

THE HAZARDS OF HILL WALKING

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The hazards of hill walking are not all topographical or meteorological as anyone who has been pursued by an amorous or aggressive stag during the rutting season can testify. One of the greatest hazards of hill walking is not recognising the fact that we are engaged in a potentially lethal sport. Acting sensibly with regard to the weather can greatly reduce any risks taken. Weather related hazards include low level cloud, resulting in poor visibility, mist and fog, strong to hurricane force winds, low temperatures coupled to wind strength producing deadly wind chill and hypothermia, heavy rain causing swollen bogs, burns and inland lochs, not to mention sodden overwear and underwear, heavy snow together with strong winds resulting in blizzards, white-outs, deep drifts and avalanches. Even excess exposure to sunshine runs us the risk of sunburn and skin cancer. At high altitudes, burn times are shorter due to the thinner and clearer air. This means more of the harmful ultra violet rays striking our delicate skin, especially if we are foolish enough to expose it when the rays can be reflected from a snow cover. Even high temperatures can be a problem leading to dehydration.

Another hazard some would argue is just as unlikely as sunstroke in Scotland is thunder. Although thunderstorms are fairly rare in this country, they do represent a definite hazard to the hill walker and most people will encounter them at some time in their hill walking career. This article hopes to illustrate weather patterns and signs leading to their development and ways of minimising this threat to our comfort and well-being, or to put it more realistically to life and limb.

What is the first thing you do when caught out in the hills in a thunderstorm? Well if you believe in God you quickly make your peace in a good Act of Contrition for all your past sins. If not you get out your lucky rabbit's foot and give it a good rub. Unlike lightning, thunder is not much of a hazard. It is the noise made by the rapid expansion of air when a giant electric spark carrying up to 250,000 amps at potential differences of up to several million volts heats the air in a millisecond or less to over 30,000 degrees Celsius. That is five times warmer than the surface temperature of the sun which is only around a mere 6000 degrees Celsius. The sound of thunder is not usually a problem except to your eardrums and nerves, though the resultant shock waves have been known to throw nearby people in the air and strip them of their clothes. So that's one good reason to avoid thunderstorms unless you want to become an involuntary nudist or naturist when out in the hills. If the thunderstorm is not directly overhead and you are not struck by lightning, the thunder clap might be your first warning of the impending storm. Since sound travels much slower than light, the time difference tells us the distance the storm is from our present location. A time

lapse of three seconds represents a distance of one kilometre, or for the older generation, myself included, five seconds represents one mile. Lightning at night can be seen from 80 kilometres away but thunder, depending on atmospheric conditions and topography can be heard only up to about 19 kilometres.

For those technically minded people with a knowledge of the current upper level wind profile, radar studies have shown that thunderstorms travel at about 20 degrees to the right of the mid tropospheric wind. They are usually complex in structure, consisting of several cells one to five miles in width. As old cells decay on the left flank, new ones grow on the right side. They will often last for less than half an hour, but with new cells developing, a storm can last for several hours over any one place. Sods Law For Hillwalkers will dictate that this one place is likely to be where you are climbing in the mountains that afternoon as they are usually associated with rising parcels of excessively heated air. This is not always true. Sometimes thunderstorms occur embedded along or ahead of a slow moving cold front (See Chart 1).

