

Avalanche

REVIEW

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The Role of Belief

IN AVALANCHE DECISION-MAKING



Story and photos by N.J. DiGiacomo

The notorious Temptation slide near Telluride, taken in March of 2002. When it comes to avoiding temptation, what you believe is as important as what you know.

photo by N.J. DiGiacomo

By any measure, the snow-science community has made great progress in understanding and communicating the objective hazards associated with avalanches. Educators have also begun to include insights from modern theories of human behavior in their avalanche curricula, and decision aids ranging from simple to quite complex have become available. Yet the number of avalanche-related injuries and deaths among recreationists—many of whom have formal avalanche training—continues to rise. Why?

I'll argue in this article that what's missing is an understanding of how our underlying beliefs color the way we view evidence and make decisions.

Most of us would probably say we make decisions on the basis of evidence. We dig pits, comparison shop, and subject ourselves to medical exams, all on the assumption that we'll make our choices based primarily on the evidence we uncover. If asked—for example during jury selection or at the trailhead when we're putting on skins—we'll say we can look at the facts with an open mind. We express confidence in our ability to take new evidence into fair consideration, whether or

not it supports our initial assessment. And we're certain that, given enough information about the chances of something happening and the potential gains or losses if it does, we can make the optimum choice.

Unfortunately, psychologists and economists have spent the last 40-odd years demonstrating that human beings don't behave this way. They've documented dozens of situations where we act in ways that just aren't rational, at least by the standards outlined above. They call these deviations from rationality heuristics: instinctive rules and behaviors that short circuit the more complex process of systematically weighing probabilities and potential outcomes before making choices. Some researchers characterize these heuristics as fallacies or biases in our behavior, while others view them as "fast and frugal" intuitive short cuts that prevent us from thinking too much in situations that require quick action. Whether it kills us or saves us, researchers all agree that heuristic behavior seems to be hard-wired into the human brain.

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I learned a valuable lesson about responsible decision-making in the mountains when under the influence of powder fever: after all these years of surviving in avalanche terrain, I am still not immune to my own stupidity.

—Toby Weed, *The Wrath of Gog*, p17



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- To provide information about snow and avalanches;
 - To represent the professional interests of the United States avalanche community;
 - To contribute toward high standards of professional competence and ethics for persons engaged in avalanche activities;
 - To exchange technical information and maintain communications among persons engaged in avalanche activities;
 - To promote and act as a resource base for public awareness programs about avalanche hazards and safety measures;
 - To promote research and development in avalanche safety.

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from the president

KETCHUM, IDAHO
DECEMBER 15, 2006—

It seems fitting that as I sit down to write, we are in our first real avalanche cycle of the winter. I am excited and honored to be stepping in as president of the American Avalanche Association. I am also very appreciative and thankful to all whom have come before me as presidents, officers, or board members. They created a vision 20 years ago and have brought us into 2007. Very special thanks go to Russ Johnson, departing president, for his oversight and expertise over the past five years.

A number of people have asked me, "What does the American Avalanche Association really do? Why should I join?" My first thought is usually, "Because it is the Association of American Avalanche Professionals," and that often can speak for itself. However, I don't want to seem trite or have a canned response. I've thought about these questions much more closely, and I'm very proud to represent A3 and provide more answers.

The American Avalanche Association is the voice of American avalanche professionals. The governing board meets twice a year and communicates often as we work on tasks and issues throughout the year. We publish four issues annually of *The Avalanche Review*, an internationally recognized resource for avalanche professionals worldwide. We participate as an organized group in issues such as explosives oversight and regulation and industry standards. We facilitate the networking of avalanche professionals nationwide through our contact directory and support of Westwide Avalanche Network's bulletin boards and data collection. We are currently updating and upgrading the americanavalancheassociation.org Web site.

We created and publish the *Snow Weather and Avalanche Guidelines for the United States*, (SWAG). No small task, and we will regularly review SWAG and make updates as needed. We provide avalanche research grants for both graduate-level scientists and field practitioners. We offer an eight-day, advanced-level certification course for Professional Avalanche Workers based on SWAG. We developed a Professional Instructor Certification. We provide continuing education programs for avalanche professionals on years opposite the ISSW. We established guidelines for levels of avalanche education in the United States, both professional and recreational. A 14-member education committee is currently reviewing these. To keep up with changing times and technology, this committee will offer draft recommendations for updated progressions and guidelines in the spring and solicit member comment. There is more, but I won't go on.

Equally important as any of these tasks, we recognize and celebrate the achievements of our co-workers and we mourn the loss of avalanche-community members.

So please urge others to join, and please join if you haven't. We exist for you and because of you. Affiliate membership is a great way for anyone who is interested in snow and avalanche work and just beginning to get their feet in the snow, to gain more knowledge, participate in mentorship, and see what the avalanche world is about.

Above all, please give us your comments. Where would you like to see A3 head during the next few years? Contact your section reps or any board member (*see names and contact information listed at left*). For it is when we hear your voices that we can truly become your voice.

—Janet Kellam, president ❄️

from the editor

DRIGGS, IDAHO
JANUARY 22, 2007—

I'm in the midst of a 3-week avalanche-forecasting class, the skiing has been good, there are a thousand things that desperately need to be done, and I have procrastinated writing this editorial until the last possible moment. Tomorrow we send the final files to the printer so this issue of *The Avalanche Review* can begin rolling off the presses.

TAR 25/3 ballooned into a 28-page issue when we received permission to reprint Morten Lund's story, *Jerry Nunn—The Lady and the Avalaucher*. This must-read biography describes a true national treasure: a pioneer in the avalanche world and beyond as well as a powerful role model for both women and men in our field. I recently spoke with Jerry and her husband Jimmie on the phone to clarify a couple of points in the article; her laugh is still infectious, and she made sure to reiterate her motto that "anything a man can do, a woman can do better." This from a woman who not only continually proved her worthiness to stand alongside men in a male-dominated field, but first had to bust down the doors of the boys' club—all accomplished with remarkable style and grace. Jerry reminds me of the quip about Ginger Rogers, that she not danced as expertly as Fred Astaire, but she did it backwards and in strappy high heels. Jerry's story inspires me to work harder and not to be satisfied with "just good enough."

Two articles in this issue balance one another nicely. Nick DiGiacomo explores the role of belief in avalanche decision-making. His examples of belief statements gave me an "ah-ha" that translated directly to my next avalanche class; my students immediately understood his insights. In her characteristic careful and complete manner, Laura Adams calls for a more quantifiable assessment of risk and human factor. Belief and benefit fit into her systems-thinking perspective. I look forward to further application of both of these perspectives in my own practice.

Karl Birkeland and Toby Weed pack a one-two punch in articles relating to the strength of fractured slopes. Karl details how his ISSW presentation was tempered by both beer and the experiences other snow professionals later shared with him. Toby's honest case study gives a very human perspective to the implications of Karl's research.

Kjetil Brattlien of Norway stirs the pot with his article promoting revision of the current avalanche danger scale. Bruce Tremper provides the official forecaster working group response, and replies from other forecasters add both insight and humor. (Can you hear Mark Moore shrieking in horror?)

I want to publicly thank Halsted Morris for his patience with my incessant badgering to produce his *Triangles to Snowflakes* article. He has devised an elegantly simple and useful structure that I look forward to trying.

Send us a view of your winter for the April issue; photos, case studies, insights, heroes—all are welcome.

—Lynne Wolfe, editor ❄️



Jerry Nunn poses near Arizona Snow Bowl's pisten bully in 2004. Her fascinating life story starts on page 18 in this issue. *photo by John Brennan*

submissions

- Seen any good avalanches lately?
- Got some gossip for the other snow nerds?
- Developing new tools or ideas?
- Send photos of a crown or interesting terrain.
- Send photos of avy workers throwing bombs, teaching classes, or digging holes in the snow.
- Pass on some industry news.
- Tell us about a particularly tricky spot of terrain.

Write it up; sent it to us. *The Avalanche Review* is only as good as the material you send.

SUBMISSION DEADLINES

Vol. 25, Issue 4..... 02/15/07
Vol. 26, Issue 1..... 08/01/07

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metamorphosis

Thanks so much to ISSW 2006 for funding our 20th Anniversary Party and the AAA Governing Board Meeting Luncheon.

AAA also thanks the following members for contributing an additional donation to further our efforts in 2006-07. In our fiscal year 2005-06, donations totaled \$10,881 and amounted to 17% of our total income.

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From Andy Anderson, Truckee, California—

This is my first winter forecasting with the Sierra Avalanche Center. The previous two winters I lived in Boulder with my wife and backcountry skied a lot. I taught avy classes and wilderness-medicine classes for WMA as my work. In previous winters I volunteered full-time at the Manti LaSal Avalanche Center, taught avy classes in Utah and the Northwest, ski patrolled on Mt. Hood, and flipped burgers at Billy's in Jackson while skiing the Teton backcountry. My wife and I also lived in Chile for a year, so I have done a lot of climbing and skiing in Argentina and Chile. I have spent time skiing and climbing in most of the ranges in the continental U.S. and have worked as a climbing ranger at Mt. Rainier National Park for the last three summers. For three summers prior, I volunteered as a climbing ranger in the Tetons. I was a climbing guide and outdoor educator before that. I like to hang out with my wife and dog, run ultramarathons with my brother, read good books, climb, and ski. I grew up in Chattanooga, TN, and graduated from Williams College in 1999 with a degree in geology. I have been trying to get a forecasting job for a long time. ❄️



From Mark Saurer, Park City, Utah—

Some changes have recently taken place in the Park City Mountain Resort Snow Safety Department. Chad Jaques, patrol veteran for 16 seasons and Snow Safety Director for the last four, has retired to run his new flyfishing guiding and retail business—Trout Bum2—with his wife Marjorie. Replacing him at the helm is Colin Wilkinson. David Weiss continues in his role as assistant Snow Safety Supervisor and I was recently named as the other assistant supervisor on the team. ❄️

From Dan Moroz, Summit County, Colorado—

Last spring I retired from full-time ski-patrol work and snow-safety coordinator at Copper Mountain after 31 seasons. I now work part-time as an avalanche educator, conducting Level 1 and 2 courses for the ski patrol and snow-awareness programs for the ski school and resort employees. I continue to teach avalanche courses for Colorado Mountain College.

My full-time position is fire-code inspector for the Lake Dillon Fire Rescue department. After 30+ years of working two seasonal jobs, I opted for a job with four 10-hour days, full health and insurance benefits, and a retirement plan. I am bringing snow-awareness programs to the High Country Fire Training center in Frisco this winter for emergency responses on the Interstate tunnel area and the Loveland Pass, Vail Pass, Fremont Pass highway routes. Plus I do training sessions for Summit County Search and Rescue group.

The most important and fun work I am currently involved with is as snow, avalanche, and risk consultant for the Ginn Company, who plan to develop a private ski resort on Battle Mountain outside of Minturn (basically the back side of Vail). They are in the initial planning stage with construction slated to begin in late 2007 or early 2008. This group plans to develop about 5000 acres into a four-season resort similar to the Yellowstone Club. This may become a full-time management position.

Though I have retired from the ski patrol day-to-day world, I'm still heavily involved within the snow world. I'm probably working as an educator even more today than in the past. If there are any PowerPoint presentations, video clips, or impressive digital photos out there which could be strictly used in educational programs only, I would be interested in reviewing them and giving proper credit in my public education classes. Do let me know, please? ❄️

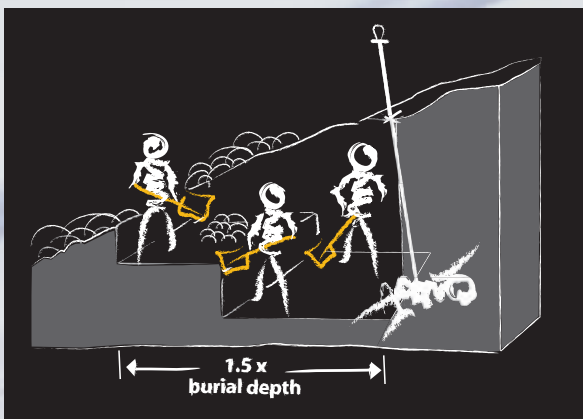
Beacon Searching 101

Shoveling 101 is part of an ongoing series of educational materials for professionals and the public. In this last installment, we discuss advanced shoveling techniques.

Shoveling with Multiple Rescuers

While shoveling might seem elementary, it usually consumes the majority of time during an avalanche beacon rescue. By shoveling strategically, you can shorten the excavation time, preserve the victim's airway, and produce a larger workspace for the rescuers.

- Once the victim is pinpointed, leave probe in place. Dig a starter hole extending downhill 1.5 times the burial depth and 1-2 "wingspans" wide, depending on the number of shovelers.
- Start shoveling on your knees, throwing snow out the sides. Stand up when the snow surface rises above your waist.



- When the surface rises above your waist again, throw the debris downhill, out the end of your hole.
- If two shovelers are available, work side-by-side, following the guidelines above.
- If more than two shovelers are available, then two should begin shoveling just downhill of the probe. One or two should begin shoveling downhill of them (1.5 times the burial depth), following the guidelines above.
- When the uphill shovelers are up to their waists and must start throwing snow downhill, the lower two shovelers should exit the hole to rest and prepare the area for first aid and evacuation. Rotate shovelers once a minute.
- In deep burials exceeding two meters, it might be difficult to throw snow clear of the hole. In this case, one downhill shoveler should exit the hole. The uphill shovelers then throw their snow to this position and the remaining downhill shoveler should move it to the surface (as shown in diagram on left).



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aaa news

Judson Receives AAA Honorary Membership Citation



Art Judson shows off his Honorary Membership award. His entire family showed up in Telluride to watch him receive his award. *photo by Lynne Wolfe*

Art Judson is a true avalanche pioneer, part of the first great generation of avalanche hunters who established the principles, protocols, and practices that are so familiar to today's avalanche professionals. As Snow Ranger, researcher, forecaster, and innovator, Art Judson is hereby awarded the American Avalanche Association Honorary Membership.

Art Judson was an ex-Marine and graduate forester from Oregon State College when he was inspired by the group of Forest Service workers who made up the 1960 Squaw Valley Olympic Avalanche Team. Their exploits and bravado steered him to the Arapaho(e) National Forest in Colorado where he came under the mentorship of Dick Stillman while working

as a Snow Ranger and avalanche forecaster at Berthoud Pass Ski Area. There, he discovered his love for snow and weather and began a lifetime avocation that continues to this day.

In 1962, Jud (his preferred moniker) transferred to the USFS Rocky Mountain Experiment Station in Fort Collins as meteorologist, to join the Snow and Avalanche Project initiated by Mario (Pete) Martinelli in order to pursue broader forecasting and research opportunities.

He set right to work trying to unravel the mysteries of snow and avalanches. He more fully instrumented the Berthoud snow-study site and developed remote wind speed and direction monitoring on Colorado Mines Peak above Berthoud ski area. He realized that the Colorado snow climate could not be inferred by this single site and developed a network of weather observers and data collection from 35 locations in Colorado, mostly ski areas, and dozens more throughout the West. West-wide data was entered onto punch cards from the infamous green and blue sheets until 1983; this data has recently been digitized and electronically archived by the Colorado Avalanche Information Center.

Jud began a pilot forecasting program in 1962/63 for the Front Range of Colorado, based on Berthoud Pass data and observations. His fascination with and enthusiasm for weather led him to contact the colorful radio personality, Weatherman Bowman, of KOA radio and television in Denver. Jud knew how popular Bowman's weather forecasts were and continued feeding avalanche-danger information to KOA during storm periods that were likely to produce slides on Berthoud and Loveland Passes. This non-Forest Service sanctioned communication became the genesis of the U.S. Forest Service Avalanche Warning Center.

Encouraged by positive feedback from ski area, transportation, and mining interests, Jud began instrumenting selected Colorado observation sites into first-order data providers and began daily advisories in 1973 through the National Weather Service weather wire, concurrent with hiring Knox Williams as a full-time forecaster. From this humble beginning, the current network has grown to include 17 avalanche information centers in the seven Western states, Alaska, and New Hampshire; all of which employ dozens of avalanche forecasters and observers to contribute educational and information services to tens of thousands of backcountry users.

In 1983, the Forest Service Experiment Station terminated the Snow and Avalanche Project. Soon after, Jud retired to Steamboat Springs where he and his wife Millie had the foresight to build their mountain home in 1969 and have since raised three sons. Jud continues to actively monitor avalanche conditions in northern Colorado and the state of avalanche science worldwide. The 12 publications dealing with instrumentation, forecasting, control, characterization, and modeling that he has written over the years also exemplify his contribution to the world of snow science.

Editor's note: see TAR 25/1, page 10, for a feature on Art Judson: ART JUDSON: A Visit with an Avalanche Legend. ❄️

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Don Sharaf Nominated for Special Service Award

We, the undersigned, would like to nominate Don Sharaf for the AAA's Special Service Award because of his dedicated work as AAA's Education Chair and, in particular, for his work on the new Professional Avalanche Worker's Course. As a wilderness educator, heliski guide, and avalanche forecaster, Don recognized the pressing need for professional-level avalanche training in the United States. He chose to take on this difficult and contentious project and probably regrets this decision – it was a job that took him countless hours of phone calls, discussions, emails, curriculum development, planning, and budgeting. Working with some of the most experienced and influential avalanche practitioners in the country, he developed a rigorous 8-day curriculum that provides a unique blend of avalanche theory, practice, risk management, operations topics, and even media relations. With the help of the American Avalanche Institute, he surmounted the obstacles of permitting and insurance to conduct the first course on December 10–17, 2005, at no lesser a place than Alta, the cradle of American avalanche science. By bringing together a roster of some of the most talented instructors in the avalanche community, Don's efforts resulted in a new and demanding training standard for avalanche observation, documentation, and practice among guides, ski patrollers, and forecasters. As the program gains momentum in the coming years, we in the American avalanche community and in the American Avalanche Association will be indebted to Don for his efforts to create a prestigious training program of which we can all be proud. ❄️



Don Sharaf hard at work at the AAA spring board meeting in Pinedale, Wyoming.
photo by Doug Richmond

Michael Jackson, Education Committee Co-Chair, powderhino@aim.com; Bill Glude, snownerd@mac.com; Ian McCammon, imccammon@earthlink.net; Rod Newcomb, rnewcomb@wyoming.com; Lynne Wolfe, lwolfe@tetontel.com



Jürg Schweizer at work in his outdoor office. Photo courtesy Jürg Schweizer

AAA Presents Jürg Schweizer with Honorary Fellowship Award

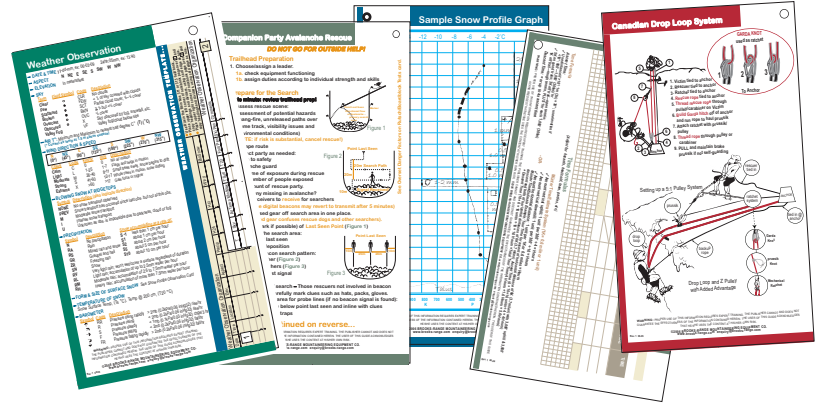
The American Avalanche Association is pleased to present Jürg Schweizer with our Honorary Fellowship Award. Jürg clearly qualifies for this award, which honors individuals for significant contributions to avalanche programs in other countries and for their efforts to transmit their findings to the greater avalanche community. Jürg has profoundly influenced avalanche research and practice. His prolific research contributions include over 30 journal articles, and his interests extend from small-scale breaking of bonds to large-scale regional avalanche forecasting. In addition, Jürg has a passion for communicating his scientific results to forecasters, ski patrollers, and guides. To do so, he has written over 40 papers in practitioner publications such as *The Avalanche Review* and the ISSW proceedings. In Switzerland, Jürg has written 35 popular articles to communicate his avalanche knowledge to a broad segment of the public which includes Swiss farmers and the many people who enjoy winter recreation in the Swiss mountains.

