



THE Beacon

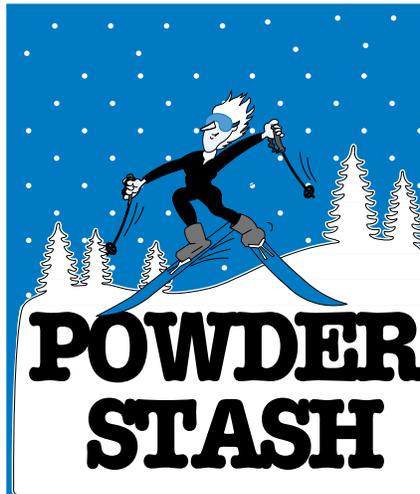
"Those who cannot remember the past are condemned to repeat it."

—George Santayana

I can't remember when I first heard the above quote, but I think of it every winter as I hear of accidents and near misses involving avalanches. It easily applies to our winter recreational world.

There are four ingredients in the people-avalanche world: terrain, weather, snowpack, and the human factor. In the study of avalanche accidents, several disturbing trends can be found. People continue to make the same mistakes over and over and over again. By studying avalanche accidents, we have discovered that they are not caused just by terrain or snowpack miscalculations, but rather include errors in human factors, more often than not. A person's ability to determine avalanche stability is an incredibly complex and interrelated skill involving physics, meteorology, and geometry—to name a few. Many who make potential life and death decisions in the backcountry are experts in their athletic pursuits, but they often make decisions based on goals and peer pressure, and on the often-untrue belief that "it can't happen to me."

One of the continuing human errors we see is exposing more than one person at a time to avalanche danger. We still see avalanche accidents where three, five, or more people are killed in one slide. Last winter in Canada, two separate avalanches killed seven people each. In Colorado it has been several years since an avalanche has killed three or more people (February 6, 1999 at Cumberland Pass). It is a troubling fact, however, that it will happen, somewhere, sometime—because of human error.



by Scott Toepfer

Equally troubling is the fact that people will still get caught in slides when the avalanche danger is rated extreme. Skiers will continue to find that the slope really was steep enough to slide, snowmobilers will continue to drive their machines into the throat of dangerous avalanche paths, and snowshoers will still walk beneath tender, steep, convex slopes.

How can we stop this recurring theme of new accidents caused by forgetting past accidents? The hardest way to learn a lesson is to have a friend or friends killed in a slide, and it need not come to that. Education is the key. As educators, we can do our best to teach people (including our friends) not only terrain,

snowpack and weather fundamentals, but also to focus on human factors. One of the best teaching tools I have found is *The Snowy Torrents*. This book about avalanche accidents was written by the CAIC's Nick Logan and Dale Atkins, and is available from the Colorado Geological Survey publications (303-866-4762). Finally, remember that avalanche education is a life long experience: we never stop learning.

That leads me to our first article of this mid-winter issue of *The Beacon*—an interview with Ian McCammon. Ian is an amazing individual who leads a strange existence in two worlds. He holds degrees in physics, materials science, and mechanical engineering. He has done research in robotics and aerospace design. For the last 20 years he has worked as a field instructor for the National Outdoor Leadership School (NOLS) and is also an avalanche educator. He is currently doing research into human decision making and snowpack instability. He presented some of his findings at the last International Snow Science Workshop in Penticton, British Columbia, and most recently at the Colorado Snow and Avalanche Workshop at Copper Mountain. His presentation was quite an eye opener. I hope you will find this interview equally as informative as I found his lectures.

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Powder Stash

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Our second piece is a bio on Halsted Morris, our Avalanche Education Coordinator at the CAIC. I first met Halsted at the 1992 International Snow Science Workshop in Breckenridge. We had a chance to talk about the important subjects—skiing, powder skiing, avalanches, corn skiing, ski patrolling and other ski related issues. It is hard to get Halsted to say “no,” consequently, I cannot think of a guy

who teaches more and who volunteers more time to the avalanche community. A few years ago Halsted took over my position as avalanche class coordinator at the CAIC—a position that requires a great deal of diplomacy and scheduling skill. (It is amazing how many people want avalanche classes December through February.) Every weekend is booked well before the season starts. It is a job Halsted has learned to do with great tact and skill. And since no one travels more for the CAIC, one of Halsted’s many hats is that of roving ambassador for the CAIC. ❄️

Ian McCammon: Avalanche Educator

An Interview by Scott Toepfer

Q: In your background as an avalanche educator, what do you see as some of the common themes and mistakes in avalanche accidents in North America?

