Drew Stoecklein wishing he'd brought his avalanche goggles. Alta bc, Utah. **Adam Barker**

TWENTY YEARS OF EDUCATION, SAFETY AND SNOW SCIENCE

A SAFER BACKCOUNTRY?

BY DEVON O'NEIL

Is it safer to be a backcountry skier now than it was 20 years ago? It's a complicated question, but most snow-safety experts believe the answer is yes.

Technology and education have changed immeasurably. Forecasters now use two-way satellite messaging systems to report backcountry conditions in real time. Smartphone apps give you updated forecasts while you're in the field. Rescue strategies are being refined, increasing probing and shoveling efficiency by as much as 50 percent.

Nevertheless, the quest is ongoing. Funding is still a hurdle. No two days—or snowpacks—are alike. As Swiss avalanche guru Manuel Genswein says, "The goggles that allow you to see the weak layers are still missing."

We spoke with eight leaders in avalanche mitigation and rescue about the progress made—and the remaining challenges—since *Backcountry* premiered. What follows are excerpts from those conversations. >>

Karl Birkeland practicing his art in Yellowstone National Park, Mont. **Paul Cronin**

"You shouldn't justify skiing something because you have a new beacon or an airbag backpack or because you have a really good partner that day."
-Karl Birkeland

KARL BIRKELAND

Birkeland, 51, is a longtime avalanche forecaster and director of the U.S. Forest Service National Avalanche Center in Bozeman, Montana.

Probably the biggest technological change we've seen is the new, digital, three-antenna beacons. They're intuitive, they're quick and they're accurate. I really see this when I'm teaching avalanche classes. Before, we used to take a significant amount of time to teach all the students who haven't practiced with their beacons how to make them work. And now what we find is you don't have to spend much time at all teaching people how to use beacons. Because they can just turn them on and in very short order they can figure out how they work and do good searches with them.

That doesn't mean they don't have to practice with them, because people who practice are faster and every second counts. But if you take two people and they both practice with their beacons a lot, and you put a new beacon in one guy's hand and an older beacon in the other guy's hand, the guy with the new beacon is going to be faster every time.

That said, all the tools you have in your pack you should use to turn you away. You shouldn't justify skiing something because you have a new beacon or an airbag backpack or because you have a really good partner that day. If you do that, you're going to get in trouble. Because avalanches aren't always survivable. If you get caught in a big slide in bad terrain, you're going to get killed.

Brian Lazar digs avy safety. Diego Allolio

It's similar to what we've found in other areas. For example, people put studded snow tires on their cars, but it turns out that people with studded snow tires have the same accident rate as people without them. And the reason is because, when you have studded snow tires on, you drive faster.

BRIAN LAZAR

Lazar, 40, is the deputy director of the Colorado Avalanche Information Center and the former executive director of AIARE. He is based in Boulder, Colorado.

Avalanche education has gone through quite a bit of refinement in the last 20 years. Twenty years ago, there were a small number of very expert avalanche educators, but there was no well-developed approach with golden objectives and consistent learning outcomes. Now, being able to decide where you're going to go—and more importantly, where you're *not* going to go, based on the avalanche hazard for the day—is more important than understanding the nuances of snow science. And I think that's a good shift.

Avalanche courses are combatting what humans are apt to do—which is making emotional decisions—with tactics that we know have the best chance of helping people stay alive. We're teaching a repeatable decision-making process that employs things like checklists. This has worked in other industries like aviation and medicine.

A lot of avalanche centers are communicating the risks by listing the avalanche problems, which is very new. So people are reading the forecast and they're writing down what the avalanche problems are for the day, where they exist, and then part of the checklist process is deciding which terrain should be ruled out for the day. For example, if you read through the forecast and sat down with your group and said, "Based on the problem today, which is large, destructive, persistent slabs on north aspects above treeline, we're not going to ski Avalanche Bowl because it's got that problem, and it faces that direction at that elevation." Then, when you get in the field and you're all looking at Avalanche Bowl and it's full of powder, you're much less likely to let emotions override you and go, "Hey, why don't we just ski it?" when you've made the decision ahead of time to rule out that terrain for the day. >>

"Twitter and Instagram seem like they were tailor-made for avalanche forecasting. People can use #utavy..."

-Bruce Tremper

Ilya Storm and Skeena, the newest avalanche rescue team in Revelstoke, B.C. **Matt Kieltyka**

BRUCE TREMPER

Tremper, 61, has been the director of the Utah Avalanche Center since 1986 and is the author of the seminal book "Staying Alive in Avalanche Terrain."