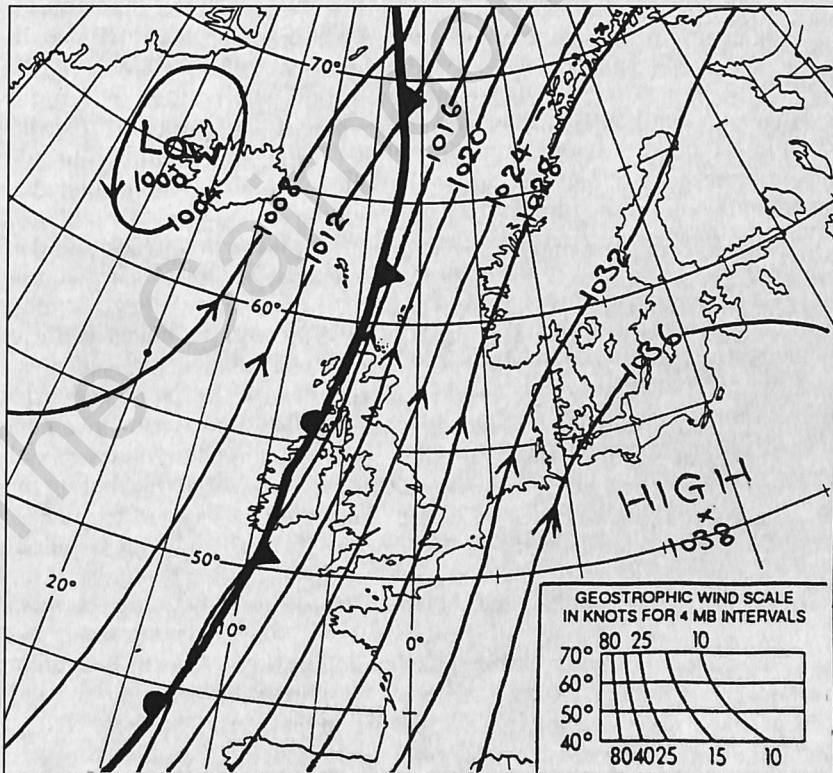


Chart 1 A slow moving summer cold front producing outbreaks of thundery rain along and ahead of the front

They can also be triggered by convergence of wind flow caused by topography or by the collision of cold down draughts from adjacent cells displacing warm moist air aloft. The resulting Cumulonimbus cloud will extend to heights greater than approximately 3,300m over Scotland in winter, to greater than say 6,000m in summer. So we can immediately forget any scatter-brained idea of climbing above these clouds as we might do with low level Stratus and Stratocumulus cloud that we might encounter, trapped below a temperature inversion in an anticyclone. Over tropical regions Cumulonimbus clouds have been measured with tops above 20,000m. You will need more than your own executive jet to get above that height. If you're not of the opinion that they are most impressive of clouds, you must agree that Cumulonimbus are certainly the most awesome.

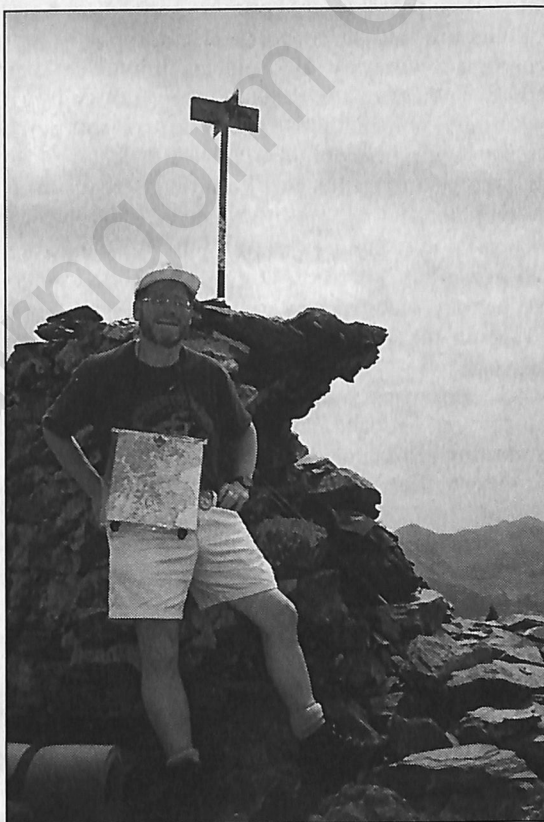
Getting back to earth, if you see a flash of lightning with a 9 second time gap before you hear the thunder, this means the storm is 3 kilometres (1.5 nautical miles) away. If the storm is travelling towards you on a 30 knot wind, (34.5 mph), this means that the storm will be overhead in (1.5 divided by 30) hours, i.e. 3 minutes. Not a lot of time to say another Act of Contrition or another rub of the lucky rabbit's foot. That lightning doesn't strike the same place twice is a fallacy. Just ask any occupant of the Eiffel Tower in Paris or the Empire State Building in New York. These buildings are struck on average between 20 and 30 times each year. Lightning tends to strike projecting buildings, hill top cairns or tall rocks. Hence these are not the best locations for shelter unless you are fitted with your own lightning conductor to safely take the massive electric charge to earth.