For the past five years, Jürg has coordinated avalanche courses for practitioners at the Swiss Federal Institute for Snow and Avalanche Research (SLF). Jürg currently works as an SLF research scientist, and he leads the Formation of Cryospheric Hazards research team. He has also contributed through the work of his graduate students, who include Dr. Kalle Kronholm and Dr. Christian Sigrist.

For his many contributions to the avalanche community, the American Avalanche Association is proud to present Jürg with our Honorary Fellowship Award. ❄️

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Randy Elliott receives Bernie Kingery Award



Randy receives the Bernie Kingery Award—a handmade wooden bowl—at the AAA general membership meeting at ISSW 2006. *photo by Lynne Wolfe*

Randy Elliott received the AAA Bernie Kingery Award during the 2006 ISSW. A low-key leader, Elliott has inspired avalanche workers with his superior skills and exemplary leadership for three decades at Bridger Bowl, Montana.

Randy started skiing at Bridger Bowl in his youth, worked on the volunteer patrol during college, and signed on as a pro in the late '70s. For the three decades since, his organization, strategy, and daily decision-making have safely guided Bridger's avalanche-control program through large increases in the number of skiers in steep terrain. He has also spearheaded the safe opening of new avalanche terrain, and he has led by example.

Randy's title changed from patrol director to mountain manager to his present day title of general manager. He still participates in avalanche control six days a week, bumping the tiller now and then when it's important. He has also led the Bozeman winter search and rescue program to a high level of excellence. In the words of Karl Birkeland, "He is so amazingly competent at so many different levels and with so many different skills."

He may not be as famous as some who have passed through Bridger, but they will tell you he showed them a higher level to strive for. Ski patrollers write songs about him. Elli-ott!

what's new



Participants from nearly 20 countries attended the 3rd International Avalanche Conference, held in northern Russia during September 2006.

Int'l Avalanche Conference Held in Russia

Story and photos by John Brennan

I had the good fortune to visit Russia to attend the third avalanche conference put on by APATIT, an avalanche institute located in the town of Apatity in the far northwestern corner of the country, north of the Arctic Circle. By chance, the conference coincided with the organization's 75th anniversary, just a few years older than the AAA. As opposed to some other conferences, I was notified that my abstract was accepted before having to pay for the conference. I obtained a visa in order to enter the Federation of Russia, which was easily accomplished through the incredible support of the organizing committee.

I came in through St. Petersburg and spent a touristy day enjoying the city. Instead of an inexpensive 18-hour train ride, I chose to fly two hours north of St. Petersburg for \$400 roundtrip and spend a night in the coastal town of Murmansk, which played a key role during WWII. From there, a three-hour van ride brought me to the small mining community of Kirovsk, where the conference took place.

More than 60 people from almost 20 countries attended the conference—I was the only one from North America. The conference is similar to an ISSW with presentations by both researchers and practitioners, providing a good blend of information. Since English was the main language, a translator was available for folks who presented in Russian. The hospitality of the organizing committee was incredible, with almost daily field trips and functions. It was a great experience to both attend the conference and to visit the Russia. This event is only held every five years, but Moscow will host a Snow Science Symposium in September 2007. See www.igsoc.org/symposia/2007/russia/ for more information. Beam me at jb@avalanchemitigationservices.com if I can be of assistance. ❄️



The WWII-era 160mm mortar, used extensively for avalanche control in Russia, weighs almost 90 pounds and packs 20 pounds of explosive payload.



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Sign Up For PAWS

There is still room in the second AAA Professional Avalanche Worker School (PAWS) course, slated for February 3-10 in southwest Montana. PAWS was successfully launched in the Salt Lake City area last winter, where participants received a thorough, well-rounded, advanced avalanche education.

This is a comprehensive professional course aimed at all levels of avalanche workers. It introduces the *Snow, Weather, and Avalanche Guidelines* (2004) and sets a proficiency standard of education for the U.S. avalanche community. Sixty percent of the course will be conducted in the field with the remaining 40 percent held in the classroom. The course is intensive: eight days long with 9-11 hours of instruction per day.

This course gives expert instruction designed to provide participants with the opportunity to become accurate and

efficient in snowpack observation. The course will solidify the participants' understanding of snowpack physics and avalanche formation and give them tools to apply that knowledge to the assessment of avalanches and avalanche potential. Terrain assessment, route finding, group management, and decision-making will be examined and practiced daily. Avalanche rescue and beacon use will be extensively practiced, and participants will be brought to a higher level and expected to meet a standard.

Additionally, the course will provide an overview into highly organized avalanche-control programs (both at ski areas and highways), and provide industry-norm instruction into avalanche-control practices. This course will benefit a large audience, including forecast-center avalanche observers, ski patrollers, ski guides, search-and-rescue coordinators/trainers, highway technicians, and experienced

recreationists who want to pursue a career in the avalanche realm.

Prerequisites— It is required that participants have taken one of the following: a three-day Level-2 avalanche course, both phases of the National Avalanche School, or the equivalent of the above with in-house training and experience. Participants will need to be proficient in beacon recovery and will be tested on single burial recovery at course commencement. Participants will also need their own skis or splitboard, boots, and skins and be proficient in their use. Skiing or riding skills need to be at least at the intermediate level in most snow conditions. Participants should be able to comfortably climb 3000' vertical over the course of a day.

For more information or to sign up, go to www.americanavalancheassociation.org/PAWS or contact Sarah Carpenter at sarahlovesnow@yahoo.com or 208-787-4235. ❄️

Avalanche Blasting Resource Guide: UPDATE

Story by Doug Richmond

The PowerPoint-based explosives training program, *Avalanche Blasting Resource Guide*, is still available to AAA or NSAA members through the NSAA for \$400. This training tool was created in 2003 by the AAA and the NSAA Explosives Committee with assistance from the US Forest Service. Its purpose is to promote consistency in explosives use and training in all U.S. avalanche-control programs.

The program includes PowerPoint presentations, instructors' guides, and attendee handouts for three modules: Core Training, Hand Charging, and Cornice Blasting. It is designed to be flexible to each organization's needs within the context of the NSAA Guidelines for Explosives Use in Avalanche Control and Federal, State, and Local Regulations. Trainers can insert specific requirements and digital images from their own programs.

NSAA members can purchase the program online in the Member Services section of the NSAA Web site: www.nsaa.org (user name/password required). AAA members can contact Kate Powers, director of member services, at katep@nsaa.org. ❄️



of Quiksilver Gore-Tex® outerwear for the trip. To earn entry into the Challenge, riders must read *The White Book* and answer 11 avalanche-related questions correctly at recco.com. Two grand prize winners will be chosen on May 15 from all correct entries and posted June 15 at www.recco.com.

The White Book is a pocket-sized publication written by renowned avalanche expert Dale Atkins. Against a backdrop of big-mountain imagery, the book provides avalanche-awareness information, eye-opening statistics, and words of wisdom from patrollers, guides, and pros.

The White Book is free at any of Quiksilver's 800 storefronts worldwide or by download at www.recco.com/avalanche/safety.asp. ❄️

Test Avy IQ for Heli-Ski Chance

RECCO®, Quiksilver, and Bella Coola Heli Sports have joined up to hold a contest aimed at increasing avalanche awareness while rewarding two lucky souls with a five-day trip to pow-turn paradise. The winners will sample Bella Coola Heli's 1.5 million acres of terrain and 300 established runs in British Columbia's Coast Range for five days. They will also be equipped with two head-to-toe sets

perfectly tuned transmit frequency, and minimal background noise. In the field, however, these ideal conditions rarely exist. On average, the effective range of a beacon is about half of its maximum range, according to a 2000 ISSW paper by Swiss ICAR avalanche commissioner Felix Meier. This means that the search-strip width in the primary search should be about the same as the beacon's maximum range. The search-strip width is equal to twice the useful range, or the diameter of the beacon's effective range, as opposed to the radius. The search-strip width is the distance recommended between switchbacks in a large deposition area being searched by a single rescuer or the distance between searchers if there is more than one.

It should be noted that these guidelines only apply to the range at which a signal is detected, whether or not that signal is strong or weak. With analog or analog/digital hybrid beacons with audible functions, there is often a zone after a signal is detected where the signal is too weak to provide useful information to the searcher. Manufacturers of purely digital beacons state that the useful range is even less for such audible-based units, as the signal only becomes useful once enough clear information is provided to justify abandoning the primary search. Therefore the recommended search-strip width should be significantly less than maximum range. The German Alpine Club (DAV), the largest mountaineering organization in the world, recommends assuming only 10 meters of useful range or a 20-meter search-strip width for all avalanche transceivers.

Now that the importance of useful range has been established, the next logical step is to agree on a common methodology for determining useful range. Shortly after this fall's 2006 ICAR meeting, the commission appointed Jürg Schweizer of the Swiss Federal Institute for Avalanche Research to work with beacon manufacturers to establish such a procedure. This will be an important subject at the 2007 ICAR meeting in Pontresina, Switzerland. ❄️

ICAR Officially Recommends "Useful" Transceiver Range

Story by Bruce Edgerly

The International Commission on Alpine Rescue (ICAR) has issued an official recommendation that manufacturers should no longer discuss "maximum" range in promotional and training materials, but only "useful" range and "search-strip width." This is an important confirmation that the maximum range stated by some manufacturers can be misleading and that the meaningful receive range of a beacon is its range under worst-case conditions in the field.

The French delegate to ICAR, François Sivardière, proposed this recommendation at the 2005 annual meeting in Cortina, Italy, where it was approved by the avalanche subcommission. It was given final approval by the entire ICAR delegation at the 2006 annual meeting held this fall in Kranjska Gora, Slovenia. Sivardière's proposal was based on his organization's experience that students were arriving at avalanche classes misinformed about the receiving capabilities of their beacons. Several beacon manufacturers promote their products as having a "maximum range" of up to 60 or 80 meters. With this in mind, students would often assume they could safely make extremely large switchbacks—or none at all—during their primary search. However, the primary search path should be carried out according to the searcher's useful transceiver range, not maximum range. The "useful" or "effective" range is defined by ICAR as that range at which a signal can be detected with 98-percent certainty under all conditions.

While maximum range is useful in marketing discussions (and is sometimes called "marketing range" by industry cynics), it really only applies to ideal conditions in the testing lab: co-axial antenna orientation, fully charged batteries,

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G3 Announces 2006/07 Athlete Team Roster

Including some of the most accomplished skiers and guides in the business, the G3 team readies for another winter in the backcountry

Eleven of the backcountry ski industry's most talented mountain guides, avalanche professionals, and big-mountain skiers have been hand picked to join G3's team of sponsored athletes.

Hailing from locations as diverse as Australia, North America, and the Swiss Alps, G3's team of snow-sports professionals all possess one common trait: a commitment to personal excellence and a product that delivers reliability and confidence in the mountains. Members of G3's select team of athletes are influencers in their profession as well as in the G3 product design process. This year's team includes:

Alan Bernholtz

A native of Southern California and recently elected mayor of Crested Butte, Alan has been living and guiding in Colorado for the past 18 years. When not defying death during Crested Butte Mardi Gras parades, Alan can be found running his own business—Crested Butte Mountain Guides—or banging a gavel at town council meetings.

Brad Harrison

Dividing his time between Golden and Vancouver, BC, Brad is a 20-year veteran with Golden Alpine Holidays, one of Canada's premier backcountry skiing guide service, and an active member of the Canadian Avalanche Association. Born in the Columbia Valley of British Columbia, Brad was raised in the backcountry, spawning a life-long love of the outdoors.

Naheed Henderson

Having grown up skiing in the Green Mountains of Vermont, Naheed now lives in Victor, Idaho, and calls Jackson Hole Mountain Resort her home ski mountain. She is currently working as the Athlete Coordinator for G3. When not traveling the world in search of fresh

snow and big mountains to climb and ski, Naheed can be found coaching ski camps and teaching avalanche courses in Canada and the US.

Brian Gould

Currently calling Squamish, BC home, Brian is a fully certified ACMG / IFMGA mountain guide and instructor. This winter, Brian will be working as an Avalanche Specialist with the British Columbia Ministry of Transportation's Avalanche Program, the biggest program of its kind in the world.

Greg Hill

An accomplished ski-touring endurance athlete and assistant guide, Greg set an incredible goal for himself; to ski tour 1 million vertical feet in a year. During the winter of 2004/05, Greg skied 145 days, climbing nearly 7000' per day to achieve his goal. Now a resident of Revelstoke, BC, Greg will be working towards his full-time guide certification this winter and defending his world-record randonnee ski-racing title.

Lorenzo Worster

Born in Boulder, CO, and now living in Truckee, CA, Lorenzo works as a project manager with Integrated Environmental during the summer and spends his winters traveling and skiing full time. Well-respected within the ski community for his big-mountain skiing style, Lorenzo is known for pushing the boundaries of modern freeheel skiing in both competition and movies.

Lars Andrews

Having grown up skiing deep in the mountains of British Columbia, Lars became an accomplished skier at a young age. Following his passion for deep powder and untracked lines, he has been a professional mountain guide for many years and has skied all

over the world. Lars can now be found running Whitecap Alpine, his family's backcountry ski lodge located in the South Chilcoteen Mountains of BC.

Martha Burley

An international Big Mountain Freeride competitor, the Australian-born Martha now calls Canada home, skiing and training in Fernie, BC, during the winter and working as a logger in Canada's Great White North during the summer. She will be competing this winter at several North American freeride competitions and hopes to make every stop on the IFSA World Tour.

Chad Sayers

A hard-charging and committed free skier, Chad is continually pushing his own limits to achieve his long-term goal of skiing that perfect line. He explores his home slopes of Whistler, BC, annually plumbs the steep slopes of the Alps, and has gone as far as the Patagonia Icecap in his quest.

Kirk Becker

Based just outside of Whistler in Pemberton, BC, Kirk is currently an ACMG-certified assistant rock and alpine guide with only one exam left between him and a full ski-guide certification. This winter, Kirk will be working as an assistant ski guide with Whistler Heliskiing, Coast Range Heliskiing, Valhalla Powdercats, and Whitecap Alpine.

Ruedi Beglinger

A certified Swiss and Canadian Mountain Guide, Ruedi was born and raised in the Swiss Alps and has been on skis since the age of three. Averaging between 170 and 200 days each season guiding ski-mountaineering expeditions, Ruedi has 164 first ascents to his credit and has guided the Europe's Haute Route on 53 different occasions.

For more info on G3 athletes, visit www.GenuineGuideGear.com ❄️

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A Reminder to Mentorship Project Contributors—

Career Paths Submissions for Avalanche Job Areas: Guiding, Forecasting, Highways, and Patrolling for TAR 25/4 (April issue) are due to Lynne Wolfe by **February 15**.

Many thanks to all those who submitted early!

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ISSW 2006 Proceedings Available Online

Kellie Erwin and Avalanche-Research.com have released the proceedings from the 2006 ISSW in video format. The video footage, all shot by Kellie, has been converted to internet files available at www.avalanche-research.com/site/issw06.asp. The video files are listed in order of appearance and available for viewing in a streaming video format created by the Adobe company.

The Avalanche-Research.com Web site was created to act as an online library for avalanche media. Video, documents, and photographs can be stored and shared. For more information on the project visit www.avalanche-research.com. ❄️

G3 Holds Backcountry Fiesta Competition

Host a backcountry fiesta this winter, and you could win a complete G3 guide kit, including a pair of skis.

To enter, merely enjoy a south-of-the-border inspired celebration during any backcountry trip over the course of the 2006-2007 winter, record the moment on digital video or imagery, and send the documentation to G3. Legitimate venues may include huts, yurts, snowcaves, bivy sacks and 1996 Ford F350 campers.

Backcountry Fiesta submissions will be judged by the G3 staff on innovation, creativity and authenticity. All images and video will become the property of G3, so don't do anything we wouldn't do.

One Grand Prize winner will receive a G3 Guide Kit, including a pair of 2008

G3 skis, G3 Targa Ascent bindings, G3 Climbing Skins, G3 AviTech Shovel, G3 Bonesaw and G3 SpeedPro Probe.

Two runner-ups will each win a G3 Targa Ascent binding, the lightest touring telemark binding on the market today.

To enter: send your non-returnable submission along with your name, address, phone, and email address, to G3 Backcountry Fiesta, 200 Donaghy Avenue, North Vancouver BC, V7P 2L7 or email your entry to: fiesta@genuineguidegear.com. All entries become the possession of G3 Genuine Guide Gear, and may be used for future promotional materials.

Entries are due on or before Cinco de Mayo (May 5, 2007). Winners will be notified by June 1, 2007. ❄️

Canada Launches Avaluator, Clarifies Roles, and Continues Sharing Knowledge

Story by Mary Clayton

Canadian and American avalanche workers alike benefit from sharing knowledge and experiences

We're in the middle of a great season up here in Canada, and we're all very excited to see the Avaluator in action, being put to use by backcountry users of all types. This newest addition to our public education tool kit is the result of three years of research and development and has benefited from some of the best minds from both Canada and the U.S.

In the late fall of 2006, sections of the recreational avalanche course curriculum were rewritten to focus on the Avaluator, which has replaced the traditional method of teaching a decision-making process. Instead of receiving a simplified version of a professional's approach, students now learn how to use the Avaluator's trip planner to choose an appropriate destination and how to apply the obvious clues to guide their route-finding decisions. All participants in Avalanche Skills Training Level 1 (introductory courses) receive an Avaluator with their course fees, and we're looking forward to the feedback from both students and instructors as the winter progresses.