Avalanche accidents seem to unfold in two ways. In the first scenario, a party with no avalanche knowledge finds itself in avalanche terrain, and unwittingly triggers the avalanche that buries them. In the second scenario, a party of folks with avalanche skills is recreating in avalanche terrain, and they decide to ski, board or high mark an avalanche path that slides. Of the two, the second scenario is far more common. The remarkable thing about this second type of accident is that it happens when the hazard is fairly obvious, even to somebody with minimal avalanche knowledge. Accidents where the hazard is subtle, or where a naturally triggered avalanche roars down on the party without warning, appear to be quite rare.

As far as common mistakes go, I’d say they fall into two categories: assessment and mitigation. Assessment mistakes happen when people assume a slope is safe when it isn’t. These mistakes include going into an obvious avalanche path when the hazard is significant (about 82 percent of accidents), when the path has been freshly loaded by wind or a storm (about 66 percent), or when the path ends in a terrain trap (about 58 percent). Well over half of all avalanche accidents occur when the hazard is rated considerable or higher, and about a third happen after the party has noticed recent avalanches—an obvious sign of danger. On average, victims ignore between three and four clear signs of hazard when they make assessment mistakes.

Mitigation mistakes happen when a party fails to take simple safety precautions—things like not wearing beacons, not carrying shovels and probes, exposing more than one person at a time to the hazard, and gathering the party in an avalanche runout zone. Something as simple as traveling one at a time in avalanche paths could cut the number of people caught in avalanches in half.

Q: Why do people make these mistakes, and continue to make the same mistakes?

That’s a great question. In fact, it’s the very question that got me started in my research on decision making. I think that on one level, we tell ourselves that people who are killed in avalanches lacked



Ian McCammon dressed for the office.

avalanche education, were reckless or were doing something fundamentally different than everybody else that day. Or we tell ourselves that avalanche accidents are caused by things like ego, haste, peer pressure and a bunch of other “human factors” that have to do with our emotions. The thing that makes me suspicious of such explanations, aside from the fact that they don’t hold up under statistical scrutiny, is that they tend to protect our assumption that a rational person with avalanche training won’t get caught in avalanches. But we know from accident statistics that this isn’t true. Plenty of victims had avalanche training, and it’s not realistic to assume that all avalanche victims were wildly emotional, as they’d have to be to ignore so many obvious clues. In the end, I think that many of our “pat” explanations of why avalanche accidents happen have more to do with our desire to believe “it won’t happen to me,” than they do with the actual causes of those accidents.

But back to your question. I think the best explanation of why people continue to make the same mistakes can be found in recent

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studies of human decision making. Traditionally, most research in this area has focused on analytical processes that people don't really use for everyday decisions. But more recent work, like that done by Gerd Gigerenzer at the Center for Adaptive Behavior in Berlin, show that we depend heavily on heuristics, or simple rules of thumb, to navigate the complexities of modern life. For example, when we're unsure of what to do, the social consensus heuristic leads us to model our behavior on what others are doing. Heuristics like this work because they are fast and usually accurate. Importantly, they tend to operate at or below the threshold of our consciousness, and so when people make decisions this way they still see themselves as being quite rational.

My research has focused on the role that six particular heuristics play in avalanche accidents. These heuristics fit the accident data better than any other decision-making model, so right now I think it's the most promising path to understanding why avalanche accidents happen.

Q: At which six heuristics are you looking? What's special about them?

The six heuristics I'm looking at are familiarity, acceptance, commitment, the expert halo, scarcity and social consensus. I chose these six because people seem to rely on them very heavily in their everyday decisions. You can see the evidence for this in advertising. Most advertisements use some variation of these six heuristics to persuade people to buy their product. In general, the more of these heuristics present in an ad, the more effective the ad is. The size of the advertising industry alone is pretty good evidence for the power and pervasiveness of these heuristics in people's thinking.