Even meteorologists have been caught out in the mountains in a thunderstorm. On a recent holiday in the Pyrenees I witnessed every surrounding summit cairn being struck in turn in a space of about 45 minutes. Standing on one of these peaks, Pic de Cataperdis at 2805 metres above mean sea level a short time before, I decided it was extremely wise to rapidly descend to a mountain hut I could see some 900m or so below. Relief at reaching this mountain refuge just as the first rain and hail was beginning to fall was quickly turned to dismay or even shock (pun) when I discovered to my horror that it was an iron structure with a damp wooden floor. I have read in various books that one of the safest places to be in a thunderstorm is seated in your car where you are insulated in what is effectively a metal box. However I wouldn't want to put this theory to the test especially if I was driving down the A96 at 60 mph. But the thought that this hut would make a good lightning conductor with the knowledge that lightning can pass through moisture in rock cracks, tree sap, floor boards etc., sometimes exploding in the process of almost instantaneous boiling, expansion and vaporisation of water soon dispelled any notion of staying. I very quickly decided it was more of a risk to remain rather than brave the elements of wind, rain and hail. After half an hour of pummelling from hailstones the size of garden peas I began to question the wisdom of my decision but now with hindsight it was probably the best thing

to do in the circumstances. The newspaper headline, WEATHERMAN FRIED IN STORM HE FAILED TO FORECAST may seem kind of funny to some people with a perverted sense of humour but it wouldn't do my reputation as a meteorologist any good or even help in the writing of my obituary. Not that I would be around to worry too much about it. I couldn't even claim I was doing research for an article in the Cairngorm Club Journal.

During my rapid descent from the metal hut I saw the nearby, (2 kilometres away), Pic de Coma Pedrosa, Andorra's highest peak at 2946m, being struck by a giant lightning bolt. On climbing this peak two days later I discovered that the concreted summit cairn had been partially blown apart, probably by this particular strike. (See Photograph below)

The cairn had been reported as intact by a Holiday Representative who had climbed this mountain only a few days before. It is extremely unlikely that the damage had been caused by other natural causes such as wind or by any juvenile delinquent for that matter. Anyhow these delinquents having climbed the peak would be too knackered to do much damage and they can always find easier targets be it in Andorra or Aberdeen. When I eventually arrived panting at Pla de l'Estany, the next mountain refuge, I was greatly relieved to find it constructed of stone. By this time the storm had almost finished. Dripping wet and still sore from the hail, I was



Brian Davey standing beside the shattered summit cairn of Pic de Coma Pedrosa

welcomed by a friendly group of Dutch students who I suppose had become bored climbing their local sand dune.

So having safely survived this episode, the best course of action I can recommend when on a ridge or summit in thundery weather is to descend if possible as quickly as you can to a less exposed place where the risk of a lightning strike is much smaller. Avoid elevated places, high rocks and isolated trees. If you are on open level ground and if it is not possible to descend both safely and quickly, the best advice is to crouch down, keeping your head as low as possible but don't lie down. The theory of this course of action is that large amounts of electrical charge concentrate at the surface in upward projecting objects near the point of a lightning strike. Therefore you must minimise the contact area you have with the ground by keeping your feet together with your hands on your knees and wait for the storm to pass at the same time trying to avoid brown pants. The warning signs to alert you of an imminent strike is your hair beginning to stand on end, skin beginning to tingle and you may also hear crackling noises. You may even glow with St Elmo's Fire. This is an electric corona discharge named after the patron saint of sailors, who in days of old were awe-stricken when this phenomenon was observed around the masts of their sailing ships. However, instead of a lightning stroke, this is a luminous, greenish or bluish halo of continuous sparks that appear around objects. This discharge is also sometimes seen around power lines, pylons and the wings of aircraft. Although usually quite harmless, when St Elmo's Fire is seen and a thunderstorm is nearby, a lightning strike may occur in the near future especially if the electric potential gradient is increasing. If this is the case make yourself scarce. Retreat immediately to a less exposed place. If you are lucky enough to escape and you see someone else being struck, immediately apply CPR (cardio-pulmonary resuscitation) if they are unconscious and not breathing, since this is the state in which a lightning strike normally leaves its victim.

Apart from the immediate warning of an approaching or nearby storm by a thunder clap, one should take heed of recent local forecasts and be on the look out for signs of rapid build up of large anvil shaped cumulonimbus clouds which in Air Mass Thunderstorms will develop in unstable air of maritime origin away from any weather fronts. They will bubble up in the late morning or afternoon triggered by rising thermals over the warming land surface, assisted by dynamic uplift of the air mass as it moves over the mountains. Their life begins in the early morning as fair weather cumulus, resembling benevolent small balls of cotton wool. But that will all change with time. A typical sequence of cloud development associated with thunderstorms is shown in the sketch overleaf.

Other indicators are heavy rain or hail showers falling from thick dark cloud. The tell-tale fibrous anvil cloud top is not always visible due to the presence of other clouds.