On other fronts, as non-government and not-for-profit organizations, we're always working on stable funding. One of the things we've been tackling to help us in this area is some fine-tuning of our brand name. Between the Canadian Avalanche Association (CAA), the Canadian Avalanche Centre (CAC) and the Canadian Avalanche Foundation (CAF), we've been facing a bit of a struggle to clarify, in the eyes of the public, each organization's role and responsibilities. To better illustrate how we all work together, we've redesigned our Web site's home page. Now, at

avalanche.ca, the user sees plainly that the CAA represents professional avalanche workers, the CAC provides programs and services for the public, and the CAF is a registered charity raising funds for public avalanche safety.

Our Web site—avalanche.ca—is a well-known source of avalanche safety information that receives more than a million hits per year. In addition to the public avalanche bulletins and other services provided out of our office, our Web site also acts as the portal for other organizations providing avalanche safety information, such as Parks Canada. Our goal with the avalanche.ca Web site is to become the primary access point for all avalanche information and programs in Canada, representing the broad community of avalanche stakeholders in this country.

We've also applied the avalanche.ca brand name to our quarterly journal, formerly known as *Avalanche News*. Under its new name, *Avalanche.ca* is a glossier and more professional-looking publication, with a mandate to represent the entire avalanche community in Canada.

I'd be neglecting my duties as editor if I didn't take this opportunity to invite the readers of *The Avalanche Review* to contribute to our pages. There's a long history of collaboration between Canadian and American avalanche workers, and we all benefit from continuing to share knowledge and experiences.

The CAA has its own history of sharing knowledge, having helped establish professional avalanche-education programs in Iceland and Japan. In November, the CAA added



For A Case of Beer, It's a Real Bargain, eh

Story by
John Brennan

Who doesn't like a bargain? At the same time, are there any true bargains left these days? As far as continuing education in the avalanche safety and mitigation field goes, I'd say that YES is the resounding answer to both of these questions.

A little over a year ago I researched the possibility of some sort of reciprocity program between the Canadian and American Avalanche Associations. While this endeavor proved overly challenging, a simpler opportunity still exists.

Basically, for little more than the cost of a case of beer annually, avalanche aficionados can become subscribing members of one another's organizations. The content of each organization's periodicals are sufficiently diverse to offer incredibly affordable opportunities for personal and professional growth.

Find information on memberships and subscriptions at:

CAA— www.avalanche.ca

AAA— www.americanavalancheassociation.org

New Zealand to this list, signing on to a long-term partnership agreement for the upgrading and delivery of that country's "Stage 2" avalanche training. Through this partnership, the CAA's Level 2 core curriculum will form the framework of New Zealand's advanced professional training, and the two countries will continue to work together as our respective programs evolve.

Working together, the CAA and CAC developed and now administer a very well-received online learning program focusing on avalanche self-rescue. The course is interactive, entertaining, and free. We've had some rave reviews from online discussion forums and backcountry magazines, and users from around the world have visited the site and taken the course.

To find out more about what's going on in the avalanche community north of the 49th parallel, consider a subscription to *Avalanche.ca*. For the cost of a couple of decent bottles of wine, it's a cheap method of expanding your professional horizons. Full disclosure here, I'm encouraging our readers to subscribe to *The Avalanche Review* as well—a little bi-lateral trade agreement that should benefit everyone. We have a lot in common and share many of the same issues and problems. Let's work on them together.

Mary Clayton is the editor of *Avalanche.ca*. In return for the first in this ongoing series of updates from north of the border, she has managed to persuade Mark Mueller and Janet Kellam to write an article for the very slick *Avalanche.ca*. ❄️

New Training DVD from the International Commission for Alpine Rescue

"Time is Life" is a comprehensive training DVD covering medical response protocols for avalanche rescue. This DVD is highly recommended for all avalanche and medical professionals.

This DVD contains a self-running presentation of 78 minutes in 10 languages about the medical aspects of avalanche accidents. Playable with any DVD player (PC or stand alone). You also get a 137-slide PowerPoint presentation including digital videos for complete or selected presentations and an interactive knowledge test.

The Canadian Avalanche Association is the North American wholesale distributor for 'Time is Life' DVD. Wholesale pricing and bulk order discounts are available. Please contact the CAA at 1-250-837-2435 or info@avalanche.ca for more information.

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TIME IS LIFE
MEDICAL TRAINING IN AVALANCHE RESCUE

Snow King Avalanche Night

Story by Jen Fisher • photos by Sava Malachowski

“The strategy for staying alive in the mountains is to not only see what’s right with the picture, but what’s wrong with the picture.”

—Jill Fredston

Where else in the country can you step into a room on a snowy evening for a taste of avalanche education and find yourself deep in conversation with mountaineering legends, top snow science and weather educators, and sales reps from leading outdoor equipment companies...all of whom share your home mountains?

Well, Jackson, Wyoming, of course. Historically the leader and cutting-edge corner of the world, Jackson has always set the stage for what is the next hot thing in the ski industry, snow-science education, and backcountry enthusiasm. On hand to peddle their wares and services were local guide outfitters Exum Guides/AAI; Jackson Hole Mountain Guides; JH Snow Observations, an online forum where locals post snowpack and avalanche observations (www.jhsnowobs.org); BCA; Cloudveil; LifeLink; Marmot; Ortovox; and many others. The gathering had the feel of a mini-ISSW for the layman (and woman) with poster presentations by the Wyoming Department of Transportation, gear demos, and, of course, beer.

Snow King Mountain Resort and Skinny Skis, a local shop owned by Phil Leeds and Jeff Crabtree, have hosted an avalanche-awareness night for locals since 1986. From its inception—when folks gathered in the Snow King Ski Patrol Hut—to its current location in the conference center, the event has grown in attendance to well over 300 people who represent a user range from your average Joe newbie to top professionals.

The evening serves as a fundraiser for Teton County Search and Rescue and the Bridger-Teton Avalanche Forecast Center (BTAFC). “Over 50% of our funds come from fundraisers and in-kind donations,” explains Bob Comey, BTAFC director. “A major percentage of our funds will be raised here tonight.” All of the money from the sale of raffle tickets goes directly to the forecasting center.

The highlight of this year’s gathering was a talk given by Jill Fredston. Jill, former director of the Alaska Avalanche Forecast Center, and her husband Doug Fesler run the Alaska Mountain Safety Center and are directors of the Alaska Avalanche School. She was the final speaker in an all-star lineup of talks by local educators and professionals Rod Newcomb, Jim “Woody” Woodmency, Mike Rheam, and Steve Romeo.

The theme of the evening was awareness. Woody, local meteorologist, former Alaska heli-ski guide, Jenny Lake Climbing Ranger, and current ski guide for High Mountain Heli in Jackson, emceed the event. He kicked the evening off by asking folks which user group they considered themselves. A peppering of hands went up for snowmobilers, to which Woody commented, “Good on you; that is the most we have seen yet.” About 10% represented backcountry snowboarders, and about 90% fell into the backcountry skier group.

The presentations began with a current season snowpack analysis given by Exum Guide and AAI founder and industry legend Rod Newcomb. The room fell silent as the vibrant 73-year-old Newcomb took the stage to share his pit profiles with the audience. “I started 25 years ago going to the same spot on the pass doing pit profiles for my own interest around Thanksgiving. Phil Leeds and Tom Sullivan [of Snow King Resort] thought it a good idea to create a forum where we shared information with other people to create an environment of safety and awareness.” As I spoke further with Rod he told me, “If you ski the backcountry long enough, you will kick something off. You need to learn how to get out of avys you trigger. Stay cautious and crowd your luck.”

Woody gave a brief session on the relationship of weather and avalanches. Quoting from Bruce Tremper, he said, “Weather is the architect of avalanches.” Understanding the relationship between weather and how it affects the snow is a key piece of your knowledge. If you are a beginner, this is not an avalanche course.” Woody discussed the human factor, the avalanche triangle, and how weather affects snow. Highlights of his talk included how wind, temperature, and precipitation create, change, and load/overload the snow. His goal was two-fold: to jump-start the thought processes for the avy-savvy folk and to point others toward an avalanche class.

Mike Rheam, forecaster for the BTNF Avalanche Forecast Center, gave a quick update on changes made to the organization’s equipment and Web site. This year, local users will benefit from upgraded equipment installed at the Raymer Plot and the Rendezvous Bowl weather station; these include new sensors and new snow-catchment buckets. In addition, a new Snotel site at Grand Targhee Ski Resort expands data points on the west side of the Tetons. In addition to numerous weather stations and two daily avalanche reports from the BTAFC, the Teton backcountry skier can access the Wyoming Department of Transportation (WYDOT) Web cam and weather station located on top of Teton Pass. “We want people to take responsibility for their actions. Don’t do anything based on what WYDOT does or doesn’t do [control work] on the Pass,” Jamie Yount of WYDOT explained. “We provide information and control work but we want to know what more we can do [in terms of control work].”

Local guide and ski professional Steve Romeo presented slides and shared his story of a brush with an avalanche. The slide carried him and fellow climbing friends over a cliff and into a river of wet sliding snow near Mt. Cook in New Zealand. Romeo never hesitated to present his story to locals; his goal was to promote better decision-making. His cautionary tale was a great lead-in to the showing of local film producer and photographer Sava



Jill Fredston, author and avalanche educator, begins her avalanche awareness presentation at Snow King after being introduced by local meteorologist and heli-ski guide Jim Woodmency, who looks on from the podium.

Malachowski’s 2006 10-minute educational film, *A Sense of Snow: An Introduction to Avalanche Awareness*. This film, dedicated to those who have lost their lives in avalanches in the Tetons, covered basic awareness information presented by local professionals, guides, and educators. Urging personal responsibility, the film left the greenhorn with the feeling that education was key to safe travel in the backcountry. Jackson resident Doug Workman of Valdez Heli-Ski Guides, representing Marmot for the evening added, “Hopefully we are getting people psyched on paying attention and getting into the mindset of asking questions.” This concept of “asking questions” was reiterated by all the professionals I spoke with. Jim Sullivan of Snow King Resort furthered the idea by saying, “This [evening] should be a segue into future education. We are encouraged by the increased number of people who attend every year.”

All this led to a captivating talk given by the unassuming and polished Jill Fredston. Jill travels throughout the country sharing her knowledge of avalanches, educating the educators, and promoting her recent book *Snowstruck*, which relates a lifetime of her involvement in the avalanche field. Continuing the theme of the evening, Jill referred to the importance of a keen eye. “The trick in avalanche country is to develop the eyeball to see what you need to see,” she explained. “The strategy for staying alive in the mountains is to not only see what’s right with the picture, but what’s wrong with the picture.” As snowfall is below average in the Tetons this season, she discussed the possibility of triggering avalanches where the snow is thin. With captivating slides of 36’ crowns to those less than 1’ in depth, Jill encouraged people to “believe what you are seeing and not get complacent.”

Historically, Jill has been involved in avalanche rescue scenarios and body extractions. She has dug out 50 avalanche victims, only one of whom was still alive, trapped in a building. She stressed the importance of not getting sucked into the “blame game.” “Placing blame and not owning your part,” she explained, lets us create distance.” Jill highlighted the importance of personal responsibility by relaying some humorous statistics. “56,000 people manage to get, and admit to getting, injured by their toilet each year. In addition, 450,000 people a year get hurt by their beds, and 33 people per day get hurt by their couches.” In the midst of uproarious laughter, the point was driven home that we need to take responsibility for our actions in life as well as in the mountains.

Community education is becoming more common throughout ski towns in the U.S., but not to the advanced level of what is happening in Jackson, WY. Sava Malachowski, who helps in organizing the Avalanche Awareness Night as a volunteer for Teton County Search and Rescue, reiterated that he hopes what is taking place in Jackson will set the stage for opening up educational forums elsewhere. “We hope that what we are doing here in Jackson, involving vendors, guides, educators, and bringing high-profile people like Jill to participate and educate, will serve as a model to organizations in other mountain regions. We believe that what we have done, and will continue to do, is very important and will create sound decision-making in the backcountry.”

The Avalanche Awareness Night is strongly supported by many outdoor equipment companies through generous contributions to the raffle that takes place during the event. Jill Fredston’s presentation was underwritten by Cloudveil and Black Diamond. Jackson Hole Mountain Resort contributed the grand prize of the raffle—an all-mountain pass. Grand Targhee Resort and Snow King Resort also contributed season passes to the raffle. The event was very successful, raising \$2147 for Teton County Search and Rescue and \$4217 for the Bridger-Teton Avalanche Center.



Jen Fisher lives in Teton Valley, Idaho, where she works as a massage therapist. She continues to pursue her insatiable curiosity about snow and surf. Her latest project involves organizing a women’s mountain biking skills camp at Snowmass in June of 2007. Contact her at jenniferleighfisher@hotmail.com for details. ❄️

Avalanche Awareness Event Held in Driggs

Story by Zahan Billimoria

On December 6, Yöstmark Mountain Equipment hosted its second annual Avalanche Awareness Night at the Driggs High School. The evening event served as an introduction to Yöstmark's avalanche courses and an opportunity for further education for those already steeped in snow study. The goal of the evening was to increase avalanche awareness through the presentation of the rule-based decision-making system ALPTRUTH1 and to use local avalanche accidents as case studies to reinforce that decision-making system.

Don Sharaf began the evening with a user-friendly introduction of the ALPTRUTH framework, replete with slides illustrating each factor. This portion of the presentation catered equally to first-time backcountry users as well as to seasoned travelers who were not familiar with ALPTRUTH.

The four local case studies that followed highlighted the ALPTRUTH factors which were present in each case, implicitly underscoring the powerful nature of this tool in avoiding avalanche accidents. Stephen Koch easily dazzled the crowd while recounting his life as a snowboard alpinist, paying particular attention to his near-fatal avalanche accident on Mt. Owen. Zahan Billimoria reviewed the Mt. Taylor avalanche of January 2006 that killed Laurel Dana. Steve Whitney offered a succinct recap of a snowmobile fatality in the Beartooth Mountain Range and offered sound advice to snowmobilers when traveling in avalanche terrain. Don Sharaf concluded the case studies with a report on Joel Roof's tragic accident on Glory Bowl during the early part of the winter of 2000. The night ended with a showing of *Know before You Go*, an 18-minute instructional DVD created by Craig Gordon of the Utah Avalanche Center that illustrates the destructive force of snow on the move.

The success of the evening hinged upon the format which used each case study to reinforce the lessons of ALPTRUTH without being redundant. Although advertising targeted all user groups, the vast majority of the attendees were skiers and snowboarders. Organizers hope more snowmobilers will attend future awareness nights, but it will take significant effort to get the word out to this user group.

Particular thanks to Don Sharaf who organized the event and whose tireless commitment to avalanche education is an enormous asset to Teton Valley.



Zahan Billimoria lives in Driggs, Idaho, and works as a ski guide for Yöstmark Backcountry Tours. He also operates Z Language School where he teaches Spanish to gringos and English to the local Latino population. Zahan competes for Team Ski Trab in the U.S. Ski Mountaineering races. ❄️

media



Is the Avalanche Danger Scale DANGEROUS?

Story by Kjetil Brattlien

The international five-level avalanche danger scale is of great value for forecasters and users, but the word used to describe Level 3 may create dangerous misunderstandings. This can be improved if the words we use to describe the levels are changed.

Last Easter there was a tricky persistent weakness in the snowpack in Norway. There were lots of accidents, and people were injured or killed by avalanches. The press went big and stated *EXTREME Avalanche Danger*, even though the bulletin gave a Considerable avalanche danger (which was probably the correct level). I gave interviews with the press and corrected them and explained that the avalanche danger was 3 on a scale from 1 to 5. Further that Level 3 is termed *Considerable Avalanche Danger*, not *Extreme Avalanche Danger*. From this, the press concluded that the danger then was about average with no extra care needed—and that was not my point!

As a forecaster and educator I find it frustrating that almost all avalanche fatalities happen under conditions where I cannot use the expression *High Avalanche Danger* to communicate the danger. Swiss statistics shows that 81% of avalanche fatalities happen when the danger is Level 3 or lower. It shows the following relationship between danger level and fatalities:

LOW	6%
MODERATE.....	30%
CONSIDERABLE	45%
HIGH.....	18%
VERY HIGH.....	1%

The terms *High* and *Very High (Extreme)* are the only two descriptions in the scale that really seem to get people's attention, and they represent only 19% of the fatalities. That simple fact motivates a possible improvement of the labels we choose in our effort to prevent fatalities.

At ISSW in Telluride, I discussed this over a beer with people from different countries, and there seems to be a common problem with different languages that the word describing Level 3 is somewhat an odd word that it not clearly understood. Do people understand the danger involved in Level 3, and what is the difference between *Considerable* and *High*? (German: *Erheblich* and *Gross*, French: *Marque* and *Fort*.) My contention is that the word describing Level 3 is not ideal, and I think that the solution is rather obvious!

Make Terminology Consistent and Clear

We want to prevent accidents by getting out the message, especially to non-avalanche-educated skiers that this might be a dangerous day. I believe this would be easier if we used the same terminology as the US

fire-danger rating. Then the avalanche danger scale would use the words:



If the avalanche terminology is changed, there will be some confusion for a while. But the only people who will be confused are the ones who already know the avalanche scale. They will probably be reached easily, and during the initial years we could write both the number and the text. For example, "Today it is a *High Danger = Level 3*." Also a possible confusion will be on the conservative side, as a skilled user only getting *High Danger* might think conditions are rated Level 4 today, while they actually are Level 3.

The terminology today is still not uniform since the U.S. describes Level 5 as *Extreme*, which Europe terms *Very High*. In my opinion, Level 5 is more than *Very High*, and *Extreme* is a more appropriate description for these extreme conditions.

The terminology chosen when the International (European) Danger Rating was established some 10 years ago was thoroughly considered and debated. The danger rating applies not only to people playing in the mountains, but also to settlements and infrastructure. Level 3 is not a *High Danger* for settlements and infrastructure, but it is *High Danger* for skiers. In my opinion, we should optimize the scale so that we can prevent most fatalities, i.e., to the skiers. Thus, the exaggeration of the danger for the settlements and infrastructure must be accepted.

For the experts it does not matter what word we use to describe the danger level; they get our message by the number—for example, "Today it is Level 3." The problem is in describing condition levels accurately for novice users and the press, and that is why I am arguing to change the terminology. Hopefully a new international terminology will make it easier for us to get our message out to people and save lives. Therefore, you guys being responsible for the Avalanche Danger Scale—get together and change it!

Kjetil Brattlien (M.Sc. Civil Engineering) is an avalanche expert at the Norwegian Geotechnical Institute (NGI) in Norway where he has been for almost 15 years. All the 10 avalanche experts in Norway are working at NGI year-round doing consulting work, forecasting, and education. Kjetil is an active outdoor guy especially loving telemark skiing, xc-skiing, and rock climbing. This story does not necessarily represent NGI's opinion regarding the subject. ❄️

From: "Janet Kellam" <jkellam@fs.fed.us>
Sent: Wed, 6 Dec 2006 11:48:02 -0700
Subject: Re: Danger Rating stuff raises its ugly head again...

