Chapter 7

Physical and Environmental Challenges of Astronomy in Later Years

I was lying on my bed staring at the stars,
then I asked myself:
"Where the heck is the ceiling?"

—Instagram joke

For backyard astronomers, the warm humidity of summer observing gives way to the cooling air of autumn. The celestial objects of summer also give way to clusters, nebulae, and galaxies of the fall. The cool brisk autumn then gives way to the cold and darkness of winter, with a whole new set of deep sky objects to observe. Cold winter then yields to spring, with galaxies to explore. Then a return to the warmth of summer. The Earth's position in its orbit around the Sun also changes the perspective of the sky. The summer has astronomers gazing into the heart of the Milky Way, while in the colder months the attention is more towards intergalactic treats.

As the seasons change, the type of clothing changes, especially for older amateur astronomers. Older astronomers must be extra attentive to dressing for the climate and environment. The older one gets, the less tolerant of temperature changes and humidity one is.

The Threat of Hypothermia

Older observers have learned that the cold weather feels colder than it felt at a younger age. This is a major concern, because the older body responds to the colder weather differently than at a younger age.

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Older adults can lose body heat faster. A big chill can turn into a dangerous problem before an older person even knows what's happening. This is called hypothermia. Hypothermia happens when your body temperature gets very low. For an older person, a body temperature colder than 95° can cause many health problems such as a heart attack, kidney damage, liver damage, or worse. The aging astronomer must use a strategy for preparing for an observing night in a warmer fashion than a younger self would.

As the backyard astronomer experiences the cooling weather, some lessons of physical preparedness are required.

1. Never underestimate the cooling temperatures. Since observing through a telescope means sitting quietly with eye to eyepiece, the chill of the night can have an adverse effect. Dress in layers and warmer than necessary. Wear several layers of loose clothing when it's cold. The layers will trap warm air between them. Don't wear tight clothing because it can keep your blood from flowing freely. This can lead to loss of body heat. Coats, hats, gloves, and blankets are the dress code. Hunting and camping stores are a good source for cold weather gear, such as heated socks and heated gloves and warming packs. (Figs. 7.1 and 7.2)
2. Ask your doctor or pharmacist how the medicines you are taking affect body heat. Some medicines used by older people can increase the risk of accidental hypothermia. These include drugs used to treat anxiety, depression, or nausea. Some over-the-counter cold remedies can also cause problems.

Fig. 7.1 Celestron Firecell Hand Warmer/Power Packs (Celestron)

Fig. 7.2 Cabelas' battery powered Hunting Socks (Cabelas)

3. When the temperature has dropped, drink alcohol sparingly or not at all. Alcoholic drinks can cause the loss of body heat. Limit the amount of beer and wine. It's best that no alcohol is consumed.
4. Make sure to eat enough food to maintain body weight. A poor diet might result in having less fat under the skin. Body fat helps to insulate the body to stay warm.
5. Some illnesses may make it harder for the human body to stay warm. These include problems with the body's hormone system such as low thyroid hormone (hypothyroidism), health problems that keep blood from flowing normally (such as diabetes), and some skin problems where the body loses more heat than normal.
6. Use discretion during cold weather. Sometimes the skies are clear and it's extremely cold outside. Without a cloud layer to hold in the Earth's heat, a clear night allows the ground heat to radiate into the air and the environment becomes extremely cold. Sometimes it's not worth the risk of spending an extended time sitting at the telescope eyepiece.
7. Observe with a partner, friend, or companion just in case there is a health issue. If in the backyard, have someone check on you periodically. Don't go to remote locations alone.

Observing in the Fall and Winter

For many backyard astronomers, the winter is prime time for observing. The skies are dark and transparent because of low humidity. No insects are crawling up the legs or flying and buzzing around the head. The trees have lost their leaves and

allow more sky to be seen. And rising from his summertime slumber, Orion rises above the horizon to welcome the astronomer to another wintry observing night.

But boy, is it COLD! There are challenges to amateur astronomy during the winter, all surrounding the fact that it's COLD! The two main challenges are keeping warm and keeping astronomy equipment functioning.