I've just completed a study where I found a strong correlation between the presence of cues for these six heuristics and the amount of risk that avalanche victims took prior to the accident. There are variations by party size and level of training, but this is strong evidence that these heuristics are influencing people's decisions in avalanche terrain. The important thing about these heuristics is that they have little or nothing to do with snow stability, and yet they seem to be driving decisions that lead to accidents.

Q: What role do you feel avalanche education (by professional avalanche educators) plays in preventing avalanche accidents?

Well, there's little doubt that people who genuinely want to avoid avalanche terrain can benefit from avalanche education. Accident statistics tell us that about a third of all avalanche victims lacked even a rudimentary understanding of avalanches, so presumably some proportion of these victims, if they had known how, would have chosen to avoid avalanche terrain that day. That would reduce the total number of avalanche accidents by that proportion, though I think the exact numbers would be hard to pin down.

In my experience though, most people who sign up for avalanche courses these days aren't interested in avoiding avalanche terrain. They want to learn about avalanches so they can get out and ski or ride steep slopes without getting caught. This type of risk management is very different from the risk reduction approach of the avoiders. With the risk avoiders, education will reduce the number of people exposed to the risk, reducing the number of accidents. But with the risk managers, education will tend to increase their perceived travel and recreation options, so the accident rate for these

folks probably won't change very much. The effect is called risk homeostasis. I know it's counterintuitive, but once you get the word out to the risk avoiders, who are a small group, modern avalanche education probably has more to do with increasing students' mobility in avalanche terrain and decreasing the severity of accidents than it does with actually preventing accidents.

Avalanche education isn't alone in this. Studies of driver training, drug education, AIDS awareness and other safety-oriented programs show the same effect. Basically, it seems that teachers can develop their students' knowledge and skills, but ultimately the students will use that knowledge to maximize their opportunities.

Q: How can we tell if avalanche education is effective?

This is an extremely important question, because it gets to the heart of our assumptions about avalanche education. One school of thought holds that effectiveness can be measured by figuring out how much knowledge students retain from their courses. This approach assumes that avalanche expertise is cognitive in nature, so it's like learning geometry or history. Another school of thought believes that effectiveness is a matter of retaining skills. In other words, how well can students recognize an avalanche path, find a beacon, or make a stability assessment three months or a year after their course? You could call this the behaviorist approach. Still another school of thought measures effectiveness by student satisfaction, assuming that if students enjoyed themselves, they must have learned something. Each of these approaches has its merits, but I think it's important that avalanche educators not confuse methods with results. In other words, educators who teach using cognitive tools but expect behavioral results are going to be disappointed. Ultimately, whether avalanche education is effective or not is going to depend on what we expect it to achieve. And I don't think there's a general consensus about that right now.

Q: Have you seen much of a discrepancy in course quality being offered in the US?

In talking about course quality, I think it's important to remember that the basics of how to avoid avalanches can be taught in a few hours. But the complexities of balancing risk in avalanche terrain can take a lifetime to master, and there are many different ways of achieving that balance. Like the question of course effectiveness, course quality is largely in the eye of the beholder, since it depends on what the student is hoping to learn. But if we're talking about quality in a global sense the question gets trickier, since it depends on what the avalanche community as a whole sees as a quality course. The American Avalanche Association has done a great job of developing guidelines for level 1 and level 2 courses, but we still don't really know how course content relates to behavior after the course. So discussions of course quality end up being pretty subjective.

