TECHNICAL SPECIFICATION: CLOTHING

As yet, there is no single fabric available which can keep you comfortable in all weather conditions and at all levels of physical activity. For this reason, the layering system has developed. The layering system is made up of a number of different garment layers, with each layer having different characteristics, which combine to keep you comfortable in as wide a range of conditions as possible.

There are almost an infinite number of variations on the layering system, but all are based around the same central idea. Most layering systems will work along the following lines:

1) Base Layer:

The first layer is worn against the skin; the main purpose of your base layer is to provide a substrate from which perspiration can evaporate as quickly as possible, thus keeping you dry and comfortable. The vast majority of base layers are currently made from some sort of high-wicking synthetic fabric, although recently Merino wool has become increasingly popular as a natural alternative. Some base layers are also used to provide an element of warmth in colder conditions.

Base layer fabrics are usually machine-washable and very quick-drying; this makes them very easy to look after. An anti-bacterial treatment is useful too, as it helps prevent odours; Merino is an exception to this as it is naturally odour-resistant.

Generally speaking, a reasonably close fit will maximise the wicking performance of your base layer; having said that, many people increasingly prefer to go with a looser fit 'tech tee' garment, as they tend to look better! This is especially the case in warmer conditions, where the rest of the layering system is not worn.

Cotton: Some people still wear cotton t-shirts, or similar, as their base-layer; under most outdoors conditions, this is a really bad idea. Cotton fibres absorb moisture, preventing it from evaporating and so passing out through the mid and shell layers. This is not a problem whilst you are active and warm, but as soon as you stop (when you reach the top of the hill, say, or are sitting on a ski lift etc) all that trapped moisture absorbs heat from your body, causing a significant chilling effect; at best this is uncomfortable and at worst downright dangerous.

In really hot and humid conditions, however, where there is so much water in the atmosphere that perspiration physically cannot evaporate (e.g. tropical conditions), cotton can be the more comfortable option.

2) Mid Layer:

The point of the mid layer is to provide insulation, whilst at the same time being breathable, to allow perspiration vapour from the base layer to escape. Synthetic fleece fabrics are the most commonly used to achieve this; fleece is usually reasonably light, very breathable and easy to care for. In general, a couple of thinner fleece layers are more effective than one thick one, as this gives you more flexibility in your layering system.

Most fleece material is not windproof; this means that its ability to insulate is massively reduced if not worn under something windproof (see shell layer). There are exceptions to this: some fleeces are windproof; this is most often achieved by means of a windproof membrane in the middle of the fabric. This means the fleece doesn't loose its ability to keep you warm, if worn without a shell layer; the breathability of such materials tends to be significantly lower than those without a membrane however (see also softshell).

There are alternatives to fleece; at a similar level of warmth, synthetic-filled insulated jackets are very good mid layers. These jackets tend to have a windproof outer layer, which is often more breathable than a membrane in a windproof fleece; the filling is similar to that used in sleeping bags and provides good insulation for very little weight. This type of garment tends to be lighter and packs down smaller than an equivalent fleece, making them ideal when weight and pack size are an issue. As they are windproof, this type of garment does not reduce in warmth when worn without a shell layer.

Down jackets generally provide the highest level of warmth of any insulating garment. They always have a windproof outer and are commonly worn without a shell layer as, if it's cold enough to need one, there's a good chance the temperature is below freezing, so rain becomes snow and won't wet the jacket! The only real snag with down is that is has to be kept dry (unlike all the garments already mentioned) if it's to insulate you properly. For this reason, it is common to find down garments with highly water-resistant outers, to help keep the down dry. Down garments tend to provide the highest warmth-to-weight ratio of any insulating layer.

3) Shell Layer:

The key function of the outer layer is to provide a windproof barrier, so that the mid layer can provide maximum insulation. The vast majority of shell layer garments are also waterproof; given the tendency of the British weather to be very wet, this is not really all that much of a surprise!

An accurate fit of the waterproof shell layer is quite important: Too tight a fit and freedom of movement is impaired, plus the mid layer can be compressed and so have its ability to insulate impaired. Too loose and the shell will not breath to its full capacity and condensation can form on the inside (in a similar manner to on the outside of a cold bottle of milk).

Most waterproof shell layers have the ability to breathe i.e. to allow water vapour to escape from the mid layer and on to the outside. A windproof shell layer (often called a windshell) will be

much more breathable than a waterproof shell layer, but won't keep the rain out. The breathability of waterproof shell materials has improved dramatically over recent years (Event and the newer versions of Gore-Tex are downright impressive for example), but even the most heroically breathable waterproof shell will be less breathable than a decent windshell.

As the outermost layer of the layering system, waterproof shells often have a wide range of features; the following section details some of these:

Main Zip: This is two-way i.e. will open from either end, to allow venting. The main zip is usually protected from water ingress by either a storm flap (which may be doubled), fastened with Velcro or studs, or by being water-resistant. There is sometimes a second 'interactive' zip system inside the main zip, which allows compatible mid layer garments to be zipped in.

Pockets: These should have either a storm flap or water-resistant zip to prevent water getting in. May be either lined with the same fabric as the shell is made from, which makes them waterproof, or lined with mesh or similar, which improves the breathability of the garment as a whole. It's useful if at least one is large enough to house a laminated OS map. Pockets positioned higher on the jacket are better if you are going to be using either a rucksack or climbing harness, as they are still accessible above the hip/waist belt; lower positioned pockets are more comfortable to use as 'handwarmers'.