I think Bruce presented a well thought out & written response [see "Reclassifying the Danger Scale" on next page]. My only addition would be when we do make a change, we want it to be something that will be well-accepted and useable for a period of time and not need another revision too soon. If there are too many revisions in too short a time period, clarity and acceptance are compromised.

Janet

See more responses to **Danger Scale Changes** on next page ➡

From: "Greg Johnson" <greg@avalanche.ca>
 Sent: Wed, 06 Dec 2006 14:39:45 -0800
 Subject: Re: Danger Rating stuff raises its ugly head again...

From Canada with love.....

I think everybody is on the same page from the US and Canada with regards to Kjetil's letter. Thanks Bruce for preparing a response that I mostly agree with as well. Janet's point is right on. I think I heard Mark banging his head against the wall in Seattle from Revelstoke. :)

The momentum in the great white north (and it is really really white this year) is to revise the danger scale with a second round of funding for the ADFAR project. This is the government funded project that produced a bunch of good papers, the Avaluator, and a pile of terrain ratings across BC and Alberta. Nobody knows if the funding will come through, but if it does the project will start in the spring 07 and it will likely be housed under the CAC or Parks with academic, government and industry partners.

- From the Canadian perspective we will quite possibly, but more likely we will probably:
- keep it a five level scale
 - work hard with the US to maintain a N.A. Standard
 - figure out how the public (not forecasters) perceives each danger level and the scale itself
 - have a communication version
 - have a technical version
 - make it work more friendly with the Avaluator

In Canada we are on hold until the great hand passes some cash our way.

More seriously...I hope that everybody is having a good winter and enjoying all.

Greg Johnson
 Avalanche Forecaster, Canadian Avalanche Centre
 250-837-2141

From: "mark.moore" <mark.moore@noaa.gov>
 Sent: Wed, 06 Dec 2006 10:48:50 -0800
 Subject: Re: Danger Rating stuff raises its ugly head again...

AAAIIIEEEEE!!! That's a primordial scream of despair for those not familiar with it.

Ahh, where to start, how to start? First, Bruce, thanks for taking the lead and preparing a more official response. For the most part I agree with this response-- while there could be a simple change to our current danger rating levels like the one suggested by Kjetil, such a change will certainly not solve the "dangerous danger level problem", nor will it make friends and influence people. We (I speak only for the US) left the LOW-MODERATE-HIGH-EXTREME world in the late 90's for a better 5-level world. We did this in part to fit into the International Scale accepted in Europe (and adopted by Canada), but also because many operational forecasters in the US found that they were using the term "Moderate to High" to describe a stability level that was more than Moderate but less than High. At the time of this transition, no one involved in the "New Danger Scale" could come up with any term that was universally acceptable for the "Moderate to High" slot. Believe me, many terms were "considered" as the large number of revisions attest, but only considerable seemed to convey at least some of the hoped for implication (You have a considerable chance of death if you don't adopt this). In short, to adopt a LOW-MOD-HIGH-VERY HIGH-EXTREME scale at this point would still leave us that BIG forecaster gap between MOD and HIGH, and would not address any of the issues outlined in Bruce's response. However, to this end I've attached a table showing some potential alternative danger level rating words...

Unfortunately at this point a seemingly simple scale has evolved into a complex and non-trivial issue, but we probably still need to pursue the process--especially if the goal is for universal acceptance and agreement about all words and every definition, and to accommodate some necessary changes in recommended actions, consequences, and their emphasis. My feeling is that we will expend large amounts of time and energy and focus incredible knowledge as well as some \$ on the problem, but may ultimately find that what we seek is not too far from what we already have. However, I am open to divine or other enlightenment as to how best to describe the avalanche danger, both objectively and subjectively.

Cheers, Mark

RECLASSIFYING the Danger Scale

there's more to the issue than first meets the eye

Story by Bruce Tremper

Since Kjetil and I are close friends, we have spent many hours talking about the thorny problems with avalanche danger ratings. And yes, it's no secret that there are problems with not only the names on the five-level avalanche danger scale, but their definitions and how forecasters determine the danger ratings.

In response to these problems, about two years ago we formed a committee composed of several working avalanche professionals from both the U.S. and Canada. The group included Karl Birkeland, Doug Abromeit, Mark Moore, Janet Kellam, Knox Williams, Ethan Greene, Grant Stetham, Greg Johnson, Ilia Storm, and myself. Like most people who have tried to solve this problem, we naively thought we would be able to have a couple of conference calls and quickly work everything out and implement the changes the following season. But after seemingly endless e-mails, conference calls, and several meetings, we reluctantly admitted that the problem was far too large and complex to tackle without putting some significant time and money into it.

We are currently looking for funding to attack the problem using the full arsenal of scientific tools. The to-do list includes:

1. **STATISTICAL STUDIES** of avalanche accidents and the character of avalanches that occur during different danger ratings
2. **DEFINITIONS** of the various concepts involved including stability, hazard, risk, and danger
3. **CONSULT** with other disciplines including behavioral scientists, communication specialists, marketing experts, and graphic designers
4. **TEST** the various options on focus groups to see how they work
5. **AGREE** on which factors, or combination of factors, define danger ratings and construct a technical model on how forecasters would determine each danger rating
6. **WRITE** definitions of ratings for public and media
7. **COORDINATE** with the international community, since we all operate on an international standard developed many years ago, which came about through a similarly long-and-involved process

This is certainly not a trivial process. Kjetil's idea is a good one, but it is not new and it has been proposed many times before and discussed at great length. I wish that everything could be solved by just changing a couple words. But as we discovered after two years of work on the problem, it's going to require lots of time and money to get it right. We don't want to make any changes without having some hard numbers and good research to show that it will actually work because none of us want to go through this painful process again.

Bruce Tremper is the director of the Forest Service Utah Avalanche Center and the author of *Staying Alive in Avalanche Terrain*. This winter he has developed an obsession with facets, as evidenced by this recent Wasatch forecast. ❄️



Alternative Danger Level Classifications (Mark Moore, 12/06)

INTENSITY	CURRENT	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6
A1	LOW	MINIMAL	SLIGHT	SLIGHT	MILD	MINOR	SLIGHT
A2	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
A3	CONSIDERABLE	SIGNIFICANT	CONSIDERABLE	HIGH	SEVERE	SIGNIFICANT	CONSIDERABLE
A4	HIGH	HIGH	SEVERE	VERY HIGH	VERY SEVERE	EXTENSIVE	CRITICAL
A5	EXTREME	EXTREME	DEVASTATING	EXTREME	CATASTROPHIC	INCONCEIVABLE	DISASTROUS



PERSPECTIVES ON AVALANCHE RISK: The Need For a Social Sciences and Systems Thinking Approach

Story and photos by Laura Adams

A lone ski track cuts through wind-affected snow in the Selkirk Mountains of British Columbia.

The presence of risk resulting from exposure to avalanche hazard is inherent in mountain snow environments. In this article, I discuss avalanche risk from social science and systems thinking perspectives. I explore how we conceptualize and perceive risk, what factors influence our risk tolerance, and why it is important to consider the context and boundary conditions that inhere in the avalanche risk assessment and decision-making process. Avalanche education and safety initiatives must move beyond the physical sciences. I suggest it is essential to understand how risk is perceived and evaluated within a behavioral-science viewpoint in order to design informed and effective strategies for avalanche risk management, communication, and education.

A SOCIAL SCIENCES PERSPECTIVE

What is Risk?

Risk is commonly defined in the physical sciences as the chance that exposure to a hazard will result in damage, injury, or loss of life. However, to a social scientist, risk is a social construct invented to help us cope with and understand the dangers and uncertainties of life. Behavioral researchers argue that risk does not exist externally, waiting to be measured. Paul Slovic, a well-known risk researcher, suggests risk assessment is inherently subjective and represents a blending of science and judgment with important psychological, social, cultural, and political factors.

How Do We Perceive Risk?

We all experience different levels of perceived risk resulting from our attitudes, beliefs, feelings, and thoughts about risk. How we perceive risk depends upon our knowledge of the hazard, our past experience with that hazard, our personal attitude toward risk taking, our assessment of the probability of our exposure in the current situation and conditions, and our degree of decision confidence in relation to the level of situation uncertainty. Our propensity to take risks significantly affects our behaviors and depends upon uniquely individual factors such as our personality, life experience, and lifestyle, as well as social and cultural factors such as our age, being part of a group, or having a family.

The sense of control we feel about accomplishing an activity also affects our perception of risk. People with a high sense of control are more likely to follow positive, healthy behaviors than those who have a low sense of control. Walter Bruns from Canadian Mountain Holidays suggests the degree of control is directly related to the extent of our risk perception and that a high sense of control is exercised by

avalanche-terrain avoidance, mitigation techniques, and conscious choice. Most fatal avalanches in North America and Europe are triggered by the victim or another party member (McClung & Schaerer, 1993). Dave McClung, from UBC, proposed that the root cause of these avalanche accidents is a failure in human perception, where the victim's perception did not match the current reality of the avalanche danger.

What Factors Influence Our Risk Tolerance?

Voluntariness in risk exposure is an important consideration in perceived risk. Research suggests our tolerance for risk is low unless we choose to expose ourselves to risky situations. For example, while the risk perceptions of winter backcountry users may vary widely, these users are voluntarily exposing themselves to the hazards present in winter mountain environments. This conscious choice is in contrast to people traveling on highways threatened by avalanches, since they may be completely naïve to the existence of avalanche hazard or their exposure to it. Thus, the highway traveler's risk tolerance is minimal. A third example lies somewhere in between, in situations where people hire a guide to assume responsibility for their enjoyment and safety. While clients may have an awareness of avalanche hazard, they may have little active role in the assessment and associated decisions regarding their risk exposure.

Affective (emotional) responses to risk directly link with whether we over- or underestimate our likelihood of harm. Ian McCammon identifies two risk characteristics that significantly impact behaviour in winter mountain terrain. First, a great deal of control is exercised over exposure to avalanches. Second, this exposure is typically associated with highly positive, affective experiences. The physical, aesthetic, and social elements of the winter backcountry are highly prized

by mountain users across the world. Basing decisions on good feelings rather than snow stability poses an additional complexity in the avalanche risk equation.

Familiarity is another influence in perceived risk. We tend to underestimate the frequency and consequences of familiar risks and overestimate those that are unfamiliar. For example, in a study of recreational avalanche accidents in the U.S., Ian McCammon found that 69% of avalanche accidents occurred on slopes that were very familiar to the accident victims. He suggests that in victims with avalanche training, familiarity with a slope tends to negate the benefits of knowledge and experience.

Personal versus Societal Risk Perceptions

Experts and laypeople perceive risk very differently. While avalanche experts may recognize real risks in hazardous situations, laypeople often have a wider dimension of perceived risk. Behavioral scientists suggest the risk assessment of laypeople is best described with subjective risk characteristics, such as dread or controllability, than with objective risk indicators, such as expected mortality.

Research indicates we make very different risk assessments for ourselves compared to when we make those same assessments of others. Our tendency is to underrate our own vulnerability to risk, yet we judge others as having a greater susceptibility. Therefore, risk needs to be described in personal and societal categories, since the factors contributing to our personal sense of risk are not the same as those that contribute to our view of societal risk.

What Boundary Conditions Influence Avalanche-Risk Assessment?

The traditional view of risk, characterized by probabilities and consequences, does not capture the subjective and contextual factors inherent in avalanche-risk assessment. While the search for accurate and objective probability values is a goal of the risk-assessment process, the boundary conditions of the problem drive the decision process. In my research on avalanche experts' decision-making, I found the boundary conditions included physical and environmental conditions; the personal knowledge, values, and attitudes of the decision-maker; the cultural dynamics within groups; the goals and objectives of the

Continued next page ➤

AVALANCHE RISK

continued from previous page

clients and the organization; economics; and societal and political values. A growing body of research suggests these risk dimensions can have a significant influence in the formation of attitudes towards risk.

Why is it Important to Consider the Risk Context in Avalanche Decision-Making?

The avalanche-risk-assessment process strives to generate predictions of exposure that are complicated by inherent uncertainty resulting from complex physical (terrain), environmental (weather, snowpack), and human factors. Thus, avalanche-risk assessment is dynamic and complicated, and the weighing of risk and its associated benefits and consequences lie at the heart of the decision process. While traditional risk assessments often utilize cost-benefit analyses, the benefit component varies in the avalanche-decision equation. Let's look at the different contexts of avalanche forecasting for backcountry skiing versus highway public safety as an example.

In backcountry skiing, the decision problem considers providing the best quality of skiing while minimizing exposure to avalanche hazard. While the cost of exposure may include injury or death, the benefit of exposure is an exhilarating ski down a deep, powder-covered mountainside. Backcountry ski guides and their clients face a tangible trade-off between the quality of skiing (client satisfaction) and increased exposure to avalanche hazard. Conversely, avalanche decision-making for public highways has a different context. Drivers and their passengers derive little benefit from exposure to avalanche hazard, other than avoiding a road delay. The onus is on the highway avalanche forecaster to make conservative

estimates of the present and forecasted avalanche risk. Consequently, highway forecasters face a different trade-off, where the cost of increased exposure does not provide equally perceived increases in benefits.

What is Acceptable Risk?

Acceptable risk is a subjective judgment for the level of risk to which people are willing to expose themselves. This uniquely personal risk level depends upon the variables discussed earlier. Gerald Wilde proposed the Risk Homeostasis Theory to explain how people accept a certain level of subjectively estimated risk to their health, safety, and property in exchange for benefits they hope to receive from engaging in risky activities. This "target" level of risk is determined by four categories of motivating factors: (1) the expected advantages of the risky behavior: for example, an exhilarating powder run; (2) the expected costs of the risky behavior: for example, injury or death from avalanche involvement; (3) the expected benefits of safe behavior: for example, returning home at the end of the day; (4) the expected costs of safe behavior: for example, failing to ski a desirable line. As a result of this theory, Wilde suggests the only way to effectively reduce accidents is to teach and adopt strategies that reduce the level of risk accepted by individuals and society in general.

Dave McClung (UBC) proposed the Risk-Decision Matrix for backcountry skiing that describes the relationship between risk propensity, risk perception, and decision-making. He suggests that error-free decisions fall within an operational risk band (ORB) delineated by two types of errors: accidents and excessive conservatism. Acceptable decisions are achieved by estimating the costs associated with exceeding the band limits. Decisions that exceed the upper limit of the ORB result in injury, death, or structural damage,

while those exceeding the lower limit lead to loss of freedom, loss of credibility in forecasted warnings, or significant economic implications (e.g., excessive delays in opening roads or ski runs).

How is Avalanche Risk Determined?

There are stochastic (random) occurrences for which we can statistically calculate risk over long time periods and broad scales using empirical data from actual avalanche occurrences and return periods. The avalanche return period (how often debris reaches the runout zone) can vary significantly, from several times per year to one event per 300 years, and is used to determine the level of acceptable risk for human use and structures in the area (McClung & Schaerer, 1993). Broad trends in avalanche activity are predictable to some extent, but no one can predict exactly when and where an avalanche will occur. Quantitatively predicting avalanche risk is therefore scale dependant.

Risk can also be described qualitatively, such as in the Canadian Avalanche Danger Scale. This scale describes the probability of avalanches occurring in relation to the likelihood of triggering using descriptors of low, moderate, considerable, high, and extreme. It is disconcerting to note that risk-communication research indicates that terms such as "likely" or "probable" are vague and that people have dramatically different ideas about what these terms mean.

Formal assessment procedures are relied upon to minimize risk: for example, snow-stability evaluation, forecasts, and checklists. We must recognize that even these "scientific" methods are fraught with complexity and uncertainty, and involve the use of considerable value-laden judgment and interpretation. Social scientists argue that while scientific facts can be used to support one's position, the facts alone are not

BEACON FEATURES CHART

Prepared January 9, 2007, by Jonathan S. Shefftz, Northfield Mountain Nordic Ski Patrol. He prepared this chart for his own edification, n

Company/Distributor & Model		ARVA / Wasatch Ski Distribution LLC	BCA	Barryvox/Mammut - Climb High		
		Evolution+	ADvanced	Tracker DTS	Opto 3000	Pulse
Typical Retail:		\$290	\$340	\$290	\$300	\$400
Note that weights below are for beacons with batteries and full harness system; figures in italics rely on secondary sources and may not be comparable.						
Weight:	oz	10.1	12.5	13.1	9.2	11.6
	g	285	355	370	260	330
Batteries:		4 AAA	4 AAA	3 AAA	3 AAA	3 AAA
Min. transmit hrs:		250	250	250	200	200
Antennas:		2	2	2	2	3
Switchover Procedure to Search:		pull out sliding switch at top of beacon		hold down centrally located button ~2 seconds	press centrally located button three times	press down and over switch on
Distances below (best/worst alignment from single range test) are meant to be roughly indicative as to when various features are activated; all information for ARVA and S1 beacons based on secondary sources.						
Initial Signal Acquisition:		digital audio, LCD distance readout, and LED directional indicators (1 of 5)	analog audio	digital audio, LED distance readout, and LED directional indicators (1 of 5) at ~48/26m	analog audio at ~66/50m	analog audio at ~52/30m
Secondary Search Mode/Display:		continue with digital audio, LCD distance readout, and LED directional indicators (1 of 5)	digital audio, LCD distance readout, and LED directional indicators (1 of 5)	continue with digital audio, LED distance readout, and LED directional indicators (1 of 5)	programmable audio (digital, analog, or none), LCD distance readout, and LCD directional indicators (1 of 5) at ~48/30m	analog audio, LCD distance readout, and single LCD arrow at ~52/30m
Distances below are simply the digital readouts from each beacon's display.						
Pinpoint Search Mode/Display (i.e., differences from secondary):		distance readout down to 0.1m and directional indicators down to 2.0m		directional indicators and distance readout down to 0.1m	distance readout down to 0.3m and arrows programmable down to 3.0 or 0.3m	audio program within 3.0m, or down to 0.0m, and down to 3.0 or 0.3m
Distances below represent the length of a constant minimum distance readout (and hence uncertainty range) when pinpointing along a line, assuming horizontal beacon burial just barely below the surface. (Note that distance readout for X1 steps down to 0.2m minimum only when almost right at the transmitting beacon; length for the more reliable 0.3m readout is similar to the D3's 0.2m readout.)						
Pinpoint Line (cm):				24	54	14
Box size equals the product of optimal and worst alignment distances from center of transmitting beacon at which minimum distance readout is reached. Note that all beacons have a similarly small box size. (Note that distance readout for X1 steps down to 0.2m minimum only when almost right at the transmitting beacon; length for the more reliable 0.3m readout is similar to D3's 0.2m readout.)						
Box Size (m2):				0.04	0.19	0.02
Multiple-Burial Indicators and/or Actions (besides multiple signals being received):		indicator on LCD screen for multiple burials (also see optional actions below)		(see optional actions below)	symbol indicates multiple beacons and automatically shifts to analog accoustical signal	soft keys to scroll through beacons with heart symbols that detect misalignment and mask each other
Optional Search Actions:		Can scan nine concentric radii (progressively), displaying distance range for each radius and directional indicator(s) for beacon(s) scanned within each radius. Also can narrow search angle (e.g., in attempt to exclude found beacon). Can scan nine concentric radii (progressively or manually selectable), displaying distance range for each radius and directional indicator(s) for beacon(s) scanned within each radius. Can switch into full analog mode with sensitivity control and LCD distance readout. Also can narrow search angle (e.g., in attempt to exclude found beacon).		"Special Mode" narrows search angle (e.g., in attempt to exclude found beacon) and simultaneously overrides any lock onto the strongest signal	programmable to allow switch into full analog mode with sensitivity control	can switch into "up" mode (i.e., rotating arrow, programmable control and suggest option to shut use only one and programmable
Emergency Revert to Transmit:		push down protruding switch at top of beacon		on each startup (i.e., setting not saved), can select 5-minute auto revert; otherwise, press centrally located button	default is 8-minute auto revert; can be programmed to 4 minutes or no auto revert; otherwise, hold down centrally located button ~2 seconds	default is 8-minute auto revert; otherwise, hold down centrally located button ~2 seconds
Version Changes:		similarly named Evolution model has single-antenna beacon in old 9000 case (with digital audio and distance, similar to Ortovox M1/M2)	versions before 2006 lacked ability to divide up search areas for multi-burials, but software can be upgraded	new harness and button design in Fall 2004; much earlier versions had all-elastic harness and default setting for automatic revert to transmit	earlier versions distributed by "RED" (in a blue case) had slower processing	new for 2006 version 2.00 a future revision

sufficient to ensure sound decision-making. In relation to avalanche forecasting, McClung suggests the only accurate ways to reduce uncertainty include new and relevant information or actions that deal with resolving variations in human perception.

