

## Feature Articles

### Articles de Fond

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# How To Stay Warm at a Cold Eyepiece

by Tony Wallace, Hamilton Amateur Astronomers  
(bravhart@interlynx.net)

**W**inter is one of my favourite seasons. No, I am not deranged, but I have learned to harmonize rather than fight with the weather it brings. I have spent many a weekend winter camping and enjoyed it thoroughly, day and night, even in temperatures of  $-35^{\circ}$  C.

That learning came at the cost of numbness, shivers, and generally living through my mistakes in the early boldness of such ventures. Last winter I was able to confirm that the same techniques that warmed me on the trail and in camp would keep me cozy at the eyepiece of my telescope. Here, then, is some of what I now know about dressing for comfort as applied to winter observing.

#### HOW WARMLY SHOULD I DRESS?

Observing consists mostly of sitting or standing around as opposed to walking, chopping wood, *etc.* Add to that the effects of radiating our heat into the inky night sky and you have a recipe for disappointment. The cure is simple. We need only to dress somewhat warmer than if we were outside doing some physical activity. In order to be comfortable we need to dress for a temperature about 10 degrees lower than the air temperature. That, by the way, is good advice for observing at any time of the year, but particularly so in winter.

#### KNOW THINE ENEMY!

Rather than provide you with a list of solutions, I would like to explain some of the processes at work that counteract efforts to keep warm and the basic remedies for them. Once you understand what is happening, you become able to recognize symptoms and devise your own solutions to problems that may arise while you are outside on a winter's night.

The major culprit in making us feel cold is our perspiration. We are all familiar with the perspiration of summer, but what about at other times? It may surprise you to know that we perspire continually, all year round, all day long. It seems our skin is very partial to life in a tropical rain forest and tries to create the same humid conditions wherever it may be. In fact our comfort demands such conditions. Skin loves moist air and sets about making the same environment by perspiring into the adjacent atmosphere. The perspiration emerges from

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our pores as water vapour. We are generally unaware of the process and only feel a change when it forms on the skin as a film of water and then evaporates directly from the skin's surface. In that case, the perspiration is being used for cooling rather than just avoiding dryness.

The process of evaporation, you may recall from high school physics, requires an additional amount of heat (latent heat of vaporization is the technical term) to bring a liquid to its gaseous state at the same temperature. It gets that heat from the skin's surface, thus cooling us in the bargain. The problem is that we do not want to lose heat on cold winter nights, so we put some clothing next to our skin to feel warmer. Well, perhaps...

It depends on what that undergarment is made of. The most popular fabric for underclothes is cotton. We like its soft feel, and it is both inexpensive and durable. The difficulty is that it is just about the worst thing one can wear next to the skin on a cold night. You see, cotton likes water. That is, cotton absorbs and retains water, which is why we use it in the best towels. One reason it feels so nice is that it is much easier to have a rain forest next to your skin when what you are wearing is sopping wet. So, getting back to our skin, cotton soaks up the water and holds it like a jug. Then, in order to stay warm we not only have to keep ourselves warm, but that wet garment must be kept warm, too. What we need is a fabric that abhors water and would rather dump it out than retain it. Polypropylene is the best known of such hydrophobic fabrics. It is a bit more

expensive than cotton and you have to be careful to wash it in cold water and hang it to dry (otherwise you will be lucky if it will fit the cat after a good hot wash and dry). We refer to such fabric as having the ability to wick the water away — and that is just what happens. The perspiration is conducted away from the skin, often before it can even condense. Condensation, if it occurs at all, takes place on the outside surface of the garment undetected by our lily whites and we feel warm.

### THE LAYERED LOOK

We have seen how important it is to choose the right kind of undergarment fabric for staying warm in winter. The undergarment (winter lingerie, if you will) is part of a system of layers designed to maximize our heat retention and to stay cozy while at the eyepiece or some other activity. The garment ought to fit snugly. We will refer to it as Layer 1.

Next comes Layer 2, the insulation layer (or the fluffies).

Its purpose, as the name states, is to insulate us from the cold of night. Garments are better if they fit loosely, not tightly. Appropriate fabrics are characteristically bulky, lightweight, and able to trap still air in their tangled fibres or tiny air pockets — air movement being a no-no for heat retention. Roughly speaking, they can be divided into two types, natural and synthetic. Each of them has pros and cons.