Social media and crowdsourcing have made it easier to be an avalanche forecaster. When you're forecasting avalanches the one thing that you desperately need to know is: What are the avalanches doing? So when there are all kinds of people running around the mountains around the state, we're trying to get information back from them to let us know where the avalanches are occurring and *what's* occurring, what their experiences are.

For a long time we invited them to send us e-mails or submit their observations. But social media is so important these days. Twitter and Instagram seem like they were tailor-made for avalanche forecasting. People can use #utavy, and if they put that in the caption, then we will see that on our TweetDeck monitor in our office.

It's amazing what backcountry users will do for free. They send in all kinds of photos and videos and snow profiles—it's kind of set up an informal competition. People want to get bragging rights that their observations are on the avalanche site and that we're referring to them when we're posting their photos on the advisory.

The web is also tied to education. I do most of my learning online. And I think, in the future, people are going to take their introductory avalanche tutorials online in small, bite-size pieces when they've got an extra 10 minutes in their busy schedules. Then, after they've done that, they might take a full day with someone who can show them how to do things in the field. That's the trend.

ILYA STORM

Storm, 50, is the forecast coordinator for Avalanche Canada and lives in Revelstoke, B.C., just down the road from Rogers Pass.

In 1994, we were using a 1-800 number to get out the avalanche bulletins. They weren't even called forecasts at the time because it was more of a summary of current conditions. It was a nowcast, not a forecast—it was out of date the moment it was written, really. Now, we're on the verge of discontinuing our 800 number, because the number of people who call into it is trivial.

We're also changing the way we teach companion rescue. Think of somewhere like Rogers Pass, where there are hundreds of people in a few valleys on a busy day. Companion rescue was originally conceived as a group of two or four people in a valley, and when something bad happens, you need to be totally self-sufficient.

Now, either multiple groups are involved, or in the sled-skiing context, people who witness something from across the valley can travel five kilometers in a minute and a half. So rather than having two rescuers on scene, you can have 30. Yes, it still is a 15-minute medical emergency, but we've seen enough accidents that have gone awry because suddenly there are 30 people on site. We need to be able to go from an active rescuer to a commander and actually manage teams of people. We're starting to teach that in our companion-rescue course this year for the first time.

MANUEL GENSWEIN

Genswein, 40, is a native of the Swiss Alps who lives in Meilen and has done snow-safety work in 29 countries. Using an electronic engineering background, he has also developed rescue products and techniques that have been applied around the world.

I don't think technology has changed that much; it's mainly been our strategies. You can do 3D analysis of the microstructure of the snow, its granular structure, with CT scans in extremely high resolution. We have better snow-measurement stations, better weather networks; we even monitor the snow with satellite imagery. But just to have more data doesn't really mean you can derive something meaningful and useful out of it.

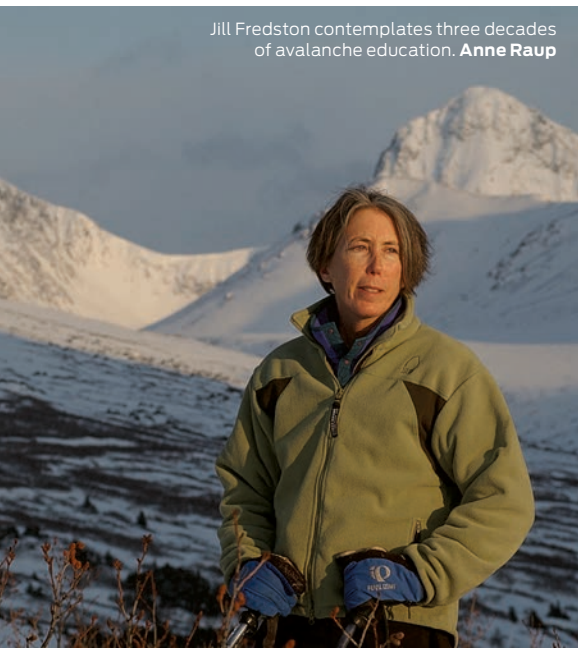
The bigger change on the forecasting side has been how we disseminate the information. Twenty years ago, many countries issued one bulletin a week. And now several countries have two bulletins a day, one in the morning and one in the evening. You get it for free, everywhere, on your smartphone.

Same goes for rescues. Technology has changed—I helped invent a dangling beacon that you can hang from helicopters and search a debris field from above. It has saved lives in many countries, because you're faster, you search very complex terrain zones, there's no extra effort, and you greatly reduce exposure of rescuers to the terrain.

Again, though, our strategies have changed even more. We have quantitatively analyzed and optimized how to probe, how to excavate a buried subject, how to apply the search devices in different search phases. We understand much better what really leads to success.