Avalanche-related decision-making strives to reduce our uncertainty in the human, physical, and environmental systems of influence. To improve our understanding of the decision process, empirical data related to human factors is needed. Current methods of avalanche-accident data recording describe the physical properties of the avalanche and associated demographics of accident victims; however, the human factors contributing to the accident are only occasionally captured. Defining criteria for the recording of human factors in avalanche accidents will offer future insight and greater accuracy in avalanche-risk assessment, communication, and education.

How Can Avalanche Risk Be Communicated Effectively?

Avalanche-risk communication is an important societal need, as it aims to exchange critical information describing potential threats to people’s health, safety, property, or general well-being. Risk-management initiatives, focusing on effectively communicating hazard and risk contexts, attempt to define the best way to conceptualize risk communication. Social science researchers have tried to understand public risk perceptions in order to design more effective risk communication. A number of effective solutions have resulted, including the development of prescriptive heuristics: rules of thumb that enhance the accuracy of risk perceptions. Examples include presenting risk as frequencies instead of probabilities, adjusting the time frame to consider the immediate consequences, and framing the outcome (i.e., describing mortality vs. survival).

A Systems Thinking Approach to Avalanche-Risk Management

Quantifying a phenomenon by breaking it down into its component parts, a reductionist approach, drives the thinking of contemporary natural-hazards assessment. Understanding the complexities of



A good shot of the Badshot Range of the Duncan Group in the Selkirks.

“Something hidden. Go and find it. Go and look behind the Ranges —
Something lost behind the Ranges. Lost and waiting for you. Go!”
—Rudyard Kipling

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not for any commercial interest. He can be reached at jshefftz@post.harvard.edu.

	Ortovox / Ortovox USA				Pieps/Liberty Mtn
	M2	X1	D3	S1	DSP/Advanced
	\$300	\$280	\$300	\$595	\$380/\$465
	10.9	9.5	11.5	8.5	10.4
	310	270	325	240	295
	2 AA	2 AA	2 AA	3 AAA	3 AAA
	300	300	300	350	200
	1	3	3	3	3
and simultaneously slide top edge of beacon	depress buckle sides to partially release harness (or can operate without harness)	slide over release switch and simultaneously turn knob near bottom of beacon		open flip-phone-style clam shell	press down release button and simultaneously slide up long switch
primary sources.					
at ~61/46m	analog audio at ~78/41m	analog audio at ~80/55m	digital audio, LED distance readout, and directional indicators (1 of 3) at ~48/27m	digital audio, LCD display with cross-hair over beacon symbol and distance readout	digital audio, LCD distance readout, and LCD arrows (1 or 2 of 5) at ~66/47m
LCD distance readout, 360-degree rotating 14m	analog audio, LCD distance readout, LCD stacked bar for alignment with flux line, and LCD indicator for suggested sensitivity control at ~48/30m	analog audio and LED distance readout at ~37/23m; then, digital audio, LED distance readout, and directional indicators (1 of 3) at ~11/4m	continue with digital audio, LED distance readout, and directional indicators (1 of 3)	continue with digital audio and LCD display with cross-hair over beacon symbol and distance readout	continue with digital audio, LCD distance readout, and LCD arrows (1 or 2 of 5)
programmable digital or analog distance readout down to 0.3m	distance readout down to 0.2m	distance readout down to 0.2m and directional indicators down to 2m (at which point third antenna becomes active)		descending circle graphic (with distance readout and arrows) on LCD display within 2m	distance readout down to 0.1m and arrows down to 2.0m
surface.					
	[Out West!]	10	160		[out for sw upgrade]
box size for a horizontally oriented beacon burial of >~70cm. (Also note that distance readout for X1 steps down to 0.2m minimum only when almost right at the transmitting beacon; size for the					
	[Out West!]	0.03	2.27		[out for sw upgrade]
roll through list of multiple distance readouts (plus for other Pulse beacons minute movements) then find beacon			LED light indicates multiple burials	displays up to three beacons with distance readouts and relative locations on LCD cross-hair display, then mask each found beacon (which then shows another beacon if more than three)	displays up to three burial symbols, with “...” added for more than three, then mask each found beacon
more traditional “back-e., distance readout, multiple-burial indicator) to add analog sensitivity suggested volume along with down LCD display and antenna; numerous other options/parameters					can scan to show number of beacons within 5/20/50m (though erases any previous masking of found beacons); Advanced version has compass, altimeter, and thermometer (all for navigation only)
minute auto revert; can be to 4 minutes or no auto e, push in protruding part on top edge of beacon	push in protruding prongs or reinsert part of harness	release sliding switch		auto revert; also can close clam shell	push down protruding part of sliding switch
5; current software is and can be updated for s	predecessor M1 had slower pulse rate and earlier M1 versions had a more complicated display	earlier version had slower signal processing and only two antennas	new for Fall 2006	new for 2007; can be updated for future software revisions	earlier versions had black harness (instead of current silver); software version 3.1 is forthcoming and older software versions can be upgraded

Beer-Fueled ISSW Discussions on the Stability of Fractured Slopes

Story and photo by Karl Birkeland

An advantage of giving an early talk at a conference is that you then have several days to hear what your colleagues think about what you've been doing. Further, if you are at ISSW and the taps are continually flowing, then the beer-fueled feedback is likely to be even more spirited! At the recent Telluride ISSW, I had the good fortune of making my presentation on the stability of fractured slopes (Birkeland and others, 2006a) on Monday, and then I had the rest of the week to hear about people's thoughts on the subject. Those thoughts and discussions were interesting enough that I felt it would be worth putting together a short synopsis of a few of the discussions for *The Avalanche Review*.

MY PRESENTATION focused on assessing the stability of fractured slopes. In other words, if a slope collapses and cracks as you approach it (or after you apply explosives to it), is it more stable or less stable than before that fracture? My talk combined some recent research that I did with Kalle Kronholm, Spencer Logan, and Jürg Schweizer (Birkeland and others, 2006b) with some interesting case studies of fractured slopes at ski areas provided by Big Sky's Scott Savage and Moonlight Basin's Simon Trautman. I won't rehash our results here, but I'd encourage folks to check out the referenced articles, both of which are available on the National Avalanche Center Web site.

In looking at the research and the case studies, we concluded that plenty of uncertainty exists about the stability of fractured slopes. While many avalanche professionals (including me!) may have considered slopes that fracture to typically become more stable, there are enough examples of fractured slopes that have later slid that any definitive answer about their stability is currently impossible. A key factor is likely the relationship between the area of the fracture and the area of the starting zone, but a person often will not know the extent of the fracture.

Of course, there are plenty of folks out in the field who have had their own experiences with fractured slopes, and I was psyched to hear from some of them during ISSW week. One of the first people I talked with works at a sizable ski area with significant avalanche problems in a coastal snow climate. He was curious about my experience in coastal snow climates, and I admitted that I had none. He said that at his area they had many cases of slopes cracking during mitigation work with explosives. In their experience, those slopes had never subsequently slid. As such, if a slope cracked after having explosives applied to it, they

considered it to be safe and then opened it up. He felt like this was probably okay since, "We aren't dealing with that funky Montana snowpack that is full of facets." I admitted that the data from our research suggested that the weak layer type probably strongly affected how fast a slope might strengthen after a fracture (Birkeland and others, 2006b), and that in a coastal climate this strengthening might be quite rapid, but that I didn't know much more than that. Indeed, the experience of the patrol at this area suggested to me that perhaps the strengthening rate in their particular snow climate was quite rapid.

Not long after this conversation, I ran into a person who works at another ski area located quite close to the ski area mentioned above. Although this ski area is physically close to the first area, it tends to have a slightly less coastal snow climate. In contrast to the experience of the avalanche workers at the first area, this ski area had experienced a few isolated cases where a fractured slope later slid. Soon afterwards I heard from yet another person who works at a large, avalanche-prone ski area in the coastal snow climate (though it is in an area that is slightly less coastal than the first area). Like this latter person, he had also observed some cases where slopes that cracked later slid, including one case of a post-control release that was triggered by a skier. He concurred with our assessment that considerable uncertainty existed about the stability of fractured slopes.

One of the more memorable (and harrowing) stories about fractured slopes which we did not include in our article involved Bridger Bowl's Randy Elliot. Randy was ski-cutting a slope that had previously fractured with an explosive when it unexpectedly released. Despite being on a steep, rocky slope above some cliffs, he managed to escape unscathed, though it sounds like his skis took a pretty good ride. He ended up leaving a fair bit of the plastic



This slope near West Yellowstone, Montana, fractured on a buried layer of surface hoar as skiers approached it. Recent research and case studies document some of the uncertainties associated with assessing the stability of such slopes.

from the bottom of his ski boots on the sharp rocks of this slope. If you want an animated telling of the entertaining version of this story, get a few beers into Doug Richmond – who was Randy's route partner at the time – and ask him about it!

Finally, Toby Weed (who is the Logan-area avalanche forecaster for the Utah Avalanche Center) offered up yet another enlightening story about fractured slopes. Toby's tale of triggering an avalanche on a previously fractured slope and almost taking out his partners with the ensuing avalanche was sufficiently interesting that I managed to convince him to write it up so it could be printed in TAR. See his article on the next page for all the details.

The bottom line of my ISSW discussions is the same as the bottom line of our ISSW paper. Namely, that considerable uncertainty exists in assessing the stability of fractured slopes. Many times these slopes appear to be stable, and additional explosives or skiers do not produce any avalanches. However, on a handful of times, relatively small additional loads (in the form of skiers or explosives) have caused previously fractured slopes to avalanche, and in some cases the avalanches have been quite large. One common thread is that fractured slopes that are left in place for a period of time (up to a day in some cases) seem to be stronger than the original snow structure.

Given the above, it seems prudent to approach all fractured slopes with an extra dose of caution – especially immediately following the fracture – and to carefully test them before trusting them.

I'm still interested in hearing more stories of experiences with fractured

slopes, so if you have any good tales of your own, feel free to drop me an e-mail sometime!

Acknowledgments

I'd like to thank all the folks who shared their experiences with fractured slopes, both at the ISSW and in the past couple of years. I think I probably hassled every researcher, heli guide, ski patroller, and highway worker I knew about their experiences with fractured slopes! I'd also like to thank my ISSW and *Geophysical Research Letters* co-authors (Scott, Simon, Kalle, Spencer, and Jürg) for their ideas and input on this subject.

References

- Birkeland, K.W., S. Savage, S. Trautman, K. Kronholm, S. Logan, and J. Schweizer. 2006a. *Uncertainties in assessing the stability of fractured slopes*. Proceedings of the 2006 International Snow Science Workshop, Telluride, Colorado, 29-37. (Available on the Web at: http://www.fsavalanche.org/NAC/techPages/articles/06_ISSW_FxWkLayer.pdf).
- Birkeland, K.W., K. Kronholm, S. Logan, and J. Schweizer. 2006b. Field measurements of sintering after fracture of snowpack weak layers. *Geophysical Research Letters*, 33, doi:10.1029/2005GL025104. (Pre-print available on the Web at: http://www.fsavalanche.org/NAC/techPages/articles/06_GRL_Birkeland_etal.pdf).

Karl worked as a ski patroller and avalanche forecaster before landing his current job as an Avalanche Scientist for the Forest Service National Avalanche Center in Bozeman, Montana. He enjoys hanging out on rivers, mucking around in the snow, and chasing his young daughters around the ski area while he can still keep up. ❄️



Toby's brother Tim Weed, took a moment to observe the surrounding landscape from the summit of Mount Gog in Utah.

THE WRATH OF GOG: Close Call on a Fractured Slope

Story and photos by Toby Weed

Over a foot of light champagne powder obscured the previous day's skin track. The snow moved effortlessly out of the way as our shins plowed through it. I'd augured the snowmobile into a deep hole, still a good way below where I had been trying to get us. Although the trusty machine had saved us hours of slogging, we still had a good way to go, up and around the bulwarked north face of Mount Gog, before we could taste some more gentle and skiable terrain. We paid careful attention to potential signs of instability and avalanche danger on our approach. The wind had diminished with frontal passage. The temperatures had dropped and the snow densities had lightened throughout the storm. We heard no audible collapsing, saw no surface cracking, and most importantly, noted no recent natural avalanches. I'd rated the danger in the region as MODERATE, with triggered avalanches possible on steep upper elevation slopes. I had yet to confirm my forecast, but all indications pointed to stable snow.

In a classic sense, we had set ourselves up for an avalanche accident. We had a definite deadline. It was Darren's birthday, and he had a long-planned date with his wife at one of the few fancy restaurants in town. On our departure that morning my brother, Tim, and I had also promised our families we'd be home before dark. We'd spent the day before in the same drainage, and the deep snow had cost us an early return. On March 21, we felt lucky to be once again released into refreshed backcountry. We were on probation, our poor wives stuck with the kids for the second straight day. On this day, the three of us honestly planned to give ourselves plenty of time to get home, but we were addicted to fine, deep powder snow and pulled by the spectacular, rarely-skied slopes in upper White Pine Canyon's northern fork.

Powder fever and self-imposed time limits clouded our heads. We also felt a bit invincible. The winter of 2006/07 had provided generally stable conditions to the region and lots of fine powder. In short, we'd

been stealing big lines for a while and getting away with it. We were enticed into something we shouldn't have tried. Subconsciously, I may have wanted to encounter an avalanche to verify my moderate danger rating, which clearly stated that human triggered avalanches were possible on some steep slopes. I figured any avalanches would be smallish and controllable, and I was comfortable with the skills of my trusted companions. Our primary mistake was to attempt a ski descent of Mount Gog's cliff-plagued east face. Our rationale was that the line was a direct route to the mired snowmobile. We'd save 45 minutes of slogging over low-angled terrain if we continued to the summit and dared to drop into the precipitous east face. "We'll be there in 10 minutes," I'd prodded, "let's just take a look at it."

From the top of the peak, we could see a gentle slope dropping off to the east, a few hundred vertical feet before it rolled off in a constriction and was obscured from view. Mutually drawn by the smooth untracked powder, our decision to commit to the line came quickly. We all understood the risk. I said, "If we are going to trigger anything today, it'll be down here."

"Whatever we do, we need to do it now," replied Darren. "I'm already late as it is. We need to get moving."

"Ok, let's go," I said and swooped into the low angled entry, carving a few turns in flawless snow. I stopped mid-slope to dig a hasty pit. Just as I'd seen in earlier excavations, under about 20 inches of gradually hardening, powder-topped snow was a thin sun-crust with sugary weak layers both above and below it. Earlier compression tests revealed a moderate to hard shear above the crust (CT 18 and CT 21, Q2) and a moderate but clean failure below it when isolated with a snow saw (CT 18, Q1+). Completing my pit in a matter of minutes, I continued down the line, cut off to the right, and found an airy perch on a point of rock, an 80 ft cliff on the south side of our entry gully. I had a decent view of the first steep drop, but I could

Karl Birkeland's ISSW presentation on the questionable stability of a cracked slope struck a nerve with me. It also helped to partially explain one factor that contributed to a close call on March 21, 2006. As the third skier to descend a steep slope that had cracked on the first, I triggered an avalanche. It could have easily caught my only brother and a favorite backcountry partner as they waited for me in a somewhat precarious place. Perhaps now I can partially blame this scary close call on my misconceptions of cracked slope stability, rather than my own less-than-fluid ski technique and extra poundage.

I've been an avalanche professional since 1986. I've seen and tested numerous cracked slopes. In most cases, I've observed these on fairly low angled slopes (<35 degrees), and I've always thought that such slabs probably would have released at the time of cracking had the slope been a bit steeper. I've also seen a few instances where much steeper slopes cracked but did not avalanche. I've always been leery of these, but after jumping on a few with no result, I became convinced that the collapsing/fracturing of the slope released the tension in the existing slab and reduced the instability. Last March, I learned that cracked steep slopes are not necessarily stable. Only years of backcountry experience, good travel techniques, and a bit of luck saved my party from tragedy. My current embarrassment in telling this story is infinitely less traumatic than the real potential loss of my only brother and/or my good friend.

only see the north side of the broad face below.

"Ok, I have a decent view. Go for it." With that, we were committed.

Darren floated down through the initial pitch and into the first narrowing drop. He stopped where the hourglass shaped slope opened up again into the steep face below. Just out of my view, he shouted up to me that he'd caused the slope to crack. Remembering what I had learned over the years, I tentatively yelled back, "That's good...I think." I paused. "The tension in the slab's been released. I'm glad it didn't rip."

"Me too, it's really steep down here." He sounded a bit shaken. "What should I do?"

"Well, you probably won't trigger it now..." I was starting to feel a prickling under my skin, and my palms were sweating inside my thin gloves. What were we getting into? I didn't much like the situation, but turning back was no longer an option, and the slab on the steep slope had already cracked without avalanching. We should be alright, right? "Shout when you get down to a safe spot." Darren resumed the descent of the steep middle face and called up to me when he found questionable safety below a battered fir on a small sub-ridge. He was perched precariously above the next and final drop, still out of view.