The most popular natural fabrics are down and wool. Down is “nature’s own snugly blanket” and the most efficient insulator for our purposes. High-grade goose down is able to provide more insulation value per unit weight and per unit volume than any other material for such an application. It has, however, one serious drawback. If it ever gets damp, or, God forbid, wet, you have big trouble! It takes days to dry out and its insulating value plummets to the point of making it useless in that state. Down is definitely not hydrophobic. Remember the perspiration that passes through Layer 1? If it collects in Layer 2 (and it will) you are in for discomfort. Down is beautiful stuff and a great temptation, but I have come to avoid it in clothing for that very reason. Well, that, and the fact it is so expensive that they want my firstborn for it.

Wool, on the other hand, is relatively affordable and, while not having as high an insulation value as down, does a pretty good job in clothing. One can always make up for its lower insulation value by putting on two sweaters, right? I will say more about that later.

What about dampness? Wool has the wonderful quality of retaining much of its insulation value even when it is wet. It is much more forgiving than down. Think of it as having built-in insurance. I like it. My skin does not. Many people, like myself,

have skin that rebels against dressing up like sheep. We either put up with the itching, tickling, and general torture, or find something else.

Enter the synthetics. There are now on the market several great synthetic fabrics with excellent insulation qualities. Names like Hollofil, Quallofil, and Thinsulate come to mind. They are all hydrophobic and a good choice for Layer 2. My favourite, though, is Polartec by Malden Mills. The stuff is very lightweight, has a luxurious fluffy feel to it, does not pill (the technical term for forming little balls of fabric on the surface after repeated use, a.k.a. nubbles), and comes in an endless array of colours and patterns. It is so hydrophobic that, if you get it completely soaked, just squeeze out the water and it will hang dry in twenty minutes. It will even dry while you are wearing it. I had the privilege of confirming that empirically on a fall canoe trip once, but that is another story.

Okay, there you have it. Some Layer 2 facts and personal biases. The last thing to remember about Layer 2 is that it is

far better to wear multiple thin layers than a single thick one. The wisdom in that is as follows: if you are warm to the point that you are feeling perspiration, then you can (must) peel off a layer or two until your brain turns off the water tap. If not, you continue to push moisture through Layer 2 at a high rate. Even the best will have trouble keeping up with such a process,

and that will leave you with a jacket full of water to keep warm. So, Layer 2 is simply as many thin layers of insulation as you will need for the coldest temperature of the night in question.

Layer 3 (the wrapper) is an outer shell with two important functions. It must be able to keep the wind and rain from getting to you, and, it must allow the moisture that has been travelling out through Layers 1 and 2 to escape from your skin. We do not do much observing in the rain, so that is not a concern here, but keep it in mind for other outings when buying.

Wind? If it is clear but windy, astronomers stay inside, not! Even the slightest of breezes will meander through Layers 1 and 2 and kiss you with frozen lips. We need to keep that air movement, however small, outside Layer 3. At the same time, Layer 3 must allow our inner moisture free access to the universe. Those two requirements may seem to be mutually exclusive in a single garment. They used to be, but not any more.

There are now a number of high-tech synthetic fabrics that can do just that. The best known of them is undoubtedly Gore-Tex. Gore-Tex is as waterproof as a rubber glove, yet will allow water vapour or air to pass through the micropores in its waterproof barrier. If absolute waterproofing is not a big concern for you, then consider a fabric known as Super Microft. It is what the manufacturer calls “water repellent.” My experience with it has been that it will keep you dry long enough to get to

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shelter, if you run! I like it because it is an excellent wind barrier, lightweight, soft and comfortable, and, above all, is a good breather that will vent my own moisture to the world outside. Get clothes a size larger than you normally would, and they will be perfect at the eyepiece or any other cold outing. Such specialty fabrics, and consequently the garments, are a bit pricey, but consider the following.

I have two shells: one is Gore-Tex, the other is Super Microft. My last Gore-Tex jacket is ten years old and still going strong. (Actually, I grew out of it.) I do not own or need a raincoat, overcoat, leather coat, parka, snowmobile suit, fall or spring jacket, K-way shell, or umbrella; I have avoided a lot of purchases over the years. The two jackets mentioned above are functionally superior and look good as well, at least to those who know the magic they hold!

