scope.

Intermission – This microbrew review pairs late summer's/early fall's cooler temperatures with some delicious porters that will warm yur innards:

Smoked Pumpkin Porter, Sherwood Brewing Company, Shelby Township, MI, - Features roasted pumpkin, then smoked to induce a tasty porter hybrid. Very drinkable. Thanks Bro for bring the growler.

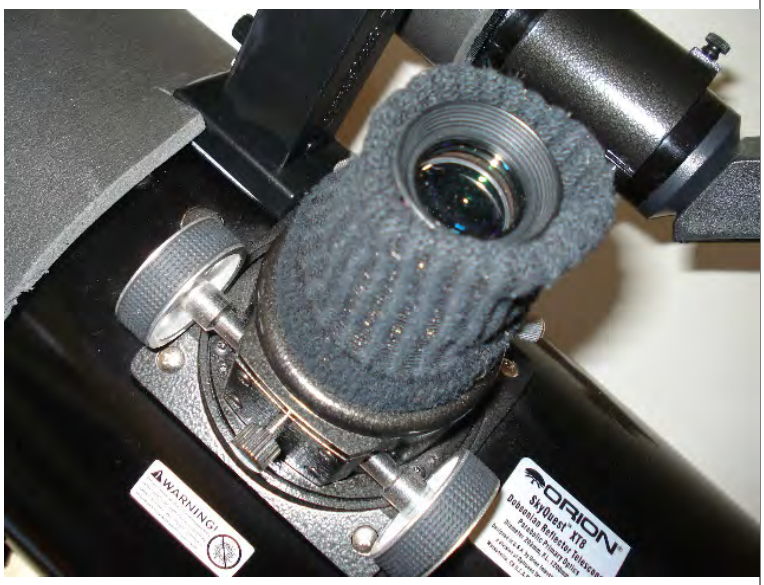
Founders Porter, Founders Brewing, Grand Rapids, MI – Billed as "Dark, Rich, Sexy". I don't know about that last item, but it is a deliciously rich almost chocolaty sweet dark porter. A great warmer for those cooler evenings.

Gonzo Imperial Porter, Flying Dog Brewery, Frederick, MD – Yes, you have seen this brew reviewed here before, but it's simply to good not to review again. Thanks. I'll have another!

So how to add insulation to our optics in ways that don't negatively affect the performance of our scopes? Here are some low cost tricks I use to keep the dew off my optics:

1. To keep dew from forming on finder scope objectives, reflecting telescope secondary mirrors (Newtonian) or lenses (think Schmidt-Cassegrain), or the zero power reflex finders (Rigel, Telrad), make a simple sleeve (dew shield) from 1/4" thick black foam plastic. Fit the dew shield over the tube of the telescope near the objective you are trying to protect. The attached pictures show examples of dew shields. Dew has never been a problem on my finder scope objective since I installed a foam dew shield. Dew shields have a secondary benefit in that they also act to shield stray light from entering the scope's optic path.

2. Protect eyepieces on finder scopes by connecting the finder scope's eyepiece lens cap to an elastic thread and then to the finder. If dew is expected, cover the eyepiece with the cap when not in use. You will never have to go looking for the cap because it is always attached to the finder.



3. Insulate eyepieces with a doubled up cotton sock with the toe cut out. Of course don't forget to wash the sock first. I read about this idea in one of the astronomy magazines then tried it out. I have to say the initial reaction was my eye enjoyed the warmer than normal eyepiece temperature until the continued drop in air temperature cooled the eyepiece past the dew point and the result was a cold eyepiece complete with a wet sock. Next time out I will experiment with some other material, perhaps 1/4" foam to insulate the eyepiece.

Following the suggestions in this article will only delay the temperature of the optics from reaching the dew point. But that may be long enough for your night under the stars or until Mother Nature decides it is time to send in the clouds. Dew shield solutions and insulating your optics are not necessarily the best way to keep your optics dew free. That involves dew heaters powered by batteries. But these ideas do provide low cost, low-tech solutions that keep the dew at bay on most nights.

Observing Chair

Jim Abshier

During outreach events like the monthly open house nights on Peach Mountain, observing usually consists of people looking through the telescopes for at most a few tens of seconds. A standing position at the telescope is adequate for this type of viewing. For detailed examination of an object, and particularly if the object is being sketched, however, a comfortable seated position is preferred. I like to sit down when I observe and have used a combination of various chairs, stools and even a cushion on the ground to find a comfortable position at the eyepiece. I finally decided that what I needed was an adjustable observing chair. Such chairs can be purchased, but they are expensive, and I figured that I could save a lot of money by building my own. An internet survey yielded several designs for home-made observing chairs. These examples provided me with some ideas on how to build mine. The simplest example found is called the Denver Chair, which uses standard 2x4 lumber and plywood. The chair seat is held in place by friction material normally used for stair steps. Other designs used notched wooden rails to provide more certain control of seat position. Examples of this approach include the Catsperch and Walt's Custom Observing Chair.