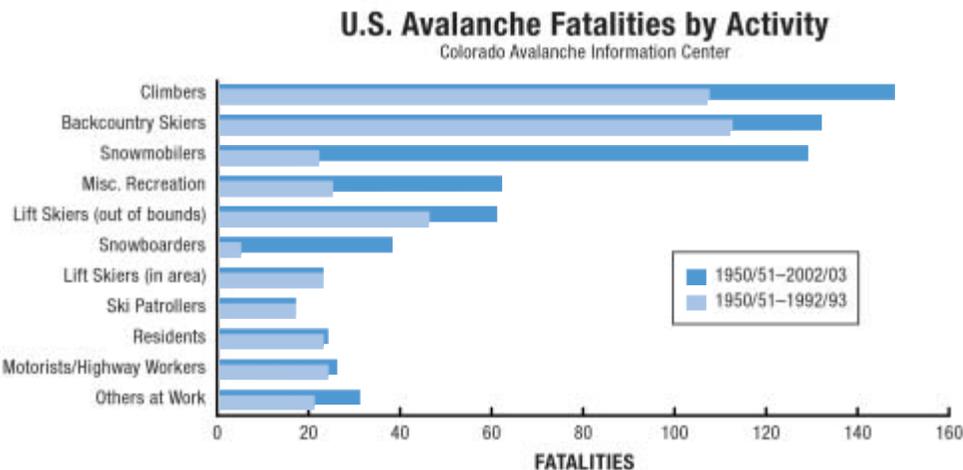
For someone choosing an avalanche course, I'd suggest seeking out instructors who mirror your objectives. In other words, if you're a snowboarder wanting backcountry avalanche skills, a backcountry guide who snowboards would be a good choice. A career ski patroller who knows control routes and organized rescue might teach a top-notch course, but may not give you what you're looking for.

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Ian McCammon

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Q: Over the years, Dale Atkins (with the CAIC) has done statistical analyses of avalanche accidents in Colorado and across the US. There has been a shift away from climbers and backcountry skiers towards snowmobilers leading the list. Would you care to take a stab at why that is?



Dale has done an excellent job of raising the awareness of the shifting demographics among avalanche victims. Certainly, with the advent of more powerful snow machines and the rising popularity of backcountry snowboarding, there are just more folks recreating in avalanche terrain now than ever before. So we'd expect the numbers to be higher, and this is reflected in Dale's data. I know that some people argue that these newcomers have less training and are taking more risks than skiers and climbers, but a recent analysis I did showed that with the exception of snowshoers, there was no significant difference in risk taking between victims doing different activities. I think it's also important to remember that the rise in snowmobiler and snowboarder avalanche deaths is in proportion to the overall number of deaths: the actual number of skiers and climbers killed is staying about the same.

Q: Do you feel the avalanche education community needs to reevaluate how it teaches avalanche courses?

Rather than reevaluate how we teach avalanche courses, I think a better starting point is reevaluating some of our assumptions about avalanche education. For example, many folks believe that the goal of avalanche education is to reduce avalanche deaths, but I don't know of any studies that actually show that it does. Also, many educators, especially those with technical backgrounds like myself, often assume that there is a connection between avalanche knowledge and risk-reducing behavior in students. Once again, I think this is an untested assumption. Given the mostly dismal record of safety education in general as a way of changing people's behavior, I think it would be premature to start redesigning our courses before we examined what effects our existing courses are actually having.

Q: Have you or someone in your group been caught in a slide?

Yes to both questions. I've been fortunate that neither myself nor my partners have been seriously injured or killed in an avalanche. I've lost several friends to avalanches, and their deaths are always hard; it makes me re-assess my own decisions. I think the line that separates most of us from the typical avalanche victim is finer than we'd like to admit.

Q: Do you have a most memorable day in the backcountry? Care to give away some of the finer details?

Two of my favorite ski partners are a husband and wife who are both practicing Buddhists. They have a knack for looking at ski runs and avalanche paths without preconceived notions of what to expect; they just focus on the data and on the immediate experience. They make great assessments, and they don't complain if the snow's not so good, or the avalanche danger's too high to get on anything steep. They just have fun. We always have a good time together. ❄️

An Excerpt From "Prometheus Unbound"

by Percy Bysshe Shelley

Marc Burdick is a friend of the CAIC, currently living in California. He sent us the following selection from Shelley's *Prometheus Unbound*, Act II. Marc interprets this selection as referring to the similarities between the mind accumulating thoughts and ideas like a mountain collects snow until something has to give. Shelley wrote *Prometheus Unbound* in 1820. [And Mary Shelley (Percy's wife), is famous for being the author of the novel *Frankenstein*.]

