

## H2O So Cold – Staying Dry in the Outdoors

*By Ira Orenstein*

One beautiful autumn day back in the early 1980s my wife Karen and I climbed Wright's Peak in the New York's Adirondack Mountains. The summit is above timberline and it supports the growth of Deer's Hair Sedge which is a tall grass that in the fall turns a beautiful shiny golden brown from which its appellation is derived. On this day Wright's peak also lived up to its reputation for hosting high winds. All in all it was a gorgeous summit day.

During our descent we were greeted by a park ranger who was spryly working his way up the mountain. It immediately became evident from his name badge that we were in the company of the legendary Department of Environmental Conservation forest ranger Pete Fish who has spent many years patrolling the Adirondack High Peaks trails. Upon surveying us he politely suggested that cotton jeans were inappropriate attire for active life in the mountains. He explained that cotton holds lots of water and dries very slowly, material characteristics that can predispose the ill-prepared to the development of hypothermia under adverse conditions. He suggested that we acquire clothing that contains synthetic materials as they absorb less water and dry quickly. He bade us farewell and we each continued on our way. We have since improved our wardrobes.

It was a frigid weekend at Alpine Camp in Alpine, New Jersey. I was co-leading a Cub Scout winter "cabin camping" trip. On this early morning the temperature was near 0 degrees Fahrenheit and was not expected to climb past the single digits. Having read the weekend forecast "like a good scout," I decided to capitalize on the extreme conditions and create a teaching opportunity and brought along a pair of cotton jeans. Pete Fish would have been proud of me as I immersed the jeans in water and proceeded to drape it over a branch. "Scouts, I want you to all observe what happens to the jeans when subjected to such low..." and before I could complete my sentence, I was absolutely shocked to find the pants rendered rock hard and completely useless. It didn't take long for the children to find good use for the frozen garment as they played catch, taking turns flinging it to each other like a Frisbee.

It was typical November day in 1994 and my good friend Jerry and I were climbing West Kill in the Catskill Mountains. The temperature was a little below freezing and there was a mixture of shallow snow and ice on the trail. We crossed over a stream on a wooden bridge and headed up the mountain. The day was going very well and as we approached Diamond Notch Falls on our return, we decided to take a "shortcut" and cross the stream on a log that spanned the two banks. The water was quite turbulent, creating a beautiful mist. As I straddled the log and made my way across (like sitting on a horse) I almost flipped over when I suddenly realized that the mist created a thin film of black ice on the bark. I carefully completed my crossing and immediately turned around to alert Jerry...there he was hanging like a peccary upside down from the tree suspended 3 or 4 feet over the water. He hung on for as long as he could and... plunk. He was now trying with great difficulty to extricate himself from the stream. The combination of slippery conditions, strong current and the frigid water's numbing effect slowed his efforts. Upon assisting him out of the stream our next goal was to get warm clothing out of Jerry's pack. We were now surprised to find that the zippers had "flash frozen" as a result of the

pack's brief immersion. It was only after repeated efforts that we were able to coerce the zippers to allow us in. Jerry bundled up and we were soon enjoying the warmth of our vehicle with only damage to our pride as the small price paid for lessons learned. Shortcuts don't always live up to our expectations. Hiking alone is ill advised. And with regard to zippers, I opt for packs with cinch closures when hiking in cold conditions.

In the summer of 2004 our family decided to vacation in the Canadian Rockies. Part of this trip involved hiking nine miles to a remote lodge that provided a bed, breakfast and dinner. It also served as a base to access other more remote hikes. When I hike my *après* ritual is to ice my knees and any other joints that are seeking attention. I was unable to obtain ice from the lodge that only had primitive resources, so I opted to immerse myself in the local glacial stream. The ice cold water became tolerable as my body adapted and my mind was distracted by the beautiful panorama of wildflowers in the foreground and a backdrop of towering glaciated peaks. The ambient temperature was probably about 70 degrees Fahrenheit. After 15 minutes, I emerged from the stream and anticipated a well deserved dinner at the lodge. After drying off I noticed that I was beginning to shiver. Soon my entire body was shaking and my teeth were chattering so violently that I was seriously concerned that I might fracture my dentition. Ironically, I did not feel cold as would have been expected. I went back to our cabin to change into warmer clothing and prepare for dinner. The violent shivering would not cease. "Come on," said my wife Karen; "we'll be late for dinner." I commented that there would be no way I could join her for dinner until my hypothermic condition abated. "You go ahead and I'll catch up." I donned multiple layers of clothing and climbed into the bed and under the covers...no luck. Finally, I put on my fleece hat and presto!... the violent shivering came to a halt. Soon I was enjoying good food and conversation with like-minded interesting people.

In retrospect, I found the entire shivering episode to be quite fascinating. Yes, the water was cold. That said, I felt relatively comfortable wallowing in the stream in the warm ambient air that was bathed in sunlight and I had no idea what was happening to me. I have certainly hiked in sub-zero Fahrenheit temperatures that actually felt painfully bitter cold but never recall shivering so violently in those conditions. The only time I remember feeling hypothermic like this was as a young child after fishing in a 16 foot boat in the middle of a bay on Long Island in pouring rain with the ambient temperature probably in the 40s. Clearly, getting wet is the most potent way to reduce core body temperature, worse even than being exposed to bitter cold air. It is for this reason that temperatures in the 30s-50s are so conducive to the development of hypothermia. The reason for this arises from the physics of heat transfer. Specific heat is defined as the amount of heat needed to raise the temperature of 1 gram of a material 1 degree Celsius. Water has a high specific heat, meaning that it takes a lot of energy to raise its temperature. When 2 objects of different temperatures are in contact with each other, heat will transfer from the object of higher temperature to the object of lower temperature. In winter, if you are outside and touch a metal pipe and a piece of wood, the pipe *feels* much colder even though they are both the same temperature. This perception is due to the fact that the metal has a higher specific heat than wood and is therefore pulling more heat from your body in an effort to become the same temperature as your body. When I was wading in the glacial stream, the water was drawing vast quantities of heat from my already enervated body, the result of the day's long hike, even though the upper half of my body felt relatively comfortable in the warm ambient air.