Before 2006, nobody really taught shoveling in avalanche rescues; it was still possible to make the excavation at least 50 percent more efficient than how it had been done before. **>>**

[above left] Bruce Tremper, now trending on Twitter and Instagram. **Matt Hart**
[above] Manuel Genswein talks beacon tech in Nakusp, B.C. **Gery Unterasinger**



Jill Fredston contemplates three decades of avalanche education. **Anne Raup**

Chris Landry avoiding theatrics in the San Juan Mountains, Colo. **Jeff Deems**

Monica Dalmasso

"In terms of technology, every backcountry skier can give information from the field with his smartphone. It's so easy to dig a snow pit, take a photo or video and share that information."

-Christophe Boloyan

We developed a conveyor-belt, V-shaped group-shoveling method that works with a small or larger team of rescuers. So not only do you make them shovel the greatest quantity of snow per minute per rescuer, but every few minutes, the rescuer working at the tip of the V, close to the probe, shouts, "Rotate!," and everybody rotates clockwise. By doing this you never run the rescuer into the exhaustion curve, where exhaustion starts to steepen. So they last much longer.

JILL FREDSTON

Fredston, 56, is a longtime avalanche forecaster and educator in Alaska who coauthored "Snow Sense" with her husband, fellow avalanche expert Doug Fesler.

Students seem to be intent on getting their Level 1, 2, or 3, but certification, of course, doesn't necessarily mean that an individual is actually making safer, wiser decisions. The plus of standardizing what is taught is to make sure certain minimums are met. The downside, as I see it, is that it results in a certain amount of "dumbing down" of the curriculum and also tends to inhibit innovation among educators.

"Snow Sense" was first published in 1984 and is now in its fifth edition. While we've added and improved sections over the years, the bottom line is still pretty much the same: for backcountry travelers to make good decisions, they must understand the interaction of critical terrain, snowpack, weather and human variables.

We have more safety gizmos to wear when in the backcountry, and there is no question that they can make the difference between life and death. But if they make us complacent enough to act in ways that are not safer, then they do not make us safer. I could still travel safely if I happened to leave my beacon home, but I would be very uncomfortable without my inclinometer, which I use constantly to help me make good decisions.

CHRISTOPHE BOLOYAN

Boloyan, 44, is the director of La Chamoniarde, a nonprofit education and rescue organization in Chamonix, France. He has worked in avalanche safety for 20 years.

To study the snow, we have less money in France now. But for education, especially in Chamonix, we have everything we need. We just ask and we have money. It's quite easy to find. Because it's a big deal in Chamonix. There are 30 avalanche deaths a year in France, and a quarter of those are in Chamonix. We get money from the European Union to teach avalanche classes, and also from the town of Chamonix. It wasn't always like that.

Our main activity now is to teach kids at school during their class day. When they're 10 years old, we start to teach them about safe zones and how things change completely when you exit the ropeline. It's harder to teach teenagers because they just want to ski. The same goes for pro skiers.

In terms of technology, every backcountry skier can give information from the field with his smartphone. It's so easy to dig a snow pit, take a photo or video and share that information. You can put it on Facebook or any user network and say, "I'm north facing on a 30-degree slope at 2,000 meters elevation. There was a shooting slab one meter deep sliding on temperature-gradient crystals." This gives very good information for all skiers in the same area. I think this is the next step.

Despite all the changes, the biggest challenge in snow safety is still to save lives. It's a challenge you never win because you can't tell if you have saved any lives this year; it's impossible to say. But it's still my goal.

CHRIS LANDRY

Landry, 65, is the executive director of the Center for Snow and Avalanche Studies in Silverton, Colorado. He has been backcountry skiing for 49 years and pioneered a number of notable routes as a ski mountaineer.

We've seen a lot of progress in technology and education and the vastly improved public avalanche bulletins, but offsetting that progress, almost back to scratch, are what I will generally call the new factors of social media and imaging technology like GoPro videos and smartphone videos. I think an opportunity to capture imagery that looks like what you see in a theater or on the web has a tendency to overwhelm good judgment. In many cases, the objective in a day of skiing is dominated by the outcome on social media.

When I began ski mountaineering, there was no sense that you could take two avalanche courses in one season and then be safe. That was absurd. There was this premise that ski mountaineering required a lot of experience in the mountains to really have any kind of long life span. I've talked at length about this with some of my old partners. What we've watched over the past 10, 15 years is this incredibly accelerated, extremely short learning curve of essentially buying the gear, taking a Level 1 course and jumping in. And jumping in with images of steep skiing in Alaska in the back of your head. ▮