



April 2021

## Banned but Still Toxic: Gail Carlson Serves Notice that Chemical in Ski Racers' Waxes Still Lurk at the Starting Line

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### Recommended Citation

Donahue, Bill (2021) "Banned but Still Toxic: Gail Carlson Serves Notice that Chemical in Ski Racers' Waxes Still Lurk at the Starting Line," *Colby Magazine*: Vol. 108 : Iss. 1 , Article 8.  
Available at: <https://digitalcommons.colby.edu/colbymagazine/vol108/iss1/8>

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## **BUT STILL TOXIC**

**GAIL CARLSON SERVES NOTICE THAT CHEMICALS IN  
SKI RACERS' WAXES STILL LURK AT THE STARTING LINE**

By Bill Donahue '86

We live in a chemical world, exposing ourselves all day long to scary toxins created in laboratories—to the traces of herbicide that lurk in our water, to the carcinogenic Teflon coating our cookware, and to the pesticides sprayed on our vegetables.

To most of us, the poisons populating our everyday lives are but grim background music. They're beyond our complete understanding, and so we write them off as the price we must pay for living in a scientifically advanced world.

To Colby Assistant Professor of Environmental Studies Gail Carlson, however, the threat posed by these toxins is as clear as white chalk on a blackboard. For Carlson, it's a call to action.

And so eight years ago, when her son, Soren, then 12, joined the Central Maine Ski Club and began racing, Carlson issued a stern maternal dictate. "You will not set foot in the team wax shed," she pronounced.

Carlson knew something about the wax that snow-sports enthusiasts—

Nordic and alpine skiers, ski jumpers, and snowboarders—have since the mid-eighties hot-ironed into the bases of their skis and boards when they want to go really, really fast. She was aware that fluorinated wax contains per- and polyfluoroalkyl substances, or PFAS—the same type of deadly synthetic chemicals that the manufacturing giant DuPont put into Teflon in the 1990s—causing widespread cancer, birth defects, and kidney damage in West Virginia and inspiring the blockbuster movie *Dark Waters* (2019), starring Mark Ruffalo.

There are roughly 4,700 different PFA chemicals, and their party trick is that they make things super slick. Thanks to their constituent fluorine, which forms a tight, water-repellent bond with carbon, PFAS enable frying pans to wick water and grease, make raincoats impermeable, and also make skis glide quickly over wet snow. PFAS are “forever chemicals,” though. They’re almost impervious to breakdown, and they’re inclined to worm their way into the tissues of humans and animals.

Soren Nyhus eschewed his team’s wax room right up until the end of his high school racing career in 2018. Still, his mom worried about the frequent use of fluorinated wax at Quarry Road Trails in Waterville, where both

Soren’s club and Colby Nordic ski teams race and train. Carlson is, after all, a casual cross-country skier who’s written eloquently about the “restorative dose of nature” she gets each time she visits Quarry Road. She wondered: How prevalent are the fluorocarbons in the snow there? How badly do they persist in the soil in springtime?

In a paper published in the December 2020 issue of the academic journal *Chemosphere*, Carlson addresses these very questions. With the help of her coauthor, Nordic ski racer and environmental studies major Skylar Tupper '20, she took samples of Quarry Road snow just hours after the Colby Carnival brought 163 college racers to the trail system last January. And chemical analysis found that, near the race’s starting line, where skiers anxiously shuffle their skis back and forth over the snow, waiting to launch, there was “extremely high contamination”—indeed, a concentration of fluorocarbon unseen by the handful of Norwegian and Swedish scientists who’d studied ski wax toxins prior to Carlson (but hadn’t focused on the start). Continued sampling in the spring revealed that fluorocarbons were in the soil, and it was present in the groundwater, too, at 34.65 parts per trillion, below the Environmental Protection



*Tracey Cote, head coach for Nordic Skiing, met with Gail Carlson, right, to take snow samples at Quarry Road Recreation Center in March.*

Agency's nonbinding health advisory standard for three widely prevalent PFAS but still alarming.

Carlson's startling findings come amid a widespread awakening. Over the past

July 2020, inducing a near-seismic shift for the Colby Nordic squad. As Carlson sees it, skiing's abrupt about-face represents genuine progress. Since arriving at Colby from the snowy plains

put in place a safer chemicals policy that allowed Maine to regulate toxic chemicals in children's products. Later, Maine used that law to ban BPA. In 2017 Carlson advised her students as they helped pass a Maine bill that made it illegal for furniture shops to sell upholstery bearing another endocrine disruptor, brominated flame retardants. Last year Carlson's "Environment and Human Health" class helped convince Maine lawmakers to curtail the use of PFAS, the ugly ski wax ingredient, in food packaging.