### EXTREMITIES IN EXTREME WEATHER

So far we have discussed materials for covering our torso, arms, and legs, but what about our head, hands, and feet? They are generally subject to the same three-layer concept, but require some special attention. The hands and feet, and to a lesser extent the head, are indicators that warn us that we need to adjust our clothing. They are the first discomfort we feel when we are not quite dressed for the part.

#### HEAD

There is a lot of truth in the old adage: if your feet are cold, put your hat on. I have read and heard various reports that the amount of heat lost from an uncovered head lies between 25% and 40%. Even conservative estimates indicate that is in the "Wow, that's a lot!" category. It may seem at first that it is a detriment. To the contrary, it gives us a range of control over our body heat just through changing headgear. So, get out your earmuffs, headbands, balaklavas, berets, babushkas, turbans, hoods, and what-have-you. They constitute your arsenal of fine-tuning weapons with which you can maintain a balance of warmth and ventilation for the rest of your body (including those cold feet).

We must not forget about ventilation of the ever-present perspiration making its journey from skin to the outside air. Be aware that bundling up your head may impede the process and result in condensation in Layer 2 of your headgear. I find it useful to think of the head and its garments as a sort of chimney conducting heat and moisture in an upward direction. My various combinations of headgear then become a damper that regulates the chimney action. Too little, and you lose a lot of heat; too much and you retain heat but your head ends up wet (like when the fireplace damper is closed too far and smoke fills the room).

I tend to dispense with Layer 3 on headgear when observing since it allows better moisture flow and winds will be low or absent at such times. Layer 2 is supplied by all manner of non-

cotton headgear. I must admit to a personal neglect of Layer 1 in cold weather observing because I do not like snug-fitting headwear. Nevertheless, I do own a polypropylene balaklava which gets use in very cold and windy conditions. The key to headgear is to have a number of options available and to vary them to suit conditions at the eyepiece.

#### HANDS

Your hands, and in particular your fingers, will be required, at a minimum, to change eyepieces and make fine adjustments to your telescope throughout the observing session. At the other extreme, you may be continually thumbing through charts and sketching the objects that you find. As a result, they are quite vulnerable to the icy wiles of Old Man Winter.

The range of available handwear includes three- and five-fingered gloves, slit-fingered gloves, fingerless gloves (a.k.a. urchin gloves, like the ones that Bob Cratchit wore in Charles Dickens' *A Christmas Carol*), mitts, combination glove-mitts, and the ever-useless and hard-to-find muff. They are available in a mind-boggling array of materials from polypropylene to neoprene; Polartec to what-the-heck. The easy way out of the maze is to apply our three-layer principle to handwear. The basic warmth requirements are met with a polypropylene inner glove, a Layer 2-type overglove that insulates, and an outer mitt of Gore-Tex or some other breathable material. The last layer is a mitt since mitts are always warmer than gloves.

There is, however, another important criterion affecting our choice, and that is the need to be able to make fine mechanical adjustments. That can be as frustrating as picking fly droppings out of pepper while wearing boxing gloves unless we make allowances. That is where the particular style of hand-wear comes in. Fingerless gloves are a boon in such situations. They actually have only the finger tips missing and so allow good tactile sensation as well as keeping most of your hand warm at the same time. They are excellent choices for Layer 2 and should be worn over a full-fingered Layer 1. Layer 3 can be quite a nuisance because it has to come off each time you have to fiddle with things. A good candidate for such an outer layer is a Gore-Tex mitt with a Velcro closure applied to a slit across the palm. They are made for the express purpose of freeing your fingertips for work without having to remove the mitt.

My own experiences at the eyepiece have resulted in my choices as follows. I wear full-fingered polypropylene inner gloves. Over them I wear a pair of wool urchin gloves. The combo has me comfortable in most cases, however, I occasionally resort to my "cold killer combo." I replace the inner gloves with a pair of fisherman's neoprene slit-fingered gloves. Neoprene is the type of closed-cell foam rubber used in wet suits. The fingertips (and thumb) are slit on the palm side at the first joint, allowing me to peel them back and expose my fingertips for fiddling about with filters and such. Bits of Velcro keeps the "flaps" out of my way until I am ready to cover up again. That provides me with the ultimate in warm hand-wear and dexterity. "But it is

not breathable!” you say. You are right, but read on a bit further.

