New developments in outerwear, from body-mapped insulation to wool-look downproof fabrics, and in natural down as well as synthetic fillers, are exploring many possible incarnations for next winter's puff jackets.

Design and technology: the evolution of thermal insulation

First introduced by Patagonia, micro-down jackets have blossomed into a whole new product category. The versatile jackets have proved useful in an unusually wide array of situations, their slim line favours movement in performance situations and is practical as casual outerwear in mid-season. The category has also expanded beyond natural down to encompass synthetic fillers.

Though puff jackets remain popular among fashion and lifestyle brands, performance apparel companies are engaged in a race to design the lightest thermal outerwear. Mountain Hardwear's Ghost Whisperer 850 fill power down jacket is one of the best in its category; the men's jacket, without hood, weighs only 205 grammes. But Patagonia is still ahead and is introducing its lightest thermal garment yet for fall-winter 2012-13: a down shirt that weighs less than 6 ounces (5.9 to be precise, or 167 grammes). The shirt packs into a ball the size of a grapefruit, according to Eric Rice, senior designer at Patagonia and the person who first "invented" the down sweater. "Our entire ultra-light series features tighter quilting, which means the jackets have a closer fit and require less down," he says. The company proposes both natural down (800 fill power) and PrimaLoft (Nano Puff series). "There are pluses and minuses for each category. With regard to wash care, down takes a long time to dry, while some synthetic fillers lose their loft over time. In general, we believe natural down is ideal for dry conditions, and synthetic fillers will be warmer in wet conditions," indicates Eric Rice.



Millet's Darwin jacket combines natural down and synthetic fillers. It was specially developed for an expedition to the Darwin Cordillera in the southernmost tip of Chile.

Millet

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Under the influence of leading brand Moncler and others sharing its heritage in the use of down, the puff jacket trend may be reaching its apex, as fashion and sports brands experiment with different ways to make thermal jackets slimmer and closer fitting. The down jackets at The North Face now boast trapezoidal shaped baffles, seen in the brand's "Shaffle" jacket. "This construction makes the garment feel much closer to the body. The insulation is partitioned, or body-mapped to address the body's different insulation needs. The finished product offers the same warmth as classic down jackets using less material," says Mark McCarthy, The North Face senior product manager for the Outdoor-Summit Series.

The North Face had plans to launch a new synthetic thermal insulation for winter 2012, a concept called ThermoBall, which was suspended at the last minute but may be introduced for the 2013-14 winter season. "ThermoBall has been two years in development; it is a five-millimetre clustered synthetic filler designed to emulate natural down. However, it did not stand up to use. The balls clumped," reveals Mark McCarthy, adding: "We had designed a triangular baffle construction that would have been ideal, but after repeated washing, the filler migrated." Blown synthetics, as this type of shredded synthetic filler is called, are currently being tested by several brands. "We've investigated similar products," confirms Eric Rice at Patagonia. "But up till now, the negatives outweigh the positives."

Hybrid solutions

To reduce bulk and maintain high thermal protection, technical brands are working on hybrid solutions, transposing body-mapping designs to thermal insulation. Patagonia's Nano Puff Hybrid jacket combines Primaloft One placed on the chest and shoulders with R2 fleece on the torso and sleeves. The upscale Black Line at Peak Performance includes a jacket pairing Polartec PowerStretch with a micro-synthetic filler at areas where the body needs more warmth. Another jacket features synthetic ThermoCool on the shoulders and natural down on the torso. According to Staffan Thomasson, senior designer for activewear at Peak Performance, "demand remains strong for bulky puff jackets in casual wear, but for functional apparel, buyers prefer slimmer styles."

Designed for an expedition to the Darwin Cordillera on the southernmost tip of Chile, the Darwin Jacket by Millet can withstand extreme cold conditions yet it weighs less than one kilo thanks to body-mapped thermal insulation. The jacket combines natural goose down with Primaloft insulation (in 100 and 130 grammes per square-metre). The lighter weight filler is placed on the upper back, hood and under the arms. Sophie Duflos, head designer at Millet, remarks that the company "is phasing out fleece for technical uses. In extreme conditions,

From left to right; The shaped baffles of the Shaffle jacket by The North Face are designed to create closer fitting natural down jacket styles.

Patagonia's Nano Puff pullover with Primaloft is one of the company's best selling ultra lightweight jackets.

Mountain Hardwear's Ghost Whisperer 850 fill power down jacket weighs only 205 grams (for a men's jacket without hood) and is a contender in the ultra lightweight category.