"Okay Tim, you're next," I shouted up to my little brother. "Be light on your feet. Go all the way to Darren."

He didn't need further coaxing and let out a whoop as he dropped into the line. Not bad for an East Coast skier, he'd mastered the art of western powder skiing with me on numerous trips into the backcountry. I watched with mute pride as he cleanly skied the committing line. Out of view, he settled in below Darren, who instructed him to tuck in and grab hold of the thickest branches he could find.

As I traversed into the line, I fully realized the actual sketchiness of our position. The slope rolled, funnel-like

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Jerry, on patrol, always managed to look both competent and stylish.

Jerry Nunn

The Lady and the Avalauncher

Story by Morten Lund

Photos courtesy Jerry Nunn collection

Somewhere in ski land

where the snow falls deep and steep there will be an occasion, during a given winter day, when a duo of ski patrollers walks up to an awkward-looking device resembling a 200-gallon propane tank with a 12 foot exhaust pipe sticking into the air from one end. One patroller drops a plastic projectile into the pipe, the other turns a valve, shuts it off, aims the pipe, pulls the lanyard, and—*whump!*—a blast of compressed gas hurls the projectile into the sky—*zing!* The projectile rapidly diminishes into the blue.

A mile or more away in the snowy distance—*boom!*—down comes an avalanche otherwise intended for the first unwary skier on the slope. This is the way an avalauncher looks and works, the mainstay of avalanche control in the U.S.

The existence of the avalauncher owes in great part to a National Ski Patrol avalanche specialist whose name is Jerry Nunn. She made the avalauncher possible, demonstrated it, and sold early models to high-profile ski areas around the U.S. and brought in the technical expertise that put the avalauncher profitable production.

How Jerry managed to accomplish all this is a remarkable story. Her lifetime devotion to the safety of the sport inspired her to take on the National Ski Patrol and the Forest Service avalanche leaders of her time. Her resuscitation of the avalauncher grew out of that. She made a difference. A big difference.

Jerry is 85 now

and lives with her husband Jimmie in a splendid home in Flagstaff, Arizona. She is still as full of fizz as ever and instinctively full of empathy and understanding, traits that made her hundreds of friends throughout the ski patrol world over the years. But this was only part of her life...Jerry was in turn an X-ray therapist, a mother with two kids of her own and four adopted, a major charity organizer in California's Bay area, one-time crocodile hunter, and other diverse accomplishments. Her news clippings fill several large, heavy scrapbooks.

Until she reached the age of 17, chances of her becoming a skier did not look good. Jerry was born Gertrude Schreiber in Oakland, California. Her mother and father divorced when she was seven. At 14, she was sent to Our Lady of Presentation, a Catholic convent school in Oakland. There she decided to become a nun. She changed her mind quickly when she entered public high school in Sacramento as a junior. There she decided there were other important things in life: one, skiing; two, the opposite sex. That ruled out the nunnery, but soon the third and most important thing of all became to help others in need, so she became a woman of faith after all.

Alpine skiing was very new in the U.S. in 1939—Jerry's junior year. A few hours by train west of Sacramento lay Donner Pass. The highest stretch, Donner Summit, was one of a half-dozen most substantial early concentrations of tows and trails in America. Donner's unique advantage was the Southern Pacific's weekly excursion train, the storied Snowball Express, which ran from the Bay area, stopped in Sacramento, all the way to Donner Summit every Friday in the winter. Jerry and her friends took advantage of her high school ski club's Snowball Express trips to get into the sport. Jerry's father had bought her Sears and Roebuck skis, beartrap bindings, and sensible ski boots. The rest of her expenses, including the \$20 round-trip fare from Sacramento (in today's money), she paid out of babysitting earnings. And that was how, somewhat improbably, Gertrude the would-be nun became Jerry the extraordinary skier.

Soda Springs was where Jerry learned to ski. She learned through the helpful hints from two Sacramento High girlfriends who were already into racing. Jerry's first and doubtlessly quite difficult lesson was how to ride the rope tow that reached halfway up Soda Springs' strapping 600 vertical feet. Once the rope was mastered, Jerry took to skiing as if born to the sport. She was naturally strong and adventurous. She could wrench herself right out of a fall. Even so, she recalls, she fell in every direction: frontward, backward, left, and right.

She soon became a sister of mercy—on skis—coming to a quick stop at the side of any fallen skier, ascertaining the extent of injury and making sure someone went for help. She made the victim comfortable until the man who became her first ski patrol mentor, Dr. Ralph Reynolds, the head of the Soda Springs patrol, arrived. After Dr. Reynolds gave first aid, Jerry would follow the victim, on the single battered Soda Springs toboggan, to the infirmary. She watched Dr. Reynolds paint abrasions with iodine, tape the sprains, and plaster the breaks. She found all of that fascinating and began to think that she might become a doctor.

Skiers at Soda Springs had one of the most advanced early ski patrols in the nation. Even so, an injured skier might spend considerable time on the snow before help arrived. Jerry was constantly on the lookout for bodies sprawled on the slope or sitting up dazed. She was often first on the scene and first to send for help. Dr. Reynolds was so taken with Jerry's effort that, in March 1940, he said, "Jerry, why don't you join the patrol? You're always here anyway. And you'd get your skiing free."

Dr. Reynolds didn't have to offer twice. Barely 18, the legal minimum age for patrolling, Jerry became what was very likely the youngest ski patroller in California. She was not expert enough to steer the toboggan, but she did learn a great deal about first aid. She even learned to fit the heavy plaster casts—work strictly relegated to hospitals today.

By 1939, Minot Dole of the Amateur Ski Club of New York was in his first year heading a National Ski Association committee to recruit a national patrol trained to national standards. At the same time, individual patrols across America were being urged to join the National Ski Patrol system by adopting minimum standards.

Jerry was one of the chosen few for whom history prepares the way. Not only was there a national ski patrol organization springing up, but avalanche work—Jerry's patrol specialty—was about to become a practical science. It was triggered when the brand-new resort of Alta at the bottom of Little Cottonwood Canyon in Utah's Wasatch Range received Forest Service approval to open. Little Cottonwood's topography had a heavy history of avalanches, so the Wasatch-region Forest Service felt an obligation to protect skiers in its licensed domain, and hired W. E. Tangren in 1938 as "a snow-avalanche observer" at Alta to maintain a log of snowfall measurements and avalanche occurrences.

In 1939 at Alta, nature gave a warning signal when a big slide hit Snow Pine Lodge. There were no injuries, but the slide did tear apart the lodge's unfinished upper story. Forest Service regional supervisor James Gurr beefed up the avalanche safety effort at Alta by hiring Sverre Engen, of the famous jumping Engen brothers, to work under Tangren, measuring snow accumulation and doing avalanche research. The next year Sverre took charge of the project and became in effect the first Forest Service Snow Ranger. The avalanche effort was underway.

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WRATH OF GOG

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through a narrow chute. It got even steeper as it opened up again into the middle face, which was divided down the center by a subtle sub-ridge (really more of a slight aspect change). The north side of the face (the direct line to the snowmobile) was steep and untracked. I could see down the dizzying drop to the start of another vertical-sided, funneling chute. Tim and Darren huddled below me, right in the fall-line on a thin spur, tucked behind the only existing tree in sight. I took a deep breath as I dropped through the bottleneck and onto the steep face.

As the third skier to descend the route, I didn't expect to trigger a slide, especially since it had already cracked. I was wrong. Mid-turn I noticed, in the very limits of my peripheral vision, the slab breaking apart across the slope above and to my left. Instinctively I skied off the moving mass while yelling, "AVALANCHE!" I watched, overcome by a helpless terror, as the slide ran within feet of my nervous partners waiting below on a tiny rib above a hundred-foot cliff, holding desperately to the flagged lower branches of a precariously perched alpine fir.



"I was starting to feel a prickling under my skin, and my palms were sweating inside my thin gloves. What were we getting into? I didn't much like the situation, but turning back was no longer an option, and the slab on the steep slope had already cracked without avalanching.

We should be alright, right?"

The avalanche ran past my two partners, barely dusting them, and continued harmlessly down the final pitch. In shaken silence, I made my way down the avalanched slope and rejoined my party. "Sorry guys. That was close," I said, but they had no idea what was going through my head. I was thinking I'd just come very close to killing them. I was overcome with fear and guilt. I was gripped, my downhill leg shaking like it did on my first exposed rock climb in Eldorado Canyon.

Tim looked at me and said, "Hey, you look kind of pale, like you've just seen a ghost."

"No, but I'm sure glad to see you guys intact. I thought you were done for."

"Well," said Darren, thinking of his spurned wife sitting at the corner table in the restaurant, "now what—where to?"

I took a few steps out to the right, breaking through a knee-deep drift, and I tried to peer down the gully to the left. The undisturbed northern half of the face hung ominously above. Luckily, the avalanche I'd triggered hadn't propagated onto it, but I feared that crossing the steep slope low might do the trick. The chimney-like gully led to gentler slopes below and to our snowmobile, but I was enveloped in nausea as I imagined the consequence of being swept down the drain. "We can't go this way, even though it goes." I was glad they couldn't see my frustration or hear the string of self-deprecating slurs I uttered under my breath as I gently re-crossed the drift and stepped back onto the relative safety of the small sub-ridge.

The soft winter light was quickly fading. Would we find ourselves benighted on our little ledge? Darren suggested following the path of the avalanche as another option. In the growing darkness, though, we could not see the route as it turned sharply to the south and was obscured by the limestone outcropping. Darren went to check. My brother and I waited, fearing that we'd soon hear our partner's dismay at finding his route blocked by an airy ledge. A few minutes passed. We heard a distant whoop and a bit later a relieved shout, "It's OK...come on down."

Although we faced the wrath of our families for our late return, we'd escaped the avalanche unscathed. This lesson on the uncertainties of cracked slope stability had a positive outcome. Gradually, our wives forgave our tardiness. They've learned what to expect when we get together and the snow is nice. We've learned not to trust cracked steep slopes. Thankfully, the lesson did not have to be learned the hard way. I also learned a valuable lesson about responsible decision-making in the mountains when under the influence of powder fever—after all these years of surviving in avalanche terrain, I am still not immune to my own stupidity.

Toby Weed is the avalanche forecaster for the Utah Avalanche Center's Logan office. He is continually learning and re-learning the connections between theory and practice. ❄️

LADY & THE AVALAUNCHER

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That same year, former Yosemite ski school director Hannes Schroll opened the brand new resort of Sugar Bowl, a mile or so into the mountains from Norden, CA. Sugar Bowl had Donner Summit's first chairlift and the first big vertical drop. Jerry signed on to patrol Sugar Bowl often enough to ratchet her skiing up several notches.

Jerry graduated from Sacramento High in the class of 1940, and her next step was to see about a medical career. She moved to Oakland to live with her father and found an on-the-job training course as an x-ray technician and therapist at Oakland's Mills Memorial Hospital. She kept on patrolling of course. She joined the three year-old Oakland Ski Club in 1940 and helped build their clubhouse at Norden.

Then things really started changing. Jerry met Dr. Justin Colburn, a charming, debonair radiologist, divorced and 22 years older. No matter. Jerry was fascinated by the idea of sharing a doctor's life. "Marrying a doctor was a lot easier than to be one," as Jerry said. And she says, "I fell in love." In 1942, she became Mrs. Justin Colburn, at age 20. Within the year, she had a son—James. In 1946 she had a second—Richard. Jerry predictably loved being a

mother, but she didn't give up skiing. By hiring help, a reliable cook/maid/babysitter named Ruby, she was able to patrol one or two days mid-week, the days when she was most needed.

In 1949, her choices for skiing widened. Alex Cushing opened up the West's first world-class ski area at Squaw Valley, just east of Donner Summit. Skiing in northern California came up a whole level. Jerry skipped patrol at Soda Springs a few times to ski Squaw every so often and thought the terrain was terrific.

Then came an enormous change in Jerry's life. She had had difficulties in childbirth with her two sons, but still wanted more kids. In 1952 she and Dr. Colburn adopted a baby girl: Carol. That turned out to be a prelude to a deluge. That same year, Justin's ex-wife became emotionally incapacitated, and the Colburns took legal custody of Justin's two children: Mary Jean, 15, and Bob, 13. The same year, presto! two more kids landed on the Colburns. Justin's brother was suddenly institutionalized, his wife could not cope with the kids alone, so the Colburns took custody of Justin's nieces: Billy Ann, 11, and Kay, 13.

Just turned 30, Jerry had seven kids to take care of—ages 1, 8, 10, 11 (two), 13, and 15—the oldest four being from broken families. This was a situation that bad dreams are made of. Did Jerry go under? She did not. She learned how to organize and how to be a group leader

(skills which stood her in good stead later on when she became a seminar leader in avalanche work).

Skiing was a lifesaver. Her expertise at skiing gave her status in the kid's eyes as she taught every one of the six oldest to ski the first winter she had them all. She took them on weekends to Clair Tappaan—still a buck a bed and a buck for dinner. She had to manage the trip by herself because Dr. Colburn did not ski (he had promised to learn but never did). But other than occasional highjinks, like pouring cornflakes into a sibling's sleeping bag, the kids behaved because they were having a great time.

Two years later, in 1954, the kids (except the youngest) were ready for racing, and they all needed the challenge of better terrain. So Jerry decided she would apply to the Squaw Valley patrol. The kids would ski free and get into racing programs available at Squaw.

Jerry applied to take the training course for the Squaw patrol and at that point ran head-on into skiing's "macho wall." She had the shock of her life when she was refused. The patrol director was a hard-bitten mountaineer, Ernest Schickler—an Austrian-born, certified male chauvinist whose patrol was 100% male. Schickler knew who Jerry was, and did not want her, or any woman for that matter, on his patrol. Period.

Jerry was not deterred. She had friends in high places. One of them was John Thune, a National Ski Patrol leader with whom Jerry had spent many evenings in conversation at Clair Tappaan. Thune wrote a forceful letter to Schickler, attesting that Jerry could ski anything a man could ski, urging that she be given a chance. Jerry was in—if she made the grade. Schickler tried to make sure she didn't.

He took the group up to the top of the main chairlift, and then, without offering a chance to practice, told Jerry to take a toboggan down to the patrol shack—a two-mile run. The young patroller who brought her the toboggan offered to take the rear slot on the toboggan team. "Never mind, Jack," said Schickler evenly, "Mrs. Colburn feels she can handle it herself."

Jerry realized she was being set up, but she wasn't going to object. She had always specialized in first aid and had very little time on a toboggan. To take one down solo was a stunt for an experienced hand. "I was scared as hell," Jerry says, "but there are times when you just do whatever it takes." Jerry straddled the front of the toboggan, which weighed as much as she did, and took off straight down.

She flew off the steep top of the run, braking hard by pressing down on the toboggan, getting the drag chain to bite. As the trail flattened out, she eased up and had a good run down. Her thighs burned from holding a deep knee bend, but she brought the sled right to the patrol-shack door. Then the other trainees came in with their toboggans. Schickler had put two trainees on every one—Jerry had been the only one who had gone alone. And she'd done it.

After that, there wasn't much Schickler could do. He went on to avalanche training—simulated slides and searches for bodies—which Jerry easily passed. When it came to first aid, Jerry was a whiz. And in any terrain, under any snow conditions, she more than held her own on skis. In the end, she passed with flying colors. She was on—the first woman patroller at Squaw!

Even after that, whenever Jerry showed up for weekend patrol during the rest of the season, Schickler would come up with difficult duty. On several occasions, he ordered her to drag a half-dozen 100-pound tanks of gasoline from the top of the main lift to the Squaw jigback lift, pulling each along the snow for the distance of a city block—exhausting work for a burly male, let alone a slim female. But Jerry managed it.

Then one day Schickler outdid himself. "You and I are gong to fracture a cornice," he said. Unlike the Wasatch region of the Forest Service, the California region did not concern itself with avalanche protection. It was left to experienced mountainmen like Schickler to deal with an over-ripe cornice.

Breaking off a cornice is a job for an experienced avalanche control team, certainly not for someone new to avalanche work. Schickler marched Jerry to a position above the cornice curling over the Squaw Headwall. "We will rope up, and I will belay you. Take



Jerry (right), on patrol at Slide Mountain, Nevada in 1955, helps secure the toboggan after administering aid to a hapless accident victim.

Jerry Nunn Garners AAA's Special Service Award

Nominated by John Brennan, supported by Karen Sahn, Jill Fredston, Janet Kellam and Leslie Ross. To be presented to Jerry by Doug Abromeit at the U.S.F.S Snow Ranger's annual meeting in New Mexico during mid-February 2007.

Jerry Nunn began working as a ski patroller in 1940 at age 18. Despite having seven children in her family by age 30, Jerry continued to patrol. She began her career at the small Soda Springs ski area on Donner Pass, transferred to Sugar Bowl in the late '40s, and then went on to Squaw Valley in the mid-1950s.

Working at the larger resorts piqued her interest in avalanche control, so in 1957, Jerry applied for the Forest Service's Snow Ranger certification course in Alta, Utah. The course was run by Alta snow-safety specialists Monty Atwater and Ed LaChapelle. Nearly barred from the course because she was a woman, Jerry went on to become the first female Snow Ranger and also the first Snow Ranger in the far West. For approximately the next decade, Jerry presented snow-safety courses for ski areas, highway and railway departments, and mining operations. It was only in late '60s that these courses were taken over by Norm Wilson—a protégé of Atwater. Having impressed Atwater sufficiently during their 1957 meeting in Utah, Jerry worked with his avalanche crew when the Olympics came to Squaw in 1960.

Atwater retired from the Forest Service in the mid-'60s and focused on consulting work and on his pet project, the Avalauncher. Jerry assisted Atwater with manufacturing and sales, netting dozens of customers around the world. One of the launchers Jerry sold in the mid-'70s ended up in the hands of the French Atomic Energy Commission. An engineer there went on to develop the first breech-loading Avalauncher in the later '70s.

Jerry's multi-decade dedication to both practicing and educating on a variety of topics related to avalanches garners her the well-deserved Special Service Award of the American Avalanche Association. ❄️



right: Jerry takes a moment to smile during duty at the 1960 Squaw Valley Olympics. She was one of only five women selected to the Olympic games patrol.

top left: Jerry carries the Bulgarian banner during the opening ceremonies.

bottom left: Jerry and Squaw Valley founder Alex Cushing inspect the area's Olympic runs in 1960.

Imagine the flap when a pig-tailed redhead arrived at the Forest Service Snow Ranger program in 1957. "I am sorry," Koziol said, "we don't accept women."

"Well you've already accepted this one."



this shovel, and dig in to start fracture. Understand?" Jerry nodded, not too happily.

"Well, this is just one of the tough demands placed on the ski patrol," said Schickler. "Nobody asked you to join us. Feel free to leave now if you like." He roped Jerry to himself and then to a carbine stuck into rock on top. Jerry hesitated. "It's getting late, Mrs. Colburn," he said. "Either you do or you don't." She went down, kicking steps until she was out on the cornice.