First and foremost, check the weather forecast and plan for dressing as if it is at least 20° colder than the weatherman predicts. Why? This is not a sporting event where a person is in constant motion, and consequently generating internal body heat. Astronomy is an activity that requires lots of sitting or standing at an eyepiece. Without proper precautions, all sorts of winter nasties can occur—shivering, frostbite, exposure, and worse. Dress in layers, wear a winter cap or hat, cover the ears, wear gloves, several layers of socks, boots, and long underwear....imagine Ralphie's little brother in the classic movie *A Christmas Story.* By dressing in layers, if it's too warm, just peel off a layer.

When it's cold outside, eat a good meal before going out into the field. Also, go to the bathroom before bundling up. Even if the observing site has a rest room or port-a-potty nearby, using the facility can be a challenge at night. Peeling down the layers to "eliminate" is a nuisance and will cause a loss of all the warmth built up.

Outdoor sports supply stores sell wonderful hand-warmer packs. These work. When hands get cold, these chemically activated packets will do wonders in warming up fingertips. Electric battery powered hand warmers are also available.

If the winter observing is done in the backyard at home, take breaks from the eyepiece to go inside and warmup. Just so long as it's dark inside the house to preserve night vision, there is no harm in warming up.

However, out in a dark country site, away from creature comforts, observe while the comfort level is good, but pack it in when the cold becomes a problem. Don't be a hero, this isn't a competition. Don't worry, the sky and the stars will be there on another night.

As far as the telescope equipment is concerned, there are a few preparations and precautions to take with cold temperatures of the winter. The cold weather rules for your telescopes are:

1. Let the telescope and eyepiece acclimate to the ambient temperature. Going from a warm home or car to a cool outdoor environment will require at least 30 min to adjust to the cooler air. If the temperature differential is greater, be prepared for a longer adjustment period. Open tube telescope designs, such as Newtonians and classic Cassegrain designs, will adjust to the ambient temperature readily. Closed tube designs such as refractors and catadioptric telescopes will take longer to adapt to the ambient air temperature.
2. Beware of dewing. As the temperature drops, optics can attract a layer of dew. There are two ways of combating dew: dew caps for the front of the telescope, and dew heater devices to gently maintain the temperature of the optics a few degrees above the dew point. Avoid observing objects directly overhead, since that position will accumulate dew on the optics. Once infected with dew, a brief exposure to the warm air of a hairdryer may help, but then the optics will have to acclimate to the ambient temperature all over again.

3. Rechargeable batteries should be fully charged. Fresh batteries should be installed if disposable batteries are used. Cold weather lessens the peak power of the batteries and shortens the length of use.
4. Beware of fogging, and condensation. It is easy to fog over eyepieces and finderscopes by inadvertently breathing on them. Don't breathe on your eyepieces or finderscopes.
5. Early autumn, the bugs and insects that bite and sting may still be a problem. As the weather gets colder, some remaining denizens may find a warmer home in eyepiece cases, telescope cases, and telescopes and mounts. Check all equipment before packing it in for a night.
6. If the user is mechanically inclined, special lubricants that work well at temperature extremes should be used on telescope mounts, focusers, and any other mechanical parts. Conventional oils and greases will thicken and become stiff in cold temperatures. Nothing is worse than being unable to focus the telescope because the focuser is frozen in place! If not mechanically inclined, seek out the nearest telescope dealer to help.

Heat Stress and Older Adults

The aging astronomer is particularly vulnerable to the problems of extreme heat, since all astronomy activities with a telescope are performed outdoors. Older bodies lose their ability to regulate temperature well. As with hypothermia, some medications may also interfere with the bodies' thermostat in adapting to high temperatures. Solar astronomers are especially affected during the heat of the summer. During some heat waves, even in the evening hours, the older astronomer must contend with warm temperatures and high humidity. A heat index in excess of 90–100° will stress the aging body. Heat exhaustion and the deadly heat stroke must be avoided by older people, especially for backyard astronomers.

Here are the different levels of heat stress to be watchful of and their treatments:

1. Heat rash, also called prickly heat, may occur in hot and humid environments where sweat cannot evaporate easily. When the rash covers a large area or if it becomes infected, it may become very uncomfortable. Signs and symptoms include a rash characterized by small pink or red bumps; irritation or prickly sensation; and itching. Heat rash may be prevented by resting in a cool place and allowing the skin to dry. To combat heat rash, keep skin clean and dry to prevent infection and wear loose cotton clothing. Cool baths and air conditioning are very helpful, and some over-the counter lotions may help ease pain and itching.
2. Sunburn is a familiar summertime malady. Solar astronomers are particularly vulnerable to sunburn. Redness, pain, and in severe cases swelling of skin, blisters, fever, and headaches can occur. There are ointments for mild cases if blisters appear and do not break. If breaking occurs, apply dry sterile dressing. Serious, extensive cases should be seen by physician.
3. Heat cramps (mild) are painful spasms usually in the muscles of the legs and abdomen, accompanied with heavy sweating. Use firm pressure on cramping

muscles, or gentle massage to relieve spasm. Give sips of water. If nausea occurs, discontinue use.

