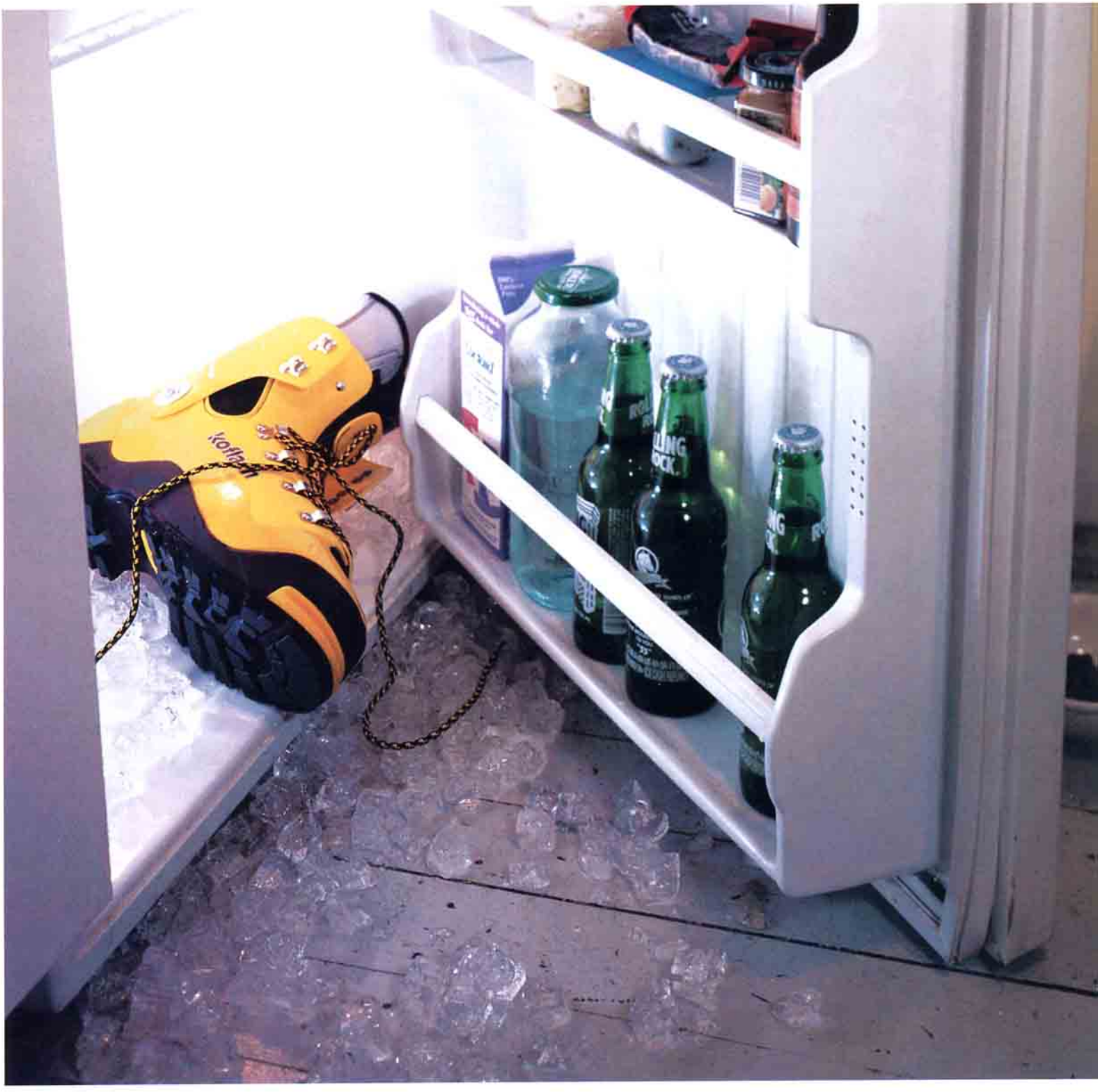
Alpine gear designed with high-tech materials is helping mountaineers conquer the world's chilliest summits.

BY MARK RIEDY | PHOTOGRAPHY BY KAZ ARAHAMA



Really Cold Mountain

PREVIOUS SPREAD, LEFT
Koflach's Arctis Expe boots have two different plastics, for support and flexibility. They withstand temperatures as low as minus 65° Fahrenheit.

PREVIOUS SPREAD, RIGHT
Brunton's Optimus Nova camp stove weighs 19.3 ounces with its aluminum fuel bottle and boils a quart of water in as little as 3.5 minutes.

BELOW **The carbon-fiber Cobra ice tool from Black Diamond weighs a feathery 1.7 pounds.**

Soft-shell outerwear is the hottest thing on the market since the fuzzy-pile jackets of the '70s.

On Alaska's Mount McKinley, "a balmy day of glacier travel can rapidly deteriorate into a day of survival snow-cave digging," reads a National Park Service report. "The Himalaya is tropical by comparison." Braced for the brutal conditions on the 20,320-foot mountain, three of America's best mountaineers—Mark Twight, Scott Backes and Steve House—set off on McKinley's steep Czech Direct route on a clear morning last June with just 55 pounds of gear among them.