Schickler braced himself above. Jerry began to dig away at the strategic spot. With a huge whoomp the cornice fell into space and Jerry with it. Schickler heaved on the line and cut her fall short, then hauled on the dangling Jerry until she got her footing and kicked her way back to where Schickler was standing. "Well, I guess that makes you a ski patroller," was all he said, but after that he began to come around and went on to become her mentor.

In 1956, her husband's practice was thriving and they bought a 20-acre ranch in Warm Springs, 25 miles south of Oakland. It had seven kids' bedrooms, one for each. And now Jerry entered another transformation to her life as a patroller and her life as a mother of seven: she became a Bay-area charity phenomenon.

Then in 1957 as she patrolled Squaw, Jerry became concerned at the avalanche danger. Essentially Squaw had no avalanche control other than Ernie Schickler closing slopes and taking down cornices. Jerry was having pangs of fear for her kids, now skiing all over the mountain. But she wasn't really sure, so she decided to learn what she could about avalanches and make her kids aware of signs and conditions for avalanche.

Jerry applied to the pioneer Forest Service Snow

Ranger program, which was held every year at Alta, Utah, under Monty Atwater (who had replaced Sverre Engen as Alta's Snow Ranger in 1945) and Monty's assistant, Ed LaChapelle, plus Wasatch Forest Service district supervisor Felix Koziol. Jerry was delighted that her application was accepted, unaware that Koziol, who handled applications, was unfamiliar with the California ski patrol scene and assumed Jerry Colburn was a man, just like the other candidates.

"Imagine the flap when a pig-tailed redhead arrived at the Forest Service school in February 1957," wrote the patrol historian, Gretchen Beset, in an article for the Ski Patrol newsletter. Understandably, Felix Koziol did a double-take when Jerry came up to say there must be a mistake, that she had been assigned to a men's dorm. "I am sorry," Koziol finally said, "we don't accept women."

Jerry crisply replied, "Well you've already accepted this one. I have it in writing." Koziol shook his head. "Well, then," said Jerry, whose sunny disposition could turn dark quickly, "I have a lawyer who will be calling you." She was bluffing but, as she said, "After some argument and my tears, they decided that I could stay, provided that I could keep up with the men."

Some of my instructors tried to make it difficult for her but, says Jerry, "I made it through by stubborn determination, perhaps a bit of my German heritage." Koziol picked Jerry over 20 men in the group to dynamite a cornice. She dug the hole, dropped the charge, and backed off while it blew—duck soup compared to breaking off a cornice while standing on it. At the end of the 11 days, Jerry graduated with the honor of being the first-ever certified female Forest Service Snow Ranger.

Jerry was now a West Coast phenomenon. No other patroller in the Bay Area held a Snow Ranger certificate. Jerry was named by the regional patrol office to head the East Bay patrol (the first-ever female section leader). She excelled at keeping up with cutting-edge avalanche literature. Over the next eight years, Jerry gave an annual course for ski patrols, highway departments, mining companies, and railroad personnel.

Some found it disconcerting to have Jerry—barely five foot five and a 120 pounds—face the group and lay out the program for what were mostly male patrollers. But she exhibited such astonishing elan and easy generosity of spirit that today, many years later, she is utterly welcome whenever and wherever she appears, as she often does, in the company of veteran national patrollers around the country.

And a new phase was about to begin. Monty Atwater had moved to California to institute an avalanche program for Squaw Valley in time for the 1960 Olympics that would be held there, and he was impressed by Jerry's knowledgeable, sharp mind. Monty, a somewhat crusty ex-captain from the 10th Mountain Division, knew more about avalanches than any man on the continent, and was not easily impressed. Of the honors that came Jerry's way, one was particularly welcome. At Monty's recommendation, Jerry was named as one of five women on the 90-person patrol that was to handle the 1960 Olympics. She spent a month in the winter of 1959 in Atwater's training session for the Olympic Patrol.

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LADY & THE AVALAUNCHER

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One part of the training was very realistic. Monty and another patroller had gone across the steep face of KT-22 and Jerry was crossing third when an avalanche broke loose above, foaming down and raking Jerry off her feet. "I started swimming because that is what Monty had told us," she says. After being carried for a city block, her body—minus skis and poles—was deposited at the edge of the slide. Her skin was massively abraded right through her clothing. Otherwise, except for a case of the shakes, Jerry was okay. That was the risk of the job. Jerry was back training with Monty the next day.

In truth, the five women who had been chosen to join the crew of over 90 patrollers owed a good deal to the waves Jerry had made during the 1950s. She would occasionally try to provoke a lingering male chauvinist by laughing and saying, "Anything a man can do, a woman can do better."

She did her bit to live up to that. During the winter of 1960, she travelled abroad to study avalanche science at the famous Davos Avalanche Institute, returning to Squaw just in time for duty at the Olympics.

Monty brought a new idea into the field of avalanche control after the Squaw Games were over. He called it the avalauncher and was responsible for the early

development. It was Jerry who provided the means to secure the avalauncher's success.

When Monty arrived at Squaw in 1957 to take over the matter of avalanche control during the 1960 Olympics, he brought in four 75mm and two 105mm recoilless rifles. They were light and had enormous range, up to two miles—an almost-perfect tool. But the outlook for recoilless rifles was limited. "The Army had been warning us that time was running out on these rifles," Atwater wrote in his biography. "No more spare parts and no more ammunition were being manufactured."

In 1961, W.S. Davis of the Forest Service regional office sent Monty a leaflet advertising a baseball-throwing machine that operated on compressed air; it was used by most major and minor league teams for batting practice. Monty wrote to the manufacturer asking if the baseball-throwing machine could be modified to throw a four-pound projectile a quarter of a mile, rather than throw a half-pound baseball 30 yards.

During the early 1960s, the inventor of the baseball-thrower, Frank Parsonault, improved the avalauncher under Monty's supervision. In 1963, Parsonault came up with an avalauncher that lofted a four-pound projectile 1200 yards, about 500 yards short of a mile. That was getting up there to a useful distance.

The next year, Monty retired from the Forest Service and moved to Sausalito to set up a company he dubbed Avalanche Control Systems. He wanted to focus on

developing the avalauncher, a device that he hoped would be his legacy. But in 1966, he had a big setback. While testing at Tuckerman Ravine in New Hampshire, an avalauncher blew up and injured two Forest Service Rangers. Without Forest Service support, the avalauncher project was now dead in the water.

In the meantime, Jerry continued to patrol at Squaw and present the annual California avalanche course for NSPS. In 1967, California's Forest Service district decided to get into avalanche work and picked Norm Wilson, who had worked under Monty at Alta and the Olympics, to give California's annual avalanche course.

During this period, Jerry's marriage to Dr. Colburn came to an end and she was feeling a bit at loose ends. She began visiting Monty in Sausalito, a half hour's drive from her home in San Leandro. Monty was also struggling. He had a heavy alimony obligation and had to pay off a settlement for the avalauncher accident. The flaw in the device's design had been corrected, but he still had not been able to sell any avalaunchers outright. Jerry agreed to help out. She went out to a test range with Monty to learn how to fire the avalauncher—she'd never fired a piece of artillery in her life.

Once she got the hang of it, she took the demo model on summer road trips. Jerry was carting the

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Jerry carted around the equivalent of several pounds of dynamite in her Chevy Impala, pitching the avalauncher to potential customers through a live demo.



Mrs. Jerry Colburn
Box 422
Carmelian Bay, Ca. 94711

FROM MR. M. M. ATWATER
21 CLOUENVIEW TRAIL
SAUSALITO, CALIF. 94965
(415) 332-5368

DATE: 2 June 75

MESSAGE Jerry:
been excellent. So far, response to the questionnaire has
been excellent. So far, we have advance notice of intent to
buy 11 launchers and 2000 projectiles.
Sun Valley same up with an intent notice
for 3 launchers, a great triumph for you. I've given up on
that outfit.
Also Everden finally paid up. What will you
do with all your commissions?
To date about half the people who received
questionnaires have sent them in, even those who aren't
interested, unusual in itself.



top: Jerry and Pete Peters (left) inspect the new MK-18 Avalauncher in 1974 with Jim Cox (right), builder of the gun and base.

left: Jerry's on-the-road avalauncher sales pitch included setting up the device and firing off a few rounds.

right: Jerry and Monty Atwater look over his book, *The Avalanche Hunters*, in 1973.



Complex terrain in Canada's Selkirk Range requires thoughtful risk-assessment. photo by Laura Adams

AVALANCHE RISK

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avalanche risk requires considering the relations between the human, physical, and environmental systems inherent in avalanche phenomena. This approach utilizes a systems-thinking perspective, and is considered essential to adequately studying and understanding complexity.

Systems thinking is integral to the study of living systems (for example, ecology). However, it has only recently been applied to understanding the relationships between humans and their environment. In the science of living systems, understanding interrelationships provides insight into the emergent properties of the system. We simply can't achieve an accurate understanding through reducing a system to its component parts when the system is more than the sum of its parts. As the system properties combine, different properties emerge. A classic example is water. Knowing about its components, hydrogen and oxygen, tells us nothing about water, an emergent result of a reaction bearing no resemblance or similar properties to its parts. Similarly, it is important to consider the systems approach to understanding avalanche phenomena. As humans, we are the most fragile and least predictable component of the very system we strive to understand.

A Few Parting Words

How we think about avalanche risk differs at individual, group, organizational, and societal levels. It is critically important to understand how risk is perceived and evaluated within social science and systems-thinking perspectives. Incorporating strategies that increase risk perception and reduce the level of risk acceptance must be an underlying principle of avalanche-risk communication, management, and education.

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References

- Aven, T., & Kørte, J. (2003). On the use of risk and decision analysis to support decision-making. *Reliability engineering and System Safety*, 79, 289-299.
- Bruns, W. (1996). Snow science and safety for the mountain guide. Proceedings of the ISSW, Banff, Canada, 203-206.
- Coleman, C., (1993). The influence of mass media and interpersonal communication on societal and personal risk judgments. *Communication Research*, 20:4, 611-628.
- Gurabardhi, Z., Gutteling, J.M., & Kuttschreuter, M. (2004). The development of risk communication. *Science Communication*, 25:4, 323-349.
- Hönekopp, J., (2003). Precision probability information and prominence of outcomes. *Organizational Behavior and Human Decision Processes*, 90, 128-138.
- Kahneman, D. (1991). Judgment and decision making: A personal view. *Psychological Science*, 2:3, 142-145.
- Karelitz, T., & Budescu, D.V. (2004). You say "probable" and I say "likely": Improving interpersonal communication with verbal probability phrases. *Journal of Experimental Psychology*, 10:1, 25-42.
- Kunreuther, H., et al., (2002). High stakes decision making: Normative, descriptive and prescriptive considerations. *Marketing Letters*, 13:3, 259-268.
- Litt, M. D., (1988). Cognitive mediators of stressful experience: self-efficacy and perceived control. *Cognitive Theory and Research*, 12, 241-260.
- Mellers, B.A., Schwartz, A., & Cooke, A.D.J. (1998). Judgment and decision making. *Annual Review of Psychology*: 49, 447-477.
- McCammon, I. (2004). *Sex, drugs and the white death*. Proceedings of the ISSW, Jackson Hole, USA, 1-10.
- McCammon, I. (2002). *Evidence of heuristic traps in recreational avalanche accidents*. Proceedings of the ISSW, Penticton, Canada, 1-8.
- McClung, D.M. (2002). The elements of applied avalanche forecasting: The human issues. *Natural Hazards*, 25, 111-129.
- McClung, D.M. & Schaerer, P. (1993). *The avalanche handbook*. Seattle, Washington: The Mountaineers Books.
- Schaerer, P.A. (1987). *Avalanche accidents in Canada III. A selection of case histories 1978 to 1984*.

National Research Council of Canada. Ottawa: NRCC IRC 1468.

Slovic, P. (2001). The risk game. *Journal of Hazardous Materials*, 86, 17-24.

Slovic, P. (1987). Perceptions of risk. *Science*, 236, 280-285.

Stefanovic, I. L., (2003). The contribution of philosophy to hazards assessment and decision making. *Natural Hazards*, 28, 229-247.

Stethem, C.J. & Schaerer, P.A. (1980). *Avalanche accidents in Canada II: A selection of case histories of accidents, 1943 to 1978*. National Research Council of Canada. Ottawa: NRCC DBR 926.

Tyler, T. R. & Cook, F.L. (1984). The mass media and judgments of risk. *Journal of Personality and Social Psychology*, 47, 693-708.

Wheatley, M., (1999). *Leadership and the new science: Discovering order in a chaotic world*. San Francisco: Berrett-Koehler Publishers.

Wilde, G. (2001). *Target risk 2: A new psychology of safety and health*. Toronto: PDE Publications.

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ROLE OF BELIEF

continued from the cover

Unfortunately, the study of heuristics has done little to actually improve practical decision-making. Despite a flood of research papers and popular articles explaining which heuristic behavior was exhibited in a particular decision or choice, people still misjudge day-to-day risks, overestimate their skills as investors, fail to recognize the influence of marketing on their consumer choices, and view lotteries as a form of financial planning.

In the avalanche world, Ian McCammon's work on the study of avalanche accidents suggests that heuristic behavior may be exhibited by skiers, climbers, and snowmobilers in avalanche terrain. Though there is much nodding of heads in classrooms or meetings when an avalanche accident or bad decision is discussed in terms of heuristic behavior, it is not clear that the insight carries over to the next real-life situation. Why hasn't all this research resulted in practical ways to make better decisions?

I would suggest there are three reasons. First is the obvious point that heuristic behavior is instinctive and unconscious, and thus difficult to avoid. When it works, we don't notice it, and when it doesn't, we read about it after the fact – unless we are the unlucky victims of a really bad decision. Second is the fact that the long litany of heuristics and biases is simply hard to remember and use in practical situations. Third - and not the least important - is the fact that to most people, the concept of heuristic behavior is quite abstract, and difficult to relate to the day-to-day world.

So we're faced with something of a dilemma. We're told we don't act rationally. Thanks to psychologists and economists, we even have a nice catalog of our bad habits, complete with names and explanations. We have lots of compelling case studies to examine, but doing so doesn't seem to help us the next time we're faced with a decision. What to do?

Let's try changing our frame of reference. If the goal is effective and



Willie's Nose in the San Juans. The line between safe and sorry is often imperceptible.

pragmatic decision-making, we might do better by viewing human behavior in a simpler, less academic and more personal manner. And there is probably nothing more personal and fundamental to us than our beliefs. So instead of analyzing our choices after the fact in terms of heuristics, why not start our decision-making by taking stock of our beliefs? Two questions quickly come to mind. What exactly do we mean by belief, and why would viewing our behavior in terms of belief make decision-making any easier?

At the risk of oversimplification, let's define belief as accumulated wisdom. We use the word wisdom, as opposed to information or knowledge, to reflect the high value we place on our beliefs. Though this simple definition of belief might not satisfy philosophers or theologians, it has some practical advantages when it comes to making choices. Let's explore in a little more detail the types of accumulated wisdom we might possess, and how they might be relevant to avalanche decision-making.

Some of our beliefs result from the conscious or unconscious adoption of cultural influences. Religious beliefs fall generally in this category, though they are less relevant in avalanche decision-making than in other aspects of life. One particular cultural belief that should be of great concern to avalanche educators is our fascination with risk takers. Extreme snow sports are highly visible in film and television, for example, but accidents are rarely discussed, and the mitigation techniques employed to reduce risk for the production are not emphasized. Naïve viewers can easily be led to believe that there is all upside and little downside – a bad perspective to have when starting into the backcountry. The point here is not to try and change the culture itself, but to recognize the effect that cultural beliefs can have on students, and explicitly address them during avalanche education.

We also possess beliefs that are more personal, accumulating either from our own direct experiences or through close observation or participation in the

experiences of others. These personal beliefs start out as a collection of discrete experiences and stories. For people with relatively little experience in avalanche environments, personal beliefs can be strongly affected by a particular event – having succeeded on a difficult line, or having been involved in a serious accident, for example. Personal experiences, particularly at a young age, can bring out the leader or the follower in us, with obvious consequences and implications later in life. As time goes on, our many personal experiences unconsciously meld into what we call intuition. This intuition “averages over” individual events, in the process revealing underlying patterns and indicators that are relative constants across time, space, and situation. Talking about personal beliefs during avalanche training could help instructors move students whose decision-making is anchored to discrete personal experiences – positive or negative – to accept and include the intuition gained by others who are more experienced.

What might a belief exercise in a Level I avalanche course look like, and where would it fit in the curriculum?

Belief exercises could fit into Level I avalanche education the way personality profiling fits into team building. In situations where a team has to be assembled for a project, the leader often begins with formal (e.g., Meyers-Briggs Type Indicator) or informal personality profiling of the team members. This serves two purposes: it allows the leader to match personality types to particular team roles in advance, and it helps the leader and the team members better understand the sources of tension and disagreement that can arise as they interact. For example, if two people assigned to work together disagree on aspects of a task, a prior understanding of their personalities will help separate the issues related to inherent personality traits from those associated with the task itself.

In team building, insight into team members' personalities provides the team leader with a non-judgmental context in which to view their reactions to instructions and new information. Similarly, insight into students' beliefs can help a Level I instructor better understand their reactions to objective hazard information, such as during avalanche-scenario exercises.

A belief exercise in a Level I avalanche course would be most useful if done before delving into details of the objective hazards. The instructor might start by suggesting that what people believe – in addition to what they know – can have an effect on how they make decisions. The instructor then

frames a discussion of beliefs by introducing the three general categories of belief that seem most relevant to avalanche decision-making:

1. **CULTURAL** (e.g., media)
2. **PERSONAL** (e.g., based on your experiences or your participation in or observation of the experiences of others)
3. **GENETIC** (e.g., heuristic based)

With that introduction, the instructor guides a group discussion. Students express their particular beliefs most likely in a rather free-form manner (often as personal stories), and the instructor helps to organize what's said around the three belief categories. The objective is to leave each student with an awareness of their particular beliefs in terms that are easily remembered and non-judgmental.

As in the case of personality profiling for team building, belief exercises help both the leader or instructor and the student. In a Level I course, the instructor can use insight into the students' beliefs to more effectively organize and manage traditional group and individual avalanche exercises and training. And, perhaps most important, the students are equipped to make more holistic decisions in avalanche terrain by combining what they learn about the physical environment with what they have learned about themselves.

We're not done with the belief catalog quite yet. As mentioned earlier, psychologists and biologists view our heuristic behavior as seemingly hard-wired into our brains. For the purposes of belief-based decision-making, let's simply choose to call the characteristics that underlie heuristic behavior "genetic" beliefs. There are two in particular that are worth discussing in the context of avalanche education.