Drawcords: These usually are located at the hem, waist and around the front of the hood. They are usually elastic and lock off by means of a cordlock. They enable adjustments to be made to balance keeping the rain out with ventilation. Increasingly, the Drawcords can be adjusted one-handed and have tethered ends to stop them flapping about in the wind.
Length: Most walking jackets tend to be mid-thigh length; a longer jacket will protect more, but restricts leg movement – better to wear waterproof trousers, especially now that they come in the same highly breathable materials as jackets. A shorter jacket is better for active sports like scrambling, climbing, snowsports, biking etc as it allows better freedom of movement.

Velcro adjustable cuffs: These should be done up properly in the rain, so as to avoid water wicking up the sleeves of the mid and base layers. When undone, they aid venting.

Ventilation: Pit-zips allow extra ventilation; a similar function can also be provided by venting pockets, along with other features in the jacket's construction. This is useful as the breathability of even the most breathable waterproof shell will be overwhelmed by very strenuous activity or high humidity levels in the atmosphere. Extra zips add to the weight of a jacket.

Reinforcement: Panels of material with higher abrasion-resistance than the bulk of the jacket can be useful on sections of the jacket expected to take a battering e.g. shoulders, fore-arms, tail etc. Such panels do add to the weight of the jacket.

Seams: all seams on a waterproof garment, plus any embroideries or other stitching, should be taped, to keep the water out. Taping reduces the overall breathability of the jacket somewhat, which makes the new generation of 'micro tape' on some top-end jackets desirable as it minimises the effect.

Hood: this should be as adjustable as possible; volume adjusters allow for a more accurate fit to the head and some allow the hood to be worn over a helmet. Wired peaks are very helpful too, to help keep rain out of your eyes. Many hoods pack tidily away into the collar of the jacket, whilst others just roll away when not in use. Generally speaking, the better a hood is, the bulkier it will be when not in use; good mountain hoods almost never pack away into the jacket's collar.

4) Softshell:
Although not a new idea, softshell (as opposed to the 'hard shell' of a waterproof jacket) has been becoming increasingly popular recently, although there is some confusion as to what it actually is!

The central idea behind softshell is to produce a garment that replaces the waterproof shell and some/all of the mid layer in most conditions. This softshell should be considerably more breathable than the hard shell, whilst still being highly weather-resistant; it should also provide you with at least an element of insulation too. Softshells are not (legally-speaking) waterproof; for example, if you kneel/sit on wet ground in a softshell, the water will be pushed through by your weight.

The high levels of water-repellency of a softshell, allow you to dramatically delay the moment you need to put on a waterproof shell (with the associated drop in breathability), possibly indefinitely. This in turn, allows you to get a much lighter waterproof shell, so reducing the weight of the gear you need to carry around with you, whilst staying more comfortable for longer.

There are two major forms of softshell, either of which do the job very well:

The original approach was to have some sort of very breathable and windproof outer layer of fabric, with something warm on the inside. The original outer fabric was Pertex, although there are a number of alternatives produced now; modern DWR (durable water-repellent) finishes make these fabrics extremely water-repellent, such that you need really quite heavy rain to get through them. The inner can be anything from lightweight microfibre, all the way up to fibre-pile. This gives you a range of warmth levels all the way from 'not very' up to things that work well below freezing.

The other approach is to use a single fabric with different qualities through it's thickness. The outer layer is very closely-woven, to produce a wind-proof barrier, whilst the inner layer is more open, to allow warm air to be trapped. The fabric is again coated in a serious DWR finish, to maximise water-repellency.
Garments made from this approach to softshell often have stretch built in to them, which allows a closer fit and improves freedom of movement. Schoeller produce a range of this type of fabric and Polartec Powershield is another good example. There are a number of different weights of this type of fabric; generally, the heavier ones are warmer.

At the time of writing, anything with a membrane in it is not true softshell, as it will not be sufficiently breathable.

How To Care For Your Garments:

The majority of modern garments are very easy to look after; most base and mid layer clothing is machine washable – just follow the instructions on the care label. Don't use anything resembling a fabric conditioner though, as that will mess up the ability of the fabrics to wick (most wicking fabrics work by means of tiny channels in the fibres which draw the moisture away from your skin; fabric conditioners clog these channels up).

You need to be a little more careful with some categories of garment:

Down: Down jackets are quite hard to clean properly at home, without damaging the garment (wet down is very heavy and can tear the jacket). The best bet with down gear is to get it cleaned professionally; Rab, for example, recommend Franklins: http://www.franklinsgroup.co.uk/duckdown_feather.html

Waterproofs: It is important to keen your waterproofs clean, as this maximises their performance.

Waterproofs should be washed at whatever temperature the manufacturer recommends (usually 30 or 40 degrees Celsius); it's normally a good idea to use a specialised cleaning product (Nikwax Tech Wash being a good example), as synthetic detergents tend to strip off the DWR coating. This coating is important as it delays the point when the fabric 'wets out' in the rain; a fabric that has wetted out won't breathe – this is the commonest cause of erroneous 'leaks' in waterproof garments and is worth avoiding.

The DWR coating on a waterproof garment will wear off with time (quite a long time, in the case of the better ones). Sometimes it is possible to rejuvenate the DWR on a garment by means of a low-heat tumble dry (carefully read the care instructions first – not everything reacts well to the tumble drier!); failing that, there are a range of spray-on or wash-in products available to replace the water-repellency on your garment.

Softshell: Broadly speaking, care of softshells is similar to that of waterproof jackets, although the water-repellency is arguably even more important. The main difference is that it is now possible to get softshell-specific products to replace the DWR on your softshell.