Hark! The rushing snow!
The sun-awakened avalanche! Whose mass,
Thrice sifted by the storm, had gathered
there
Flake after flake, in heaven-defying minds
As thought by thought is piled, till some
great truth
Is loosened, and the nations echo round,
Shaken to their roots, as do the mountains
now. ❄️



You've got questions? We've got answers.

by Scott Toepfer & Dale Atkins

Q: "I moved to Colorado four years ago and recently found your mountain weather and avalanche forecasts. The question I have is where are the boundaries for the north, central, and southern mountain zones?"

—Janine Fugere

A: We divide the Colorado mountains into three regions that are divided sensibly by the routes of I-70 and U.S. 50:

Northern Mountains:

This region extends from the Wyoming border on the north, to a line from Denver to Hoosier Pass (just south of Breckenridge) to Glenwood Springs as the southern boundary. The southern boundary roughly follows I-70, but dips south in the area of Breckenridge to include the Ten Mile Range. Ski areas included in the Northern Mountains are Steamboat, Winter Park, Eldora, Loveland Basin, Arapahoe Basin, Keystone, Breckenridge, Copper Mtn, Vail, and Beaver Creek. Major mountain ranges are the Front Range, Medicine Bow Mountains (Rawahs), Indian Peaks, Park Range, Gore Range, Ten Mile Range and Flat Tops.

Central Mountains:

This region extends from a northern boundary on a line from Denver to Hoosier Pass to Glenwood Springs to a southern boundary on a line from Pueblo to Montrose. Ski areas included in the Central Mountains are Powderhorn, Sunlight, Aspen areas, Ski Cooper, Crested Butte, and Monarch. Major mountain ranges are the Mosquito Range, Sawatch Range (Collegiate Range), Elk Mountains, West Elk Mountains, Grand Mesa, and Pikes Peak.

Southern Mountains:

This region extends from a line from Pueblo to Montrose on the north (US 50) to the New Mexico border on the south. Ski areas included in the Southern Mountains are Telluride, Durango Mtn (formerly Purgatory), Silverton Mtn, and Wolf Creek. Major mountain ranges are the San Miguels, La Platas, San Juans, La Garitas, and Sangre de Cristos.

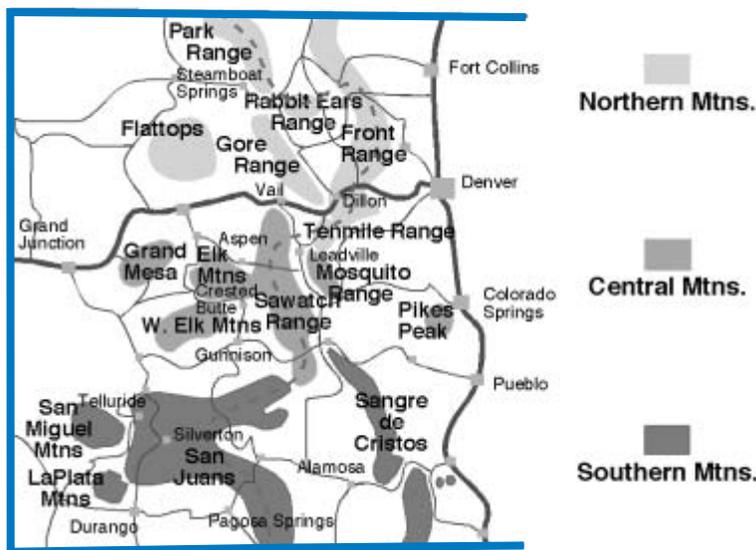
Q: "I have heard lightly of the suggestion for backcountry snowboarders to get 'releasable' bindings (this from an avalanche person—a skier). However, I am unaware of such bindings (just the traditional snowboard bindings—which are anything but). If anyone has insight, it would be appreciated."

—Sharon Smolinski

A: When teaching avalanche courses, we recommend releasable bindings for backcountry users. Snowshoers and snowboarders do not have this option, at least not yet, while skiers do. Skiers caught in a slide have a better chance to swim, if their bindings release. Telemarkers have access to releasable telemark bindings, but they add a fair amount of weight. Many ski areas require their telemarking ski patrollers to use releasable bindings while doing

avalanche work. From personal experience I see few telemarkers in the backcountry with releasable bindings.