From McKinley to the unclimbed peaks in Pakistan's Karakoram range, some of the world's most demanding ascents are now done faster than it took to set up base camp just a few years ago. From carbon-fiber ice axes and titanium ice screws, to composite-shelled boots and "bionic" crampons, the gear used by the world's elite Alpinists enables them to climb tough routes faster and safer than ever before.

"People used to do big climbs with a siege mentality," says Chris Chesak, development director of the American Alpine Association. "Now they go much lighter, and they minimize risk by minimizing the time they spend on the mountain."

The first ascent of the Czech Direct route, in 1986, took 11 days to complete. As recently as 2000, it was down to an eight-day outing. Traveling light and fast, House, Twight and Backes brought only enough equipment and supplies for 48 hours of good weather. The team tackled Czech Direct in a single, sleepless 60-hour push, besting the previous record by five days. And within two hours of skirting McKinley's summit, the trio was back at 14,000 feet enjoying toasted cheese sandwiches in a warm and dry ranger's cabin.

For their Czech Direct assault, House and Twight relied on soft-shell outerwear, one of the most innovative products to hit the mountaineering world since the bearskin-like fuzzy-pile jackets of the '70s. Eschewing the stiff, crinkly, GoreTex-laminated fabric of the '80s and '90s, soft-shell garments are made from supple, flexible fabrics, such as Dryskin from Swiss manufacturer Schoeller. Composed of flexible fibers that both block out the elements and pull moisture away from the skin to evaporate sweat, Dryskin and other soft-shell fabrics combine the best qualities of a soft, insulating layer and a stiff, waterproof layer in one garment.

"It's a big leap because it maintains your comfort zone for the greatest amount of time," explains Eric Rice, Patagonia's senior designer and a climbing enthusiast. "So you don't have to take layers off and on."

But soft-shell jackets are only good to a point. They can withstand winds up to 50 mph and temperatures as low as minus 20 degrees Fahrenheit, but they're not recommended for the 100 mph winds and minus-40-degree temperatures one can encounter on Mount Everest. On a more temperate climb like McKinley, however, the jacket allows House's team to spend less time adjusting layers and more time climbing. For the average outdoor enthusiast, it simply makes for a more comfortable walk to the corner store.

Technical equipment changes every day. The Malden Mills Company recently released Polartec Heat, a version of its Polartec soft-shell fabric. It uses a dense matrix of conductive filaments to carry battery-powered warmth between 105 and 114 degrees through the fabric. The North Face developed a soft-shell jacket—the $350 MET5—around the heat technology. The jacket weighs only 12 ounces (compared to a 2-pound down parka), but the weight of the heat system, along with a limited battery life (about five hours per charge), make the MET5 impractical for hardcore mountaineering. If the price keeps dropping, however, the consumer market might see this toasty technology in lightweight, low-cost clothing.

Down the road, self-healing technology will mend scuffed boots, torn sleeves and cracked shovels.

Researchers at the University of Illinois at Urbana-Champagne are testing a synthetic material that heals itself. Scuff a thermoplastic boot shell, crack a carbon-fiber snow shovel or tear a sleeve and the otherwise normal-looking material releases a micro-encapsulated healing agent and catalyst. Once the healing agent and the catalyst mix, the scuff, crack or tear heals to approximately 90 percent of its original strength. "It's going to make for hardware that lasts longer and is more dependable," says Eric Brown, a research assistant on the project. "If you're in an extreme situation where an equipment failure can lead to disaster, this would be great to have on your side." In the next few years, look for self-healing technology to appear in consumer electronics, where it could extend the life of circuit boards.

One technological breakthrough that will be coming to mountains around the world this fall is an extreme alpine boot from Seattle's Montrail. For the first time, the new I.C.E. 9 system integrates the comfort of a boot, the traction of a crampon and the warmth of a gaiter into one unit. When used without the pointy steel crampon, the boot is flexible enough for hiking or climbing non-technical slopes. Yet when the crampon is affixed to the front and back of the boot and to a shank in the mid-sole, the entire unit stiffens to provide a solid platform for climbing technical pitches. While the I.C.E. 9 system won't provide as much warmth and protection as flashy composite-shelled boots from small manufacturers like Austria's Koflach and Italy's Asolo, the integrated I.C.E. 9 gives climbers greater flexibility under a wider range of conditions.

Even the ice axe, the very symbol of mountaineering, is evolving. Fueled by competition ice climbing and its emphasis on speed and agility, House and company use new ice tools with ergonomic carbon-fiber handles and without the leash traditionally used by climbers to hold their weight while resting. While one-axe-fits-all-climbs versatility was once paramount, companies like France's Grivel and Salt Lake City's Black Diamond produce ice axes, weighing only a pound and a half, for every possible condition.

Since his record-setting assault on Mount McKinley last summer, House, who estimates that he spends 300 nights outdoors annually, has been busy planning his next exploit from his base on the eastern slope of the Cascades. And gear is on his mind. He's dreaming of a lighter pack or an ice axe tailor-made for the 10-ton gorilla that patiently awaits him in Pakistan's Hushe Valley—the 25,000-foot Masherbrum peak. "People laugh when I tell them I'm going to Pakistan," House says. "But you have to have the mentality to imagine the right approach to the climb and the equipment you'll need for it, and then you have to be willing and committed enough to test it." ✦

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BELOW **Black Diamond's Gemini headlamp is equpped with a long-life xenon halogen bulb and superbright LED. It weighs 5.3 ounces.**