I liked the simplicity of the Denver Chair, but wanted the more positive control of the notched board approach. For my observing chair, I incorporated (shamelessly stole) ideas from all of these chairs. The basic structure of my chair is 2x4 lumber, and the seat is held in position by notched boards. A picture of my observing chair is shown in Figure 1. The notched boards are made of 1x4 lumber with the notches produced by a ¾ inch drill and drill press. A fixture on the drill press held the lumber in place for drilling the notch (half of a hole). The seat is made of 1x10 and 1x4 lumber with ¾ inch dowels. The seat could be made of plywood, but I happened to have some 1x10 lumber available. The brace is 1x2 lumber with a hinge at one end. The other end of the brace has a hole reinforced by an aluminum plate. The hole in the brace slides onto a ¼ inch bolt to hold it in place.

Figure 1 My Home-Made Observing Chair

The observing chair is adjustable to accommodate a range of observing positions. Figure 2 shows the chair adjusted for observing near Zenith, and Figure 3 shows the chair adjusted for observing objects near the horizon. Most of the observing chairs I found on the Internet used sturdy wood such as red oak. I made mine out of cheap pine lumber, so it will probably not hold as heavy an observer. It seems to be adequate for my 170

pounds. At least it hasn't broken yet. The chair can be folded for storage or transport to an observing site. Figure 4 shows the observing chair in folded configuration.

Figure 2

Figure 3

I have found this observing chair to be very easy to use. It is nice to be able to quickly adjust the seat to a comfortable height for a wide range of viewing positions. I find that a comfortable seated position is almost essential for detailed examination of objects in the telescope eyepiece.