The issue with snowboard bindings is that they do not release if you are caught in a slide. This means that your board will most likely act as an anchor and drag you further under the snow. A releasable snowboard binding would need to allow both feet to release from the board. Also, some form of braking mechanism would be needed so the board would not run free down a ski area run. A safety strap would also cause problems as you would still be tethered to your board, acting to drag you deeper in the debris. Every year I hear of advances in snowboard bindings, but have not seen releasable bindings on the market yet. That has not stopped some backcountry riders from fabricating a release mechanism to their bindings. For step-in style bindings, backcountry riders have run a cord from their bindings up through their clothes and set-up a rip-cord that allows the rider to pull the cords which would cause the bindings to release. If you know of any avid backcountry riders I am sure they will know what that looks like. Of course no binding manufacturer would advocate modifying their systems, so try not to alter the actual binding in any way. ❄️



Halsted Morris: “Education Coordinator”

a Biography by Scott Toepfer

Halsted Morris was born in Colorado and quickly got caught up in the mountain life. He was skiing at age 8, and rock climbing at 15. He has the fifth winter ascent of Mount of the Holy Cross in the Sawatch Range. His skiing career has taken him from Baffin Island above the Arctic Circle to New Zealand. He’s a bit of a ski addict, and that is a good thing for the CAIC because we at the Boulder office hear from Halsted almost daily with snowpack information.

His first avalanche encounter was in 1979. He and a friend were backcountry skiing above Black Lakes near Vail Pass during a storm. The light was very flat as they made their way off the ridge towards Black Lake. “I didn’t know that much about avalanches, but I did have enough sense to ski one at a time,” he says. After stopping at what he thought was a safe spot, he waved his friend down. He had stopped just above a steeper convex slope and watched closely as she skied down to him. Just as she stopped they heard “a rifle shot” and Halsted watched a crack leap out from between his skis and rocket across the slope. Halsted said, “I was totally amazed at how fast that crack moved.” A self-preservation bomb went off in his head and he immediately fell into a self-arrest position and stopped himself before becoming entrained in the moving debris. Had he been standing a foot lower he probably would have gone with the avalanche.