Although it is difficult to illustrate every potentially thundery situation of the synoptic weather chart, discrete, scattered afternoon thunderstorms over Scotland often develop in an unstable Polar Maritime airstream. See Chart 2 overleaf.

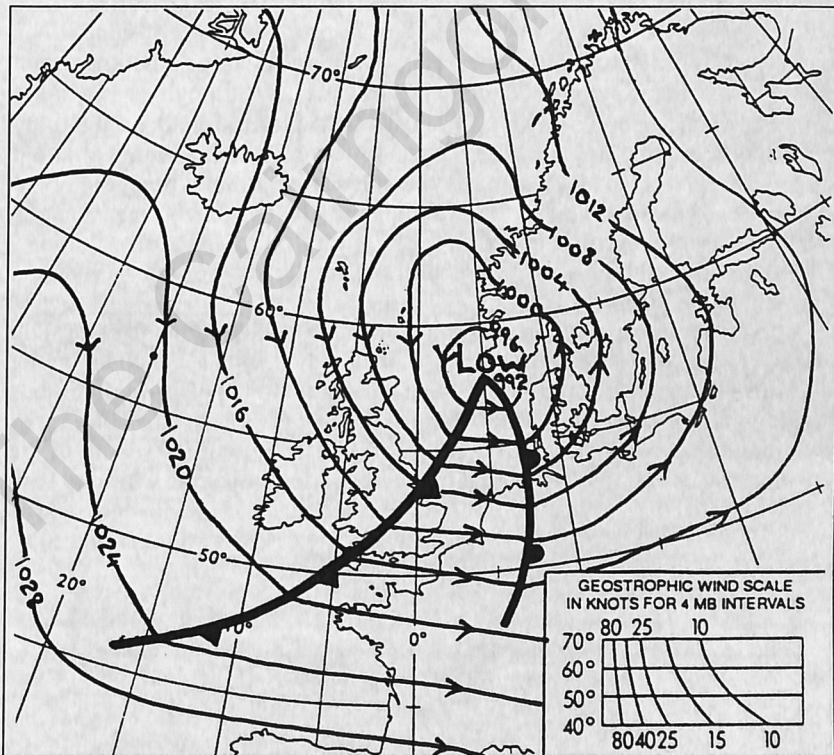
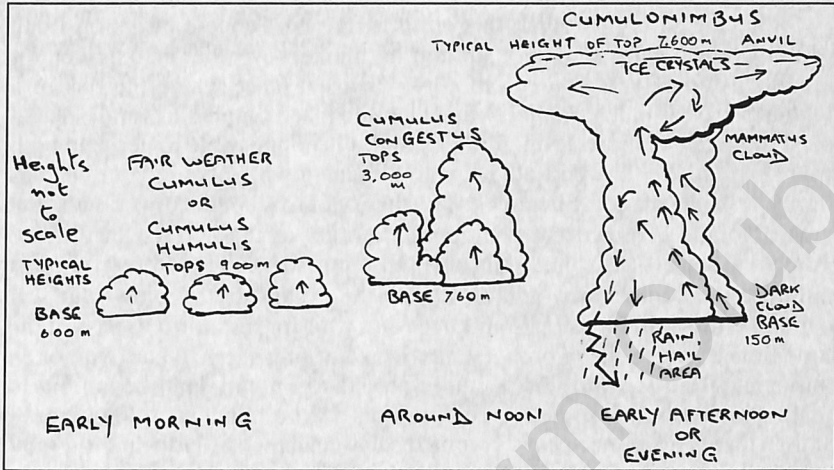
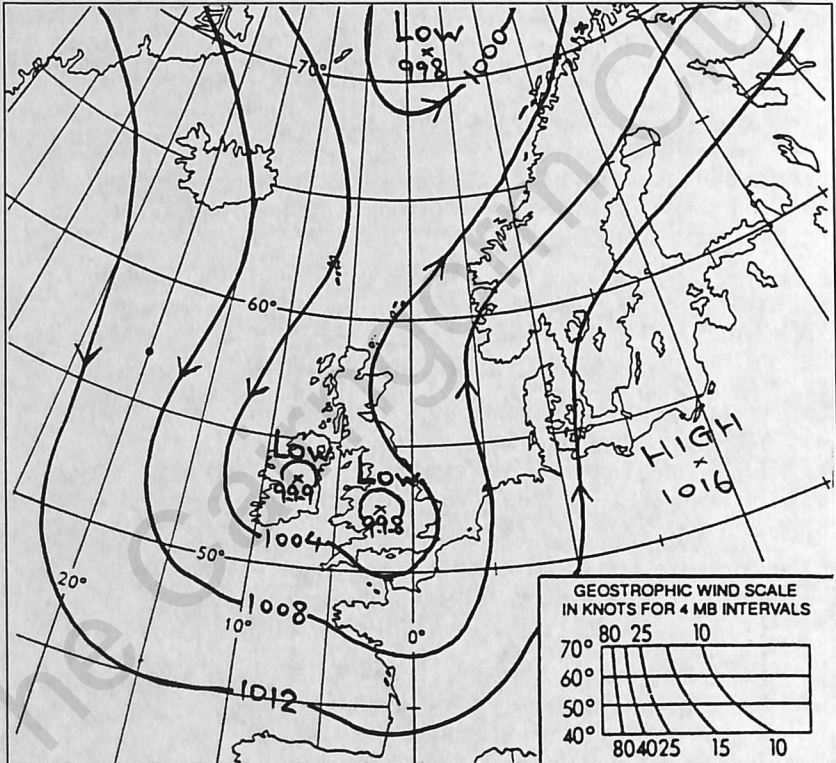