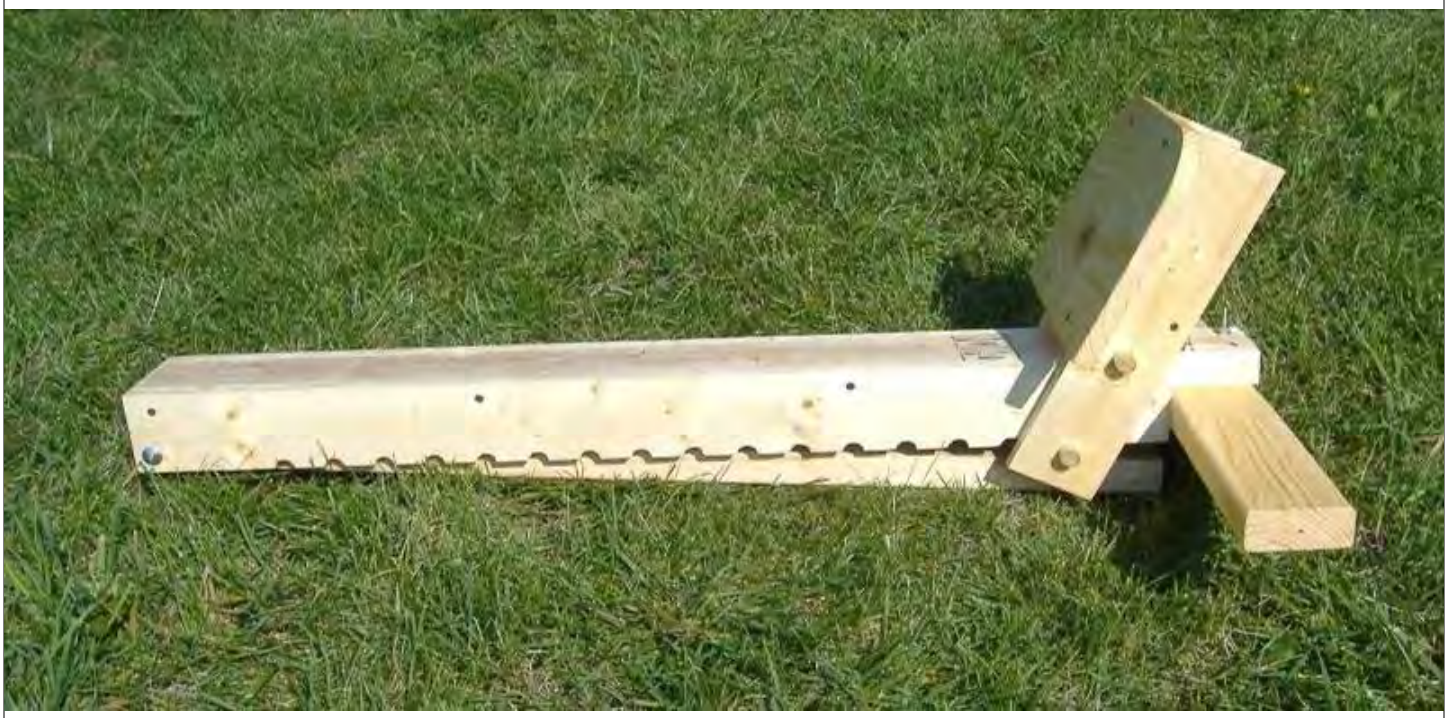
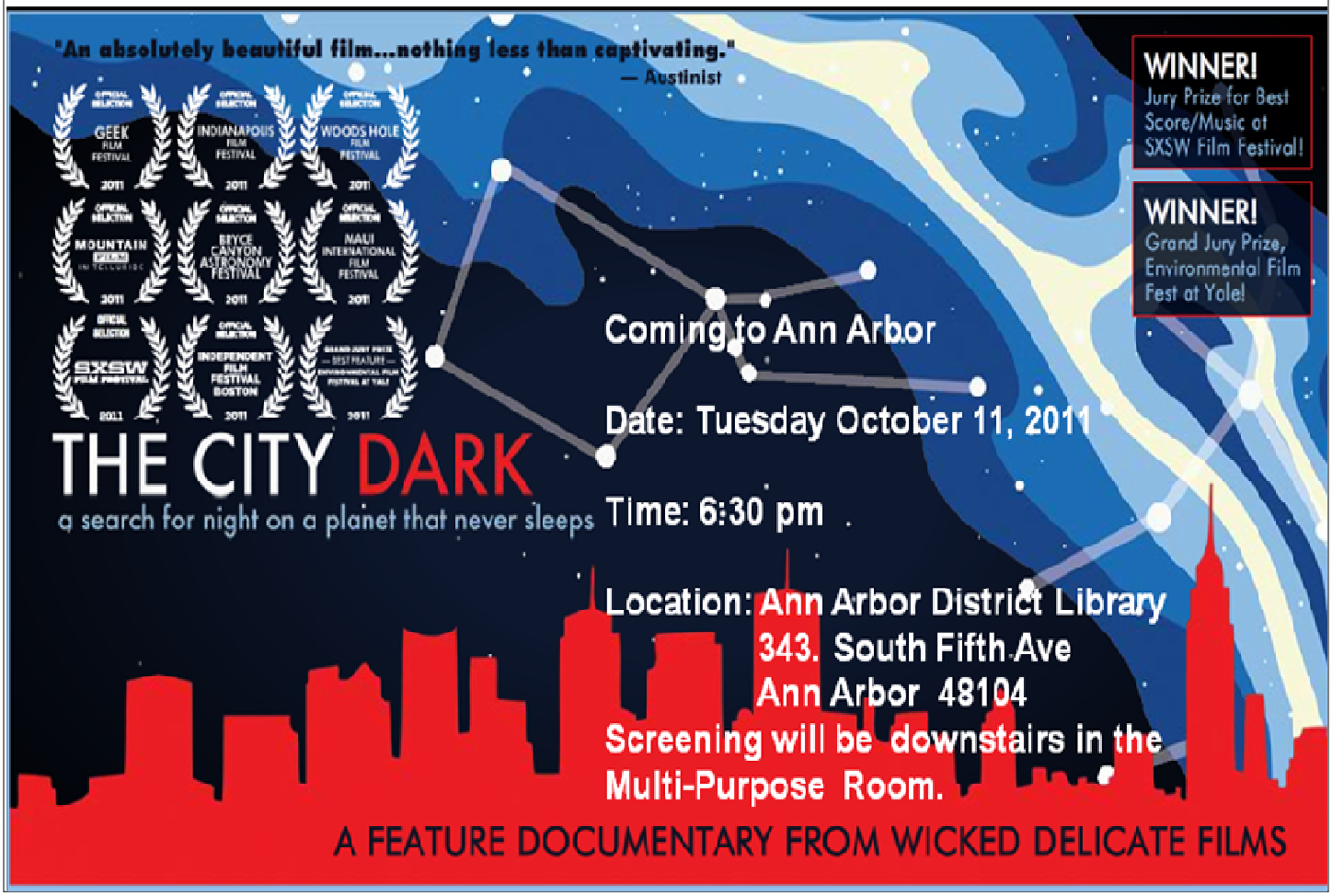