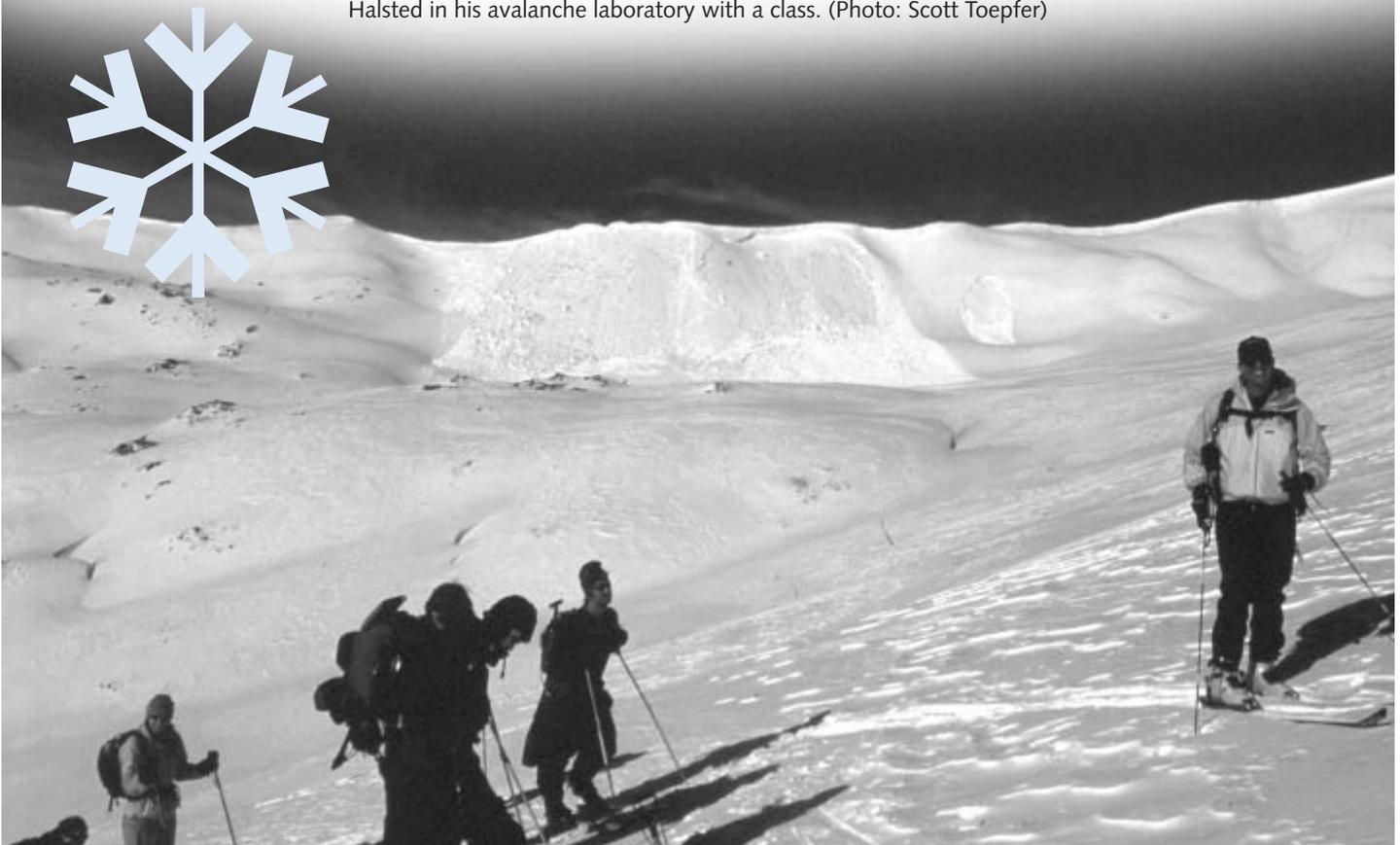
That began his quest for avalanche knowledge. He began taking some avalanche courses and tried to learn as much about snow as he possibly could. He still found time to go on climbing expeditions. In 1980 he planned a second climbing trip into the Ruth Gorge, Alaska. A young and skinny future avalanche forecaster with the CAIC, Dale Atkins, was suggested as a potential climber for the trip and it wasn’t long before Halsted and Dale became good friends.

Even though Dale was unable to join the climb due to a bout of “summer school,” they both started skiing at Loveland Basin every chance they could get. In 1984 Dale got a job as a ski patroller at Loveland Basin, and Halsted became a travel agent to support his skiing problems. Now able to ski in Austria, Canada, New Zealand and across the United States, Halsted discovered heli-skiing. Since then, his one major vice has been traveling to Canada every year for a visit to Mike Wiegele Heli Ski in British Columbia. A side benefit of all this world skiing was an increasing knowledge of snow and avalanches. Skiing in maritime climates, intermountain zones and continental climates taught him things impossible to learn from textbooks alone.

While Dale became a forecaster at the Colorado Avalanche Information Center, Halsted kept his hand in the avalanche

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Halsted in his avalanche laboratory with a class. (Photo: Scott Toepfer)



world by becoming a field observer for the CAIC, and patrolling part time at Loveland Basin. It was about this same time that Halsted was asked to fill in as an additional instructor for an avalanche class Knox Williams was teaching with the Colorado Mountain Club. There is probably no better way to really learn about avalanches than to teach avalanche classes. Halsted fit the bill perfectly and was soon teaching on a regular basis. Meanwhile, his avalanche education continued. He was a student at the National Avalanche School and began attending the International Snow Science Workshops (ISSW). It was at an annual meeting of the American Avalanche Association (AAA) that Halsted became the official representative of the affiliate members of the AAA.

It was soon after this, in 2000, that Knox asked Halsted to take over as the Avalanche Education Coordinator for the CAIC. After all those years of learning about and working with snow and avalanches, Halsted is still a humble educator and field practitioner. His classes run the gamut from fourth graders to snowplow drivers, recreationists to professional ski patrollers and guides. His position with the CAIC is largely funded by a grant from severance tax monies paid by the oil, gas, and mineral extraction industries in Colorado.