## FEET

Feet are unforgiving! Let us face it, the threat of cold feet is responsible for many of us refusing to even go outside in winter. Feet are the first to complain when they get cold — and they do it so-o-o-o well, don't they? Well, we can look at it positively too. The same attribute makes them the early warning sensor in detecting heat loss and signaling the need to adjust our garb. Do we need to put on our hat?

The above assumes we are properly attired in the foot department. Starting with Layer 1, we would wear a pair of polypropylene, or other wicking, socks, and, over them, one or more insulating Layer 2 types of socks. Our winter boots would suffice for the windproof Layer 3, except that they are often not breathable at all, or are grossly inadequate for the task. That fact alone is the cause of nearly all cold feet at the winter observing site. Extreme countermeasures may be called for.

Recall the neoprene gloves? They are as impenetrable as rubber gloves, because, well, that is what they are. What they do is prevent any moisture from leaving the surface of my skin. The skin on my hands perspires enough to create its beloved “rain forest,” and then stops, as long as I am not too active. The insulating Layer 2 has absolutely no way of getting damp from the inside, and we are not about to observe in the rain. The layer is known as a vapour barrier when used next to the skin. It is a technique used by avid campers in extremely cold conditions. They (I) go so far as to spend the night using a vapour barrier sleeping bag liner to eke out a ten to fifteen degree advantage over life without one. The vapour barrier is a type of Layer 0. It can be used to advantage when you are not physically very active. Get too active and you will drown in your own perspiration!

Getting back to our feet, it is the same secret weapon we will deploy to guarantee that the familiar cozy feeling prevails. All we need is to don a couple of plastic bags as the first layer and cover them with Layer 2 socks. Do not laugh, but I find bread wrappers are great for this, the kind without holes in the bottom. The extra length makes all the difference. I first discovered it while on a fall camping trip with the local motorcycle club. It was a cold and rainy return from wherever we had been and I was intrigued to see the more experienced among us snap up all of the bread wrappers left over from our food supplies and wear them inside their socks. One has to be a quick study in a bike club. I found it made a big difference on the ride home. Are you too shy to try it? Nobody is going to see anyway.

I have not yet needed to resort to that level of footwear while observing, but some people are different in their, let us say, cold tolerance limits. My wife, for example, would pack snowmobile boots for a trip to hell and would still complain of cold feet. I suppose that is exactly what she will give me for writing that — hell and cold feet!

My personal solution to cold feet is a bit more conventional.

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I start with polypropylene socks, then a layer of wool or synthetic socks. I will include a second layer of them if I am to wear my size twelve hunting boots. I take a size ten shoe, but the size twelve boot keeps the Layer 2 socks thick and fluffy! My preference, though, is to wear a pair of moon boots over the polypros and a single pair of wool socks. Moon boots are a wonderful invention fashioned directly after Inuit mukluks. They are available at many specialty outdoors stores. They consist of a mid-calf length upper of ripstop nylon that has been stuffed with Hollofil or some other synthetic insulation. That is attached to a thick sole of Evazote (the yellow spongy closed-cell foam that some sleeping pads are made of) that has been finished by covering with heavy Cordura material for durability. The ripstop nylon seems to form enough of a wind barrier and still allows moisture to escape freely. They are the best when the snow has no chance of melting.

## FUEL FOR EXTRA HEAT

Now that we have learned how to dress ourselves, there is one more area to cover. While we are observing we need to consume copious amounts of hot drinks. They go a long way to make a cold night a pleasure for all but the most obstinate curmudgeons.

A word about alcohol — don't use it. There is nothing wrong with a glass of wine or a “wee dram” of the aqua vitae. I would not refuse one. There is, however, a danger in downing a few of them. The ability to sense subtle changes in temperature is easily impaired without one even noticing. By the time you become aware of the cold, the best thing to do is pack up and go home because, in reality, you are probably well down the road to hypothermia, from which some never return. Enough said.

The usual hot chocolate, Ovaltine, and herbal teas are fine companions. Be aware that strong tea and coffee result in a net loss in the body's water reserves. Take water along to drink as well. Hot Dr. Pepper is great, as is hot fresh cider, mulled if you like (skip the rum). Here is one of my favorite cold night recipes. I usually make two litres.