Figure 4 Observing Chair Folded for Storage or Transport


"An absolutely beautiful film...nothing less than captivating."
— Austinist
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INDIANAPOLIS FILM FESTIVAL 2011
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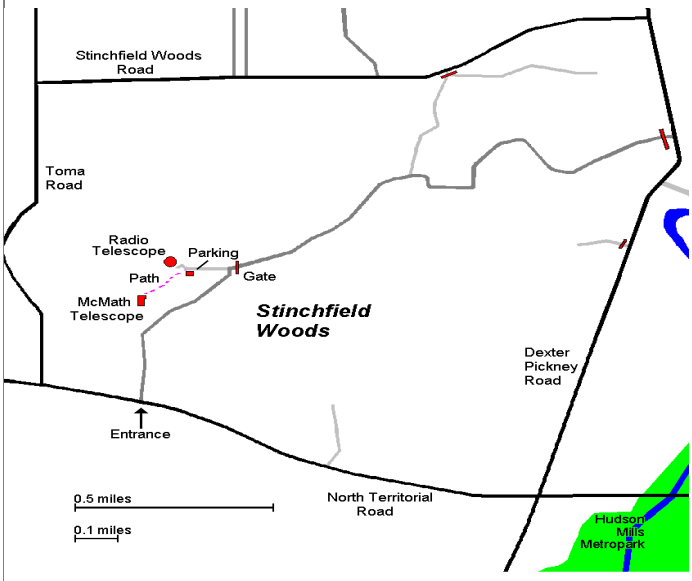
SXSW FILM FESTIVAL 2011
INDEPENDENT FILM FESTIVAL BOSTON 2011
GRAND JURY PRIZE BEST FEATURE ENVIRONMENTAL FILM FESTIVAL AT YALE 2011
WINNER!
Jury Prize for Best Score/Music at SXSW Film Festival!
WINNER!
Grand Jury Prize, Environmental Film Fest at Yale!
THE CITY DARK
a search for night on a planet that never sleeps
Coming to Ann Arbor
Date: Tuesday October 11, 2011
Time: 6:30 pm
Location: Ann Arbor District Library
343. South Fifth Ave
Ann Arbor 48104
Screening will be downstairs in the Multi-Purpose Room.
A FEATURE DOCUMENTARY FROM WICKED DELICATE FILMS

Places & Times

Dennison Hall, also known as The University of Michigan's Physics & Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. Dennison Hall can be found on Church Street about one block north of South University Avenue in Ann Arbor, MI. The meetings are usually held in room 130, and on the 3rd Friday of each month at 7:30 pm. During the summer months and when weather permits, a club observing session at the Peach Mountain Observatory will follow the meeting.

Peach Mountain Observatory is the home of the University of Michigan's 25 meter radio telescope as well as the University's McMath 24" telescope which is maintained and operated by the Lowbrows. The observatory is located northwest of Dexter, MI; the entrance is on North Territorial Rd. 1.1 miles west of Dexter-Pinckney Rd. A small maize & blue sign on the north side of the road marks the gate. Follow the gravel road to the top of the hill and a parking area near the radio telescopes, then walk along the path between the two fenced in areas (about 300 feet) to reach the McMath telescope building.



Public Open House / Star Parties

Public Open Houses / Star Parties are generally held on the Saturdays before and after the New Moon at the Peach Mountain observatory, but are usually cancelled if the sky is cloudy at sunset or the temperature is below 10 degrees F. For the most up to date info on the Open House / Star Party status call: (734)332-9132. Many members bring their telescope to share with the public and visitors are welcome to do the same. Peach Mountain is home to millions of hungry mosquitoes, so apply bug repellent, and it can get rather cold at night, please dress accordingly.

Membership

Membership dues in the University Lowbrow Astronomers are $20 per year for individuals or families, $12 per year for students and seniors (age 55+) and $5 if you live outside of the Lower Peninsula of Michigan.

This entitles you to the access to our monthly Newsletters on-line at our website and use of the 24" McMath telescope (after some training).

A hard copy of the Newsletter can be obtained with an additional $12 annual fee to cover printing and postage.
(See the website
http://www.umich.edu/~lowbrows/theclub/
for more information on joining the club).

Membership in the Lowbrows can also get you a discount on these magazine subscriptions:

Sky & Telescope - $32.95 / year

Astronomy - $34.00 / year or $60.00 for 2 years

For more information contact the club Treasurer. Members renewing their subscriptions are reminded to provide the renewal notice along with your check to the club Treasurer. Please make your check out to: "University Lowbrow Astronomers"

Newsletter Contributions

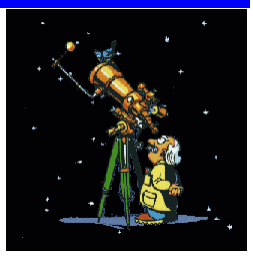
Members and (non-members) are encouraged to write about any astronomy related topic of interest.

Lowbrow's Home Page

http://www.umich.edu/~lowbrows/

University Lowbrow Astronomers

Reflections & Refractions



Website

www.umich.edu/~lowbrows/

Check your membership expiration date on the mailing label