The North Face, Patagonia and Mountain Hardwear

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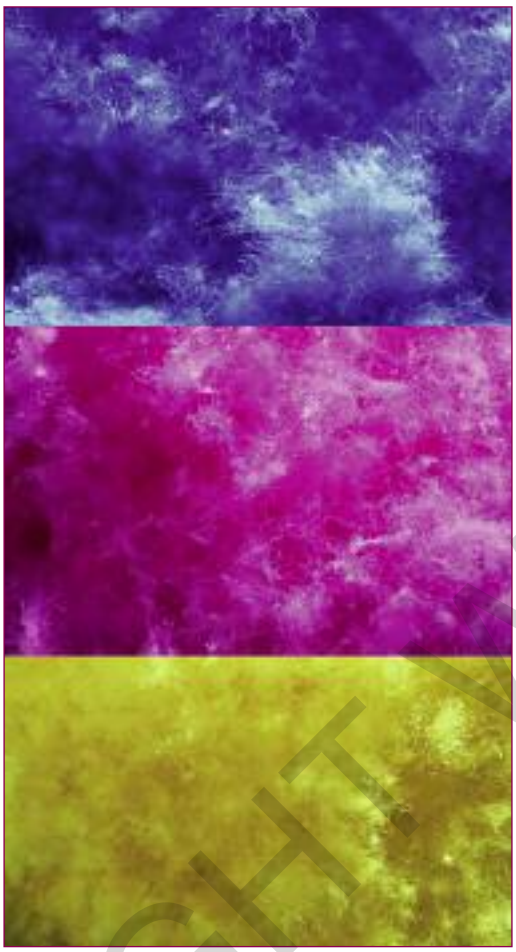
natural and synthetic fillers are lighter and more compressible. In addition, they are better thermoregulators because their non-woven construction lets more air pass through the garment."

"It's easy to make a warm jacket; a thermoregulating garment is much more complex," echoes Lionnel Ducruet, in charge of product design at Eider. The company works with three types of thermal insulation: "We use wool for ice-climbing apparel because it's the best fibre in truly wet conditions. Down is great because it compresses into a small volume, but its thermal insulation weakens when wet. Primaloft comes closest to down in terms of handle, and we have found that two-millimetre thick Thinsulate has the best warmth-to-fineness ratio," indicates Mr Ducruet. Eider is also introducing body-mapped insulation to its ski-touring garments.

The high compressibility of down has inspired François Latterrade, global product outerwear manager for Quiksilver and Roxy, to create a down jacket that packs up into a pouch that is shaped like a neck rest, ideal for long-haul travellers. Most of the down used by the brand comes from Pyrenex, a down supplier based in the French Basque region, near Quiksilver Europe's headquarters in Saint-Jean-de-Luz. The action sports brand has also expanded its range of slim thermal outerwear made with Thinsulate for fall-winter 2013-14. "One of our team riders, Mathieu Crepel, is a fan of thermal-lined hoodies and over-shirts," says François Latterrade. Inspired by traditional lumberjack shirts, these types of products are gaining ground in casual wear collections and are part of the same global trend towards warmth without weight.

Improving on down

"Over the past ten years, we have been able to improve down's overall performance," claims Eric Bacheré, Pyrenex general manager. The company has specifically worked on producing high-performance down in lighter weights, improving the fill power thanks to finer down selection processes. "This means brands can use less down to obtain the same level of thermal insulation. We've been able to increase the thermal insulation power of our down by 10%, 15%, even 20%," he claims. Mr Bacheré sees slimmer silhouettes gaining ground even among fashion brands, and new markets beginning to adopt high-tech natural insulation. He says: "Trail runners are adopting ultra lightweight down jackets for before and after the races." The company is currently working on improving two of down's most serious handicaps: wash and care and long drying times.



Down now comes in an array of bright colours, courtesy of Dyntex, Austria.

Dyntex

Dyntex, an Austrian down supplier, is exploring yet another novel design option by offering natural down dyed in bright colours. The company proposes no fewer than 14 shades, from bright pink and orange to green, yellow, blue, violet, and so on. Mathias Braun, company manager, expects several brands to present jackets made with a translucent outer fabric that reveals the coloured feathers at ispo. The company is also working on improving performance features, water-repellent treated down is currently being tested by a technical alpine sportswear manufacturer, according to Mr Braun.