Chart 2 A deep low in the North Sea centred just to the south of Norway bringing a showery Polar Maritime airmass over Scotland

More widespread and prolonged thunderstorms with heavy rain and hail can sometimes come by day or night in summer when we have a slow moving cold front tracking into Scotland from the west to replace a very warm, moist South-south-westerly Tropical Maritime airmass. See Chart 1 again.

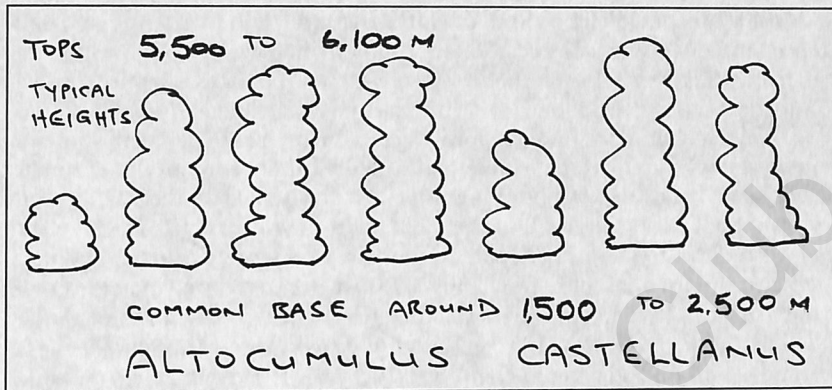
Another situation for thunderstorm development over Scotland in summer may be a slow moving area of low pressure drifting north-eastwards across Ireland and Britain. See Chart 3 below.



A slow moving area of low pressure in summer bringing widespread thundery rain from the south

In this case be on the look out for *Alto cumulus Castellanus* clouds. These are medium level towering cumulus clouds which as their Latin name suggests look like a row of castle turrets sprouting upwards from a common base typically between 1,500m and 2,500m. See the sketch overleaf.

If these clouds are observed to spread in and grow as the low pressure area approaches, (falling barometer), there is a good chance of thunder to come, be it by day or night. Hopefully for you it will be at night when you



are tucked up in bed with a good book or better still a good partner, secure under your warm, dry duvet and not in some cold, damp bothy in Scotland or metal hut refuge with a wet floor in the Pyrenees.

ON CLIMBING BEINN DUBHCHRAIG

A quiet pause amid the purple, scented heather,
 where curving interspersions of graceful bracken, feather
 highlighted richness green beneath unsullied skies,
 that spread their cloudless wrap above the eagle's cries.

And there I sat my tiredness by a pristine, crystal pool,
 a liquid mirror unequalled for clear and still reflections,
 and thus recalled the words that 'climbing's for a fool,'
 so said by those in chiding with dearth of hill connections.

But was this cold reality that I could then divine,
 for in that glassy water a face resembling mine
 looked up in brief appraisal then gave a youthful smile,
 and a voice spoke to my heart as I rested yet a while.

"I know you well, my friend, so heed not the voice of others,
 for you have learned perspective and wisdom from the hills.
 the ancient rock writ messages of Earth, old Mother of mothers,
 which brings its own deep peace far from the world's ills."

A ripple stirred the water, and face and waving frond
 were swiftly wind erased, and to Dubhchraig beyond
 I raised two grateful eyes for a hill I'd climb refreshed,
 unburdened by blind critics simplistically enmeshed.

George Philip