4. Heat cramps (prolonged) are painful muscle spasms that occur when someone drinks a lot of water, but does not replace salts lost from sweating. Tired muscles are usually the most likely to have the cramps. Signs and symptoms are cramping or spasms of muscles that may occur during or after the work. To treat heat cramps, drink fluids. A Gatorade or a similar sports drink can be consumed to replace the bodies' electrolytes. If the cramps are severe or not relieved by drinking a sports drink, seek medical attention.
5. Fainting usually happens to someone who is not used to working in the hot environment and stands a lot. Moving around, rather than standing still, will usually reduce the likelihood of fainting. Signs and symptoms include a brief loss of consciousness; sweaty skin, normal body temperature; and no signs of heat stroke or heat exhaustion. In a fainting situation, the victim should lie down in a cool place and seek medical attention if he or she has not recovered after a brief period of lying down.
6. Heat exhaustion can be recognized by heavy sweating, weakness, while the skin is cold, pale, and clammy. The victim's pulse becomes thready. Fainting and vomiting can occur. Get the victim out of sun, lay the victim down, and loosen their clothing. Apply cool, wet cloths. Fan or move the victim to an air-conditioned room. Give them sips of water. If nausea occurs, discontinue the water until it subsides. If vomiting occurs and continues, seek immediate medical attention.
7. Heat stroke (or Sunstroke) is the exact opposite of hypothermia, characterized by a high body temperature (103 °F or higher). Like hypothermia, heat stroke can be deadly. Watch the absence of sweating, with hot red or flushed dry skin, rapid pulse, difficulty breathing, strange behavior, hallucinations, confusion, agitation, disorientation, seizure, rapid and strong pulse leading to possible unconsciousness and coma. HEAT STROKE IS A SEVERE MEDICAL EMERGENCY. SUMMON EMERGENCY MEDICAL ASSISTANCE OR GET THE VICTIM TO A HOSPITAL IMMEDIATELY. DELAY CAN BE FATAL. Move the victim to a cooler environment. Reduce body temperature with cold bath or sponging. Use extreme caution. Remove clothing and use fans and air conditioners to aid the cooling process. If temperature rises again, repeat process. Do not give fluids. Persons on salt restrictive diets should consult a physician before increasing their salt intake.

Dressing for Success in Spring and Summer

As far as observing in the environmental conditions of spring and summer, here are a few things to remember:

1. Wear comfortable clothing. Spring clothing will tend to be heavier than summer clothing because of the slight nip in the springtime air. Summertime clothing

must be chosen to provide comfort in warm humid weather, but also provide some shielding from insects.
2. Use insect repellant. Some camping references recommend insect repellant with DEET. Some sporting goods or camping stores sell shirts and pants treated with an insect repellant or insecticide. Check with camping friends or even Consumer Reports magazine on the effectiveness of these treated clothes.
3. If possible, have an oscillating fan sweeping the observation area. Mosquitos are weak flyers and have difficulty finding their intended targets (i.e., you) when fighting against a wind (i.e., the oscillating fan).
4. Humidity may cause a decrease in the sky transparency. But the seeing conditions (the steadiness of the sky) will likely be excellent. Often, steady but slightly hazy conditions will yield good planetary observing.
5. The warmer weather and the resulting sweat that is generated by the human body can cause dehydration. Keep on hand plenty of liquid refreshments and stay hydrated. As tempting as it is, don't imbibe in alcoholic beverages. Drunk observing doesn't mix well with expensive eyepieces and telescopes.

Many of these environmentally caused health issues point to a common sense preventative and potentially lifesaving idea. Don't go observing without a partner or observing companion, especially to remote locations. The victim may not recognize the symptoms of hypothermia or heat stroke, but the companion will, and can take lifesaving action. Don't observe alone.