Carlson personally testified at each of these hearings, and she's become, over the past dozen years, a "true environmental hero," according to Mike Belliveau, the executive director for the Portland-based Environmental Health Strategy Center, for which Carlson served as a board member. "When she testifies in Augusta, she's calm. She's credible, and the legislators listen."

All told, Carlson has helped Belliveau's group pass a dozen laws in Maine, and some of them—among them, the rubber duck bill and the one curbing PFA use in food packaging—have been copied in other states. Belliveau recalls with relish how Carlson crushed chemical industry lobbyists in a legislative discussion of the latter bill. "She simply delivered the scientific evidence without hyperbole," he said.



*Ski wax is freshly applied to the bottom of Nordic skis before each practice and competition.*

two or three years, numerous news stories have zeroed in on the dangers of fluorinated ski wax. Now, with scientific papers like Carlson's amplifying the alarm, fluoro is suddenly vanishing from elite snow-sports competitions. Effective next season, the wax will be verboten at all World Cup races hosted by the International Ski Federation. The Eastern Intercollegiate Ski Association, Colby's league, outlawed fluoro in

of Wisconsin and Minnesota in 2004, she has prioritized "using science to make a difference." Her signature course offerings include Environmental Activism and Global Public Health, and regularly she brings her activist students into the Maine state legislature to testify on bills related to the environment.

In 2008 Carlson's charges successfully championed the "rubber duck bill," which



And with an equally determined and informed group of Colby environmental students. In fact, Carlson's greatest gift to Maine politics is probably her entourage. "It's not typical for young people to testify in the legislature here," said Emmie Theberge '08, federal director at the Natural Resources Council of Maine. "And the legislators all know that environmental policy impacts future generations. When Gail's students speak, everyone tunes in."

Back when she was a Ph.D. candidate at the University of Wisconsin in the early nineties, Carlson didn't seem destined to be a political force. She studied biochemistry, focusing her thesis on a tiny one-celled organism, the paramecium. "I thought I was going to find the cure for cancer," she says, wryly, "but of course that never happened, and I began to feel as though scientific research wasn't that compelling to me."

Carlson taught college chemistry briefly, though, in Minnesota, but she began contemplating a career change in 1995, when her husband, Professor of Environmental Studies Philip Nyhus, embarked on a yearlong study of Sumatran tigers in Indonesia. As she bumped through the jungle on the back of a motorcycle, Carlson reflected on how she had protested as a college student, demanding that her

school, St. Olaf, divest from South Africa's apartheid regime. She remembered how she'd written careful letters to the editor on topics ranging from gendered language to profligate lawn watering during a Midwestern drought.

Soon after, Carlson came to Colby with Nyhus in 1999, and she found her new academic voice, designing and teaching, as an adjunct, a class called Women and the Environment. It was about "how women are affected by toxic chemicals, and about women activists and women writers. I realized, 'This is what I want to be doing,'" she remembers.

Today, Carlson both teaches and runs the Buck Lab for Climate and Environment. She draws inspiration from Rachel Carson, author of the groundbreaking 1962 book *Silent Spring*, on pesticide contamination, and Sandra Steingraber, a poet and ecologist whose 2011 book, *Raising Elijah: Protecting Children in an Age of Environmental Crisis*, informed Carlson's parental wax policy and also points toward Carlson's feminist outlook. "I'm a biochemist first," she said, "but I've seen, teaching, that so much of the important work in environmental studies has been done by women. They're typically the ones making decisions about children's health; they're the ones seeing firsthand the effect of toxic chemicals."

Because the docket for the Maine legislature only becomes clear a few weeks before its annual spring session, Carlson doesn't know precisely what her next campaign will be. But she knows that she'll keep her sights on hazardous wax. Nordic racers everywhere still have large caches of fluoro malingering in their wax kits, and despite the ban ski shops are still selling the stuff. There's little doubt that a few cheaters will fluoro up this winter, and unwitting recreational skiers will surely be bamboozled into buying the stuff. Meanwhile, of course, the old fluoro remains in the soil at Quarry Road—just as it does at myriad other cross-country ski spots worldwide.

"If we go back and test over, say, a 10-year time frame," Carlson said, "we can see if ski racers are complying with the new regulations. We can look at our first test as a worst-case baseline, and we can look at how PFAS break down in the soil and water. They won't go away from the world—they'll get blown toward the Arctic, on the wind; they'll get into the water—but they could become less present at Quarry Road. And they could, over many years, break down in the soil.

"There's still a lot we don't know about PFAS," Carlson said. "That's why we need to keep paying attention."

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