We are lucky to have Halsted, with his high energy and sense of humor, working for us. It is a tough position to hold, and I for one hope he has no designs on leaving his position any time soon. ❄️

Loss of a Friend

Richard Kerr of Aspen died in an avalanche near Revelstoke, BC, Canada, on January 8, 2004. He was backcountry skiing with a group of Colorado skiers at the time of the avalanche. Richard, 46, was an avid skier and was a Friend of the CAIC. He had many skiing friends in Aspen and Crested Butte, and is survived by family in Illinois. ❄️

Russell George Appointed Director of DNR



Governor Bill Owens appointed Russell George of Rifle, formally Director of the Division of Wildlife, as Executive Director of the Department of Natural Resources on January 9th.

"Russ George is one of Colorado's most respected leaders. He is an energetic and articulate

advocate for common-sense policies to protect and preserve Colorado's natural resources," the Governor said. "In his role as Director of the Division of Wildlife, Russ earned my respect as well as the respect of sportsmen and conservationists here in Colorado and throughout the nation. I am pleased and grateful that he has joined the Cabinet."

"I was proud to accept the Governor's appointment to the Department of Natural Resources," George stated. "Colorado's natural resources are the envy of many. Our state parks, wildlife, minerals, forests, water, oil and gas resources are an important part of what Colorado is all about. I look forward to continuing the Governor's vision of a proactive approach as we balance management of these resources. Colorado is viewed as a national leader in natural resource management and together we will continue to lead the way."

George, born and raised in Rifle, was named director of the Colorado Division of Wildlife in September, 2000. He served as Speaker of the Colorado House of Representatives, which was the capstone of his eight years in the House. A graduate of Harvard Law School, he had a private law practice in Rifle for 24 years. He and his wife Neal, a Rifle public school teacher, have four sons. ❄️

Renewal Notice (or recruit a Friend)

Yes, I will join the Friends of the Avalanche Center. Enclosed is my donation of:

- \$30*, which gives me a CAIC window decal (if I am a new Friend), *The Beacon* newsletter, the *Avalanche Wise* booklet, and a morning forecast by e-mail.
- \$45*, which gives me all the stuff above, plus an afternoon forecast sent by e-mail.
- Please accept my additional donation of \$ _____ *
- I'm a renewing member.
- I'm a new member. Please send a CAIC decal.

* Your donation may be tax deductible and your canceled check is your receipt.

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Mission: The Colorado Avalanche Information Center promotes safety by reducing the impact of avalanches on recreation, industry, and transportation in the state through a program of forecasting and education.

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Nick Logan—Associate Director
Dale Atkins—Forecaster, Web Master
Scott Toepfer—Forecaster, *The Beacon* Editor
Lee Metzger—Forecaster, Ike Tunnel
Stu Schaefer—Forecaster, Ike Tunnel
Mark Mueller—Forecaster, Pagosa Springs
Andy Gleason—Forecaster, Silverton
Jerry Roberts—Forecaster, Silverton
Rob Hunker—Forecaster, Carbondale
Halsted Morris—Avalanche Educator
Brad Sawtell—Summit County Staff

Durango.....970-247-8187
Summit County970-668-0600
Denver303-275-5360
Fort Collins.....970-482-0457
Colorado Springs.....719-520-0020
USFS-Aspen970-920-1664
Crested Butte970-349-4022

Friends of the CAIC
325 Broadway WS1, Boulder, CO 80305
phone: 303-499-9650 fax: 303-499-9618
e-mail: caic@qwest.net
Web site: <http://geosurvey.state.co.us/avalanche>



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DEPARTMENT OF NATURAL RESOURCES
Russell George, *Executive Director*

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Knox Williams, *Director*

A program of the: Colorado Geological Survey
Division of Minerals and Geology
Colorado Department of Natural Resources
1313 Sherman St., Room 715, Denver, CO 80203
(303) 866-2611



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Boulder, CO 80305

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