Sophisticated synthetic blends

The trend towards slimmer styles can be a challenge for natural down. "Filling ever finer baffles is labour-intensive. For 'artistic' diamond shaped or floral quilt lines, the jacket is first filled with down, patted down, and then quilted. This process can lead to down leakage," remarks Mark McCarthy, at The North Face. Though synthetic fillers are also prone to fibre migration, they are easier to sew and care for.

Synthetic filler suppliers are working on increasingly elaborate blends to achieve the highest warmth-to-weight ratio. Advansa's recently introduced ThermoCool Thin is available in 60-120 grammes per square-metre,

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compared to standard styles that weigh more than 200 grammes per square-metre. "ThermoCool Thin was designed to be used in thermal second-layer apparel as an alternative to fleece," remarks Silvia Toledo, market manager for Advansa ThermoCool. ThermoCool is based on a special blend of various fibres. Hong Kong Nonwoven's ThermoCool range combines a multi-channelled fibre on the binder layer with hollow core fibres in between. Peg, in France, is known for its thick insulators that are made with an intimate blend of hollow core, multichannelled and recycled polyester fibres.

In the mind of many consumers, thicker padding means more warmth, whether natural or synthetic. "We have many clients who prefer puffy volumes and soft down-like hands," points out Oliver Brandes, in charge of Thermore sales for Western Europe. Though natural down remains the ultimate standard in quality, he foresees a switch to synthetic padding, saying: "Real down has been a dominant trend for four years now. In Italy, the shift to leaner, synthetic fillers is already beginning to be felt."

Thermore is introducing recycled fibre content in its most popular ranges, EcoDown, TMK and T37, and plans to increase the proportion gradually. But demand is not as dynamic as Oliver Brandes would like it to be. He says: "Sustainability is in everyone's mouth, but not in their head or heart."

New solutions to downproofing

For the past few seasons, downproof-fabric manufacturers have been able to reach new limits in terms of lightness. Many companies have developed 10- and seven-denier fabrics, though some question their stability. Eric Liu, sales manager at Labtex, Taiwan, believes the best weight-to-resistance ratio is obtained with 30-denier fabrics. "Fabrics made with finer yarns often have stability problems", he says. Filltex seems to have achieved the lightest fabric available with a 22 grammes per square-metre downproof fabric woven with seven-denier yarns. Erictex Fashion Company, also based in Taiwan, favours 15- and 20-denier rip-stop weaves, in polyester or polyamide. Lighter fabrics are also more expensive. "There is a one dollar price difference between the 15- and 20-denier fabrics," says Gina Chiu, sales manager at Erictex Fashion Company. Dyntex, in Austria, also makes ultra-lightweight downproof fabrics, weighing 28 to 40 grammes per square-metre and using 10-denier fibres in the warp and weft. "We have tried seven-denier yarns, but they are too weak and quite difficult to dye. We have found that 10-denier yarns with a small rip-stop texture are the best options," says Mathias Braun.

New downproof fabrics also explore varied textures and fibre blends. Dyntex for example is working on stretch downproofed textiles in response to demand for slimmer fitting styles. Wool is another area that the company is investigating for casual sportswear end-uses. A new product development combines a wool-like outer fabric with a polyurethane membrane that is not waterproof but highly breathable. "Air permeability is important to make the jacket puff up," says Mathias Braun. These fabrics are heavier, weighing from 150 to 250 g/m^2.

Schoeller's rainproof USP (Ultra Soft Protection) fabrics, introduced in July 2011, can also be used for down jackets. According to Dagmar Signer, at Schoeller, "most of the USP fabrics pass the downproofness test. The weaving construction provides a certain degree of downproofness which is then reinforced with the USP finish." The lightest of these fabrics weighs 80 grammes per square-metre^2.

Korean taping specialist Sealon has introduced a new trim specifically designed to reduce fibre migration in natural down and synthetic insulation apparel. The fine tape is applied to the quilt seams, effectively sealing the hole made by the needle and thread. "The taping has a small amount of adhesive that melts with the friction created by sewing. It closes around the holes made by the needle and thread," explains Rick Kang, Sealon sales manager.

This novel tape would protect filler from escaping for brands seeking to use unconventional fabrics for their down or synthetic insulated jackets. From hybrid constructions to shaped baffles and creative quilting, the design options continue to expand for cold weather outerwear.



The slimmer fit of thermal over-shirts is gaining ground in outerwear, here a lumberjack-type jacket by Eider.

D. Daher

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