In late December 2012 our family decided to climb Esther Mountain in the Adirondacks (adjacent to Whiteface Mountain, a well known ski resort). The Weather Channel forecast in Saranac Lake called for snow showers with temperatures in the twenties (Fahrenheit) and high winds. It snowed and was windy throughout the hike with temperatures probably in the teens on the summit. I briefly removed my mittens to help my younger son Jeremy with mittens he had trouble getting back onto his painful hands as the straps needed adjustment. I took two quick photos and proceeded to place my mittens back on when to my surprise I noted that the last inch or so of my pinkie finger was completely numb and hard to move. As I headed down the mountain the feeling (and pain) began to return to my finger in approximately ten minutes. For the next two weeks it felt as though I had dipped the tip of my pinkie in Crazy Glue. The dead and damaged superficial layers of skin peeled off during those two weeks. I tried to recount how this incident could have occurred so quickly considering that I have hiked in colder conditions many times in the past. In retrospect there were many risk factors at play in this situation. It was a humid day (it was snowing and my hands were probably sweaty from the climb). It was cold, with temperatures probably in the teens. It was windy, which accelerated evaporative cooling. My core may have been getting chilled in the short time that we were on the summit. The body wants to protect vital organs and it diverts blood away from the extremities to the core. The climb up took several hours and we may not have consumed adequate calories and liquids, both vital to maintaining homeostasis. The risk of developing frostbite can be minimized by maintaining a comfortable body temperature, staying dry, keeping exposed skin protected from the wind and by eating and drinking regularly. There is a tendency to not want to stop to eat and drink in the winter, particularly on cold, wet, and windy days. This can be overcome by creating a schedule of planned brief stops, maybe at one hour intervals that is strictly adhered to. Plan another stop just prior to going above tree line. This break can be rather tricky because often you are adjusting layers, changing traction, eating, drinking and answering nature's call, all leading to a longer than desired respite. It may be best to take two short breaks as you approach tree line to divide the chores. Familiarize yourself with the use of your equipment (i.e. donning and removing crampons) in the warmth of your home. Easily digestible quick energy foods that remain chewable at freezing temperatures are most appropriate. Food's response to freezing temperatures can be tested by throwing it in your freezer. Stay alert to signs of impending frostbite and check any exposed skin of your hiking companions for blanching.

The Appalachian Mountain Club manages a system of huts that are spaced a day's hike from each other. The huts provide dinner, bunks, breakfast and friendship in idyllic surroundings. The crew (or croo, as they are informally referred to) usually consists of a hut master, assistant hut master and a number of other members depending on the size of the hut. Crew members are generally in exceptional physical condition by summer's end as they routinely haul 100 lb. loads from the nearest road to resupply the huts. Crew members generally spend their free time hiking and exploring the White Mountains.

The book *"Not Without Peril,"* by Nicholas Howe (2000, 2009, The Globe Pequot Press, Guilford, Connecticut, AMC Books) is a collection of stories about mishaps that occurred throughout the years in the notoriously harsh White Mountains of New Hampshire. One account details an above tree line rescue attempt atop Mount Madison during a raging storm in late

August of 1986. Madison Hut lies 0.6 miles from the summit of Mount Madison. The crew at the hut became aware of a 52 year old man suffering from exhaustion and hypothermia who was unable to move. One of the crew members set out into the storm to attempt to find the victim and assist him into the hut. The victim was located but could not be coaxed to move. The rescuer determined that the victim's condition was dire and that the only way to get him to the hut would be with the assistance of a rescue team. When the crew member returned to the hut he was completely exhausted. He would not be in any condition to be a part of the rescue team. The author carefully detailed the chronology of the events associated with the rescue attempt. It was striking to me that this very strong crew member was outside of the hut for a period of only one hour and twenty-five minutes. It does not take long to succumb to the onslaught of extreme combinations of cold temperatures, high winds and heavy rain.

It becomes quite obvious that one of the most important factors necessary to stay homeostatic (where the body is comfortable and in equilibrium) is to stay dry. This is best achieved by developing a layering system that permits temperature modulation by adding and shedding layers as necessary. There are a multitude of quick drying garments on the market that employ polyester, wool and other synthetic wicking and insulating materials. Wind and rain are kept at bay by topping the system off with a waterproof shell that is preferably breathable, meaning that it allows vapor generated from overheating and from condensation to escape out through the material but does not permit the entry of water droplets as in the case of rain. In bitter cold weather, staying comfortable is achieved by bringing lots of insulation that covers all body surfaces. Layer as needed and avoid overheating as that will generate moisture that can wet the skin and clothing and become a problem later in the day when you are coming down the mountain and the temperature drops. Bring enough protection to survive an unexpected overnight bivouac. Stay dry!!