Despite overwhelming evidence that chance – randomness – plays a dominant role in our universe, it seems that humans are hard-wired to assume that someone or something is in control. For some, it is God or the gods, for others events are "meant to be", or "part of the plan". Even scientists operate on the implicit assumption that there is an underlying order to the physical world. The origin of this characteristic is much debated, but some researchers think it is an evolutionary adaptation that kept us from being overwhelmed by the sheer complexity of our environment. They also agree that, by extension, it makes us believe we as individuals have much more control over events than we actually do. A related "genetic" belief is our completely unwarranted self-confidence and optimism. If we only knew – or could calculate – the odds against us, we wouldn't have chased down the mastodon then, or jumped the cornice into the bowl now. Discussion and exploration of these "genetic" beliefs and their implications in avalanche education may be a very effective way to reach students. Rather than calling students irrational for thinking they are in control or for being unduly optimistic about their chances of survival in high-risk environments, a belief-based approach offers a non-judgmental path to appreciating that their behavior is a product of their innate humanity.

Now we're equipped to address the last question. Why would viewing our behavior in terms of belief, as defined above, make decision-making any easier? There are three reasons. First, belief is a familiar concept to most people, and as such is a more natural and universal starting point for dialog and reflection than heuristics. Second, viewing our behavior as driven by our beliefs is less likely to result in the sort of negative reinforcement that occurs when we're told that our behavior fails to meet some standard of rationality. Our beliefs are not right or wrong, they just are. And since it's easy to keep track of a few core beliefs, we might be more likely to take them into consideration early the decision-making process. Third, with our beliefs in hand, we can look at the evidence in a more systematic way.

This third point is very important. The idea that sequential negotiation between beliefs and evidence leads to better choices in individual decision-making is drawn from the success that Bayesian statistical methods have had in more quantitative situations. Bayesian mathematical methods power complex decision systems in fields as wide ranging as asset allocation, inventory control, oil drilling, industrial plant safety, and automotive diagnostics. When your car goes in for service, for example, technicians don't just look at the obvious symptoms. Their diagnostic equipment starts with what is essentially a "belief baseline" for your particular make and model. From there, it makes a particular measurement, adjusts the assessment accordingly, and repeats the process until the problem is solved. This dramatically reduces the number of tests and measurements that need to be done, which is particularly important given the complexity of modern automobiles. An added benefit of the Bayesian approach is that the belief baseline is updated by what is learned in each use.

The idea that Bayesian methods might be useful in individual decision-making is not new to the avalanche community. In a seminal 1980 paper published in the Journal

of Glaciology, Ed LaChapelle suggested that successful avalanche forecasters operate in a Bayesian fashion – i.e., they treat each new piece of evidence as independent, and systematically combine it with their prior knowledge of the situation to arrive at an updated assessment. This stands in marked contrast to the way most people deal with new information. Studies by psychologists have shown that people tend to unconsciously make up their minds based on the first pieces of evidence they encounter, and then look for further support for their decision, minimizing or ignoring evidence to the contrary. In the avalanche world, this is well-known behavior, in that once we've made the decision to move on avalanche terrain, we then tend to weigh signs of stability more heavily than signs of instability.

If there is a bottom line to all this, it's the following. If we can muster the discipline to examine and catalog our beliefs beforehand, we will be in a better position to consider evidence sequentially and systematically. If we do that, we'll make better decisions, if the success of Bayesian methods in so many other areas is any indication. In terms of applying the ideas in this article to avalanche decision-making, the best place to start is during avalanche education and training. There, instructors can help students establish their belief baselines, and then use them as starting points for decision-making exercises involving the objective indicators with which we're so familiar.

ACKNOWLEDGEMENTS

I am grateful to Pascal Haegeli, Jim Jenkins and Ian McCammon for their insightful comments and to Karl Birkeland for making me aware of Ed LaChapelle's 1980 article.

FURTHER READING

- DiGiacomo, N. J. (2006). *Toward Better Decision Making: Recognizing the Effect of Selection Bias in the Analysis of Recreational Avalanche Accident Data*, Proc. Int'l Snow Science Workshop, Telluride, CO, 244-253.
- Gigerenzer G. and Todd P. M. (1999). *Simple Heuristics that make us Smart*, Oxford University Press, New York, NY.
- Gilovich, T., Griffin, D., Kahneman, D. (2002). *Heuristics and Biases: The Psychology of Intuitive Judgment*, Cambridge University Press, Cambridge, UK.
- LaChapelle, E. R. (1980). The Fundamental Processes in Conventional Avalanche Forecasting, *Journal of Glaciology*, Vol. 26, No. 94, 75-84.
- McCammon, I. (2004). Heuristic Traps in Recreational Avalanche Accidents: Evidence and Implications (Part 2), *The Avalanche Review*, Vol. 22, No. 3, 11-13.
- Winkler, R. L. (2003). *An Introduction to Bayesian Inference and Decision, Second Edition*, Probabilistic Publishing, Gainesville, FL.

Nick has been an avid recreational climber and backcountry skier for over 30 years. His first classroom experience in avalanche safety occurred in a snow cave deep in the Wind Rivers on a NOLS trip in 1977. He received a Ph.D. in physics from UC Boulder in 1979, had one career as a research scientist at Los Alamos and CERN (the European Center for Particle Physics near Geneva), and then another as an executive at Martin Marietta, Science Applications International and Scient Corp. He lives in Telluride and is working on a book that explores the role belief plays in decision-making. He can be reached at PO Box 2879, Telluride, CO 81435 or nick@nickdigiacomo.com.



What sort of statements reveal beliefs that could influence avalanche decision-making?

"I'm the last of five children, and it always seemed natural for me to rely on my brothers and sisters for guidance, since they were all so accomplished. Now, whenever I start something new in my life, I believe it is important look for people who are the experts, and make sure to always follow their lead."

"I'm really into extreme board sports. Those sponsored riders are my heroes – I want to dress like them, talk like them, and rip sick lines just like them. And I really believe I'm meant to be one of them – I just need to make my mark so I can get noticed."

"I've been a construction professional for over 25 years, and I've operated just about every kind of equipment you could imagine. Because of this, I think I have a unique understanding of how to control powerful machines, and I believe this edge will keep me out of trouble on my sled."

"As long as I'm with a group, I feel good. That's why I joined the Mountain Club. I believe in the power of collective responsibility, so I feel much more comfortable about taking risks if I'm with an organized group."

"Look – when your time is up, your time is up. Forces bigger than me control my fate, so all I can do is follow my instincts and have fun."

"I've been building businesses since I was 18. The formula for my success is simple: planning and commitment. I don't believe in leaving anything to chance, so I work through all the angles and alternatives. But once I have my plan in hand and commit to action, nothing gets in my way."

"I've always been a natural athlete. I excelled at every sport I tried in high school and college, and always seemed to be a step ahead of my competitors. I believe I've been blessed with a special athletic gift, and I think it will always help me stay one step ahead of trouble."

"Hey - it's not worth doing if it's not worth dying for. Sure there are risks in life, but somebody has to win big, and it might as well be me."

"I'm an engineer. I've found that if you have the right data and make the right measurements, the decision makes itself. I believe the world is predictable, and you can control the outcome if you focus on the facts, and don't get emotional."

"I've been skiing and climbing for a long time, and I believe I have a good handle on the risks. People tell me I'm one of the most confident people they've ever seen in the mountains, and I think it's a reflection of my intuition. I've just moved here, and want to learn about the local conditions, but I don't want someone trying to tell me how to think."

TRIANGLES TO SNOWFLAKES: From 3 Points to 6 Points

Story by Halsted Morris

"I give myself very good advice, but I very seldom follow it."

—Alice, from Walt Disney's
Alice in Wonderland



Dale Atkins, 2005

When Knox Williams hired me as the education outreach director for the Colorado Avalanche Information Center (CAIC) in 1999, I had done a few avalanche courses for mainly ski patrollers. I had a couple hundred avalanche-related slides, and I needed to put together a few programs (mainly awareness and backcountry short courses) quickly. Since there wasn't a standardized presentation curriculum for me to follow, I figured the classic Avalanche Triad was the best thing to base my programs on. After 3 or 4 winters – and nearly 100 avalanche courses – I found the Avalanche Triad didn't match the way most people think about and prepare for avalanche hazards, even after they have had avalanche-awareness training.

Our goal as avalanche educators is really pretty simple: Help people recognize hazards so they can better manage their risk. What seemed to be missing was a framework for how people make decisions. In time, my methods evolved to better meet how people really make decisions – no matter their avalanche awareness skills and knowledge.

The Development of a New Progression

I believe that folks view the ingredients for making a decision in a simplistic manner. From novice to expert, no matter the activity (skier, rider, snowmobiler, climber, plow driver, miner, etc.), they all visit an area: **TERRAIN**. There they knowingly or unknowingly assess the **INSTABILITY** and make their determination of risk: **DANGER**. With the danger decided, they make a decision about what to do: **ACTIONS**. With every action there is a result: **CONSEQUENCES**. The consequences can be positive – great recreating or getting a job done – but consequences can be negative when an accident happens. When misfortune strikes, companions must be ready to effect a speedy **RESCUE**.

Flushing out the details took some time and effort. During the summer of 2005, I presented my idea at a staff meeting of the CAIC. Originally I was envisioning a compass rose of avalanche subjects, but after a long afternoon of discussion with five other forecasters/educators, we settled on six subjects. Conveniently they match the six points of a stellar snow crystal (no surprise, given that I worked with a crew of snow nerds).

The four subjects of the classic Avalanche Triad have been the focus of most avalanche-safety courses since Jill Fredston and Doug Fesler's book *Snow Sense* came out in 1984. Long before even the AAAP/AAA issued its Level 1 course guidelines, most avalanche educators in the U.S. had based their courses around the Avalanche Triad subjects.

So when I started to put together my awareness and backcountry short programs, I based them on the classic Avalanche Triad of terrain, weather, and snowpack – the three points of the avalanche triangle – with human factors within the triangle's center. All this seemed to work well for the basis of most of my courses, and even for more specialized courses such as for transportation workers (snowplow drivers, state patrol officers, etc.), it worked well. Only the route-finding portion of the terrain subject matter was a bit different for backcountry users.

This approach seemed to work well for a number of seasons, but I started to realize that often I was discussing subject material that didn't neatly fit into any of the four subject categories in the Avalanche Triad. Avalanche rescue, the five-level danger scale, smart travel protocols, and consequences could be included in human factors. But in reality these are distinct subjects.

Weather and snowpack all too often are so interrelated that they could actually be one topic. Let's face it, when it comes to weather we can often have weather-related events (such as surface hoar formation) that could later affect the snowpack stability. I started to think that I should show my students how weather-related events that are not directly observed can and do contribute to raising avalanche hazard.

Philosophy of Terrain

Meanwhile, terrain seems to be the only constant in avalanche assessment. From year to year there might be radically different snowpack because of what the weather has done, but avalanche terrain doesn't change much from season to season. The principles of slope angles, convex and concave slope shapes, starting zones, etc., remain constant from season to season. Terrain is the primary subject for my students to understand.

Desired Outcomes: Instability Observations

I want my students to observe the environment around them. Just as with *Snow Sense*, the goal is for my students to be looking for factors that may lead to instabilities. Instability observations became the second major subject for my new avalanche-education curriculum.

Actions

The Avalanche Triad's human factors seems to me to be a subject of "what people do, which gets them into trouble," and "what people could do to keep themselves out of trouble." Boiling these two ideas down into one subject, I realized that both

are due to our own actions (i.e., our "good" and "bad" behaviors).

Rescue

Avalanche rescue is a subject unto itself. I really don't believe that you can do a more advanced avalanche presentation without talking about rescue. When a first-time student comes to an awareness talk, they want to know what to do in case everything goes wrong. As educators we hope that our students never have an interaction with an avalanche. But realistically this is not always the case.

Consequences

At the summer staff meeting, I presented my idea of the compass rose of avalanche subjects. The first input I received was that in my four subjects there wasn't anything about being caught in an avalanche. Basically, what are the consequences of being in an avalanche? This topic can also cover the Five-Level Avalanche Danger Scale.

Avalanche educators have difficulty convincing folks that even small avalanches have serious consequences. Film companies like Teton Gravity Research (TGR) are showing their audiences that there are consequences to being caught in an avalanche, but there are many other "ski porn" film companies out there that don't show the consequences. TGR is the exception to the trend, and they should be commended for their efforts.

Consequences, as a separate subject, can be covered with the typical avalanche statistics or, better yet, with a case study that requires students to piece together a complete situation.

The five-level avalanche danger scale (5LADS) is probably the most misunderstood subject we teach in our courses. In the past, I think a lot of instructors left it up to the students to read it on their own for the actual definitions of the different levels. The 5LADS is also the least sexy subject of any avalanche course, which aids in its omission. The 5LADS requires some hard thinking about exact wording and definitions. The terms "possible" and "probable" are where most students get hung up on understanding the 5LADS. As educators we deal with not only the dictionary definitions of these terms, but also with the personal connotations within our student's minds. There can be some major differences between the two definitions.

(Editor's note: for more perspective on this topic, please see Nick DiGiacomo's article on the role of Belief in avalanche decision-making in this issue of TAR.)

PRESENTATION FRAMEWORK: Using the Six Points in Class

I usually start my presentations with a short introduction of avalanches. I show the two ends of the size spectrum (small road bank to “monster” size) and then some examples of the destructive power of avalanche. At this point, I’m ready to jump into the meat of the presentation. In order to do that, I need to give my students a bit of a nomenclature foundation (types of avalanches, physical features, etc.).

Terrain

With the foundation laid, I begin discussing terrain. I want students to come away from the presentation with a clear understanding of six sub-points:

1. slope angle
2. slope shapes (convex/concave/planner)
3. anchor points vs. weak points
4. natural clues to recognizing avalanche terrain
5. classic terrain traps
6. islands of safety

To conclude the terrain portion of my presentation, I spend quite a bit of time illustrating terrain examples with virtual tours that take various routes through avalanche terrain. Student interaction with the terrain choices allows for better understanding.

Instability Observations

Depending upon the level of the course or presentation, this is when I’ll do a detailed or a general overview of snow metamorphism. Primarily I want students to develop an understanding that their field observations are key to safe travel in the backcountry. I stress the need for using all their tactile sensory skills (look, listen, touch, feel) in observing the environment around them. A few years ago, I discovered the book, *Secrets of the Snow: visual clues to avalanche and ski conditions* by Ed LaChapelle. In it LaChapelle talks about understanding the constantly changing snowpack. He focuses on visual clues and the use of kinesthetic senses to observe the snow’s stability and behavior. All too often, avalanche students arrive at courses with the idea that digging snowpits holds the single key to their safety in the backcountry. I emphasize that decision-making is based on a larger scale system of observations, which certainly encompasses snowpits.

When discussing instability observations, I like to focus on how conditions are constantly changing in the field. Observing changes is important, but it is even more critical to share observations with their group.

During this portion of my course, I can also introduce my students to Ian McCammon’s Five Lemons for judging snowpack quality and the Obvious Clues Method for recognizing avalanche hazards. For years I had been teaching the Five Red Flags:

1. recent natural avalanches
2. recent significant snowfall
3. recent significant wind loading
4. collapse and shooting cracks, and
5. recent significant rise in temperature

In addition to these, The Obvious Clues Method includes two more:

1. RATING: of considerable or higher in the current avalanche bulletin

2. TRAP: trees, cliffs, gullies or any other terrain features that amplify the effects of an avalanche.

These simple handy methods for judging snowpack quality and recognizing avalanche hazards are very well received, indicated by a mad scramble of note taking when I introduce these methods.

Danger

From instability observations, I move on to the 5LADS. Now that the students have an understanding of avalanche terrain, I can discuss which terrain to avoid during higher avalanche danger. The analogy of a visit to Las Vegas can clarify the distinction between “possible,” and “probable.” Most folks clearly understand low, high, and extreme avalanche-danger levels. The big hang-up has always been clarifying the differences between moderate and considerable, so I spend quite a bit of time on this distinction.

There’s been so much great research about human behavior and decision-making in recent years, you’d think that we should all study behavioral science before studying snow or weather. In truth, I believe that it’s fairly easy to teach students to recognize avalanche terrain and find weak layers within a snowpack. Helping students realize when their decision-making skills or behavior are leading them astray is entirely another matter.

Your Actions

The Your Actions portion of my presentation focuses on “what gets us into trouble” and “what we can do to minimize” the hazard we’re faced with. Students seem to relate well to Ian McCammon’s heuristic traps, especially if I use examples of how we fall for the traps in our daily lives. The key here is to relate daily life into what happens in the backcountry. Asking students to keep a mental tally of the number of heuristics traps they have fallen for in the past makes them really sit up and take notice. If they walk out of my class thinking, “Wow, somehow I’ve ducked the avalanche bullet in the past, and I better not do those things again,” I have succeeded.

Rule-based decision-making seems to be what students want. But when it comes to avalanche education, there are always exceptions to the rules. Rather than getting students to base their decisions simply on rules, I want them to first adopt smart behaviors. I spend the second half of Your Actions talking about the use of “Smart Travel” protocols. By starting out with smart safe behaviors, smart decisions will often follow.

Consequences

Consequences can be handled in a variety of ways, depending upon the group I’m instructing. One idea is to simply present, “Here’s what’s going to happen to you if you’re caught in an avalanche.” Or I could use a lot of the normal avalanche statistics. With the statistics approach, I like to concentrate on the idea that avalanches are avoidable.

As previously mentioned, I find that case studies require the student to piece together all the clues and

mistakes present in an accident. At this point, they have enough avalanche knowledge to recognize the terrain, instability observations (clues), and human mistakes to see what led to the accident. Here the students can start to use their new avalanche knowledge.

Rescue

Finally, I present rescue as an entirely separate subject. I discuss equipment, what to do if you’re caught (I now teach going for an air-pocket strategy versus swimming strategy when caught in an avalanche), what to do if someone else is caught, and different search-and-rescue strategies. I really try to keep from getting overly complicated with any of these subjects. Obviously getting hands-on instruction is better when it comes to practicing transceivers, but they can be discussed without delving into excruciating detail.

When talking about rescue, I stress the urgency of a timely rescue of buried victims. Along with this, I stress that folks shouldn’t give up on their rescue efforts if they don’t quickly find the victim and abandon the search in order to go for help. My insights into real-life rescue timelines can be sobering, but hopefully give students useful tools.

Conclusions

The Six Points have been well-received by students and even by some fellow instructors. Dale Atkins has been using The Six Points successfully since late 2005. “The Six Points provides a nice framework for getting sliders and riders not only thinking about terrain and instability, but also using the danger ratings,” he comments, “and it gets them thinking about the consequences of their actions too.”

The Six Points started out as a framework of subjects to be covered in a Backcountry Short Course (one evening and a day in the field). I have also used it in shorter awareness presentations. In addition, I have been using the Six Points while I’m out in the field making decisions—the points have progressed from the Triad, to an educational tool, to a real-life decision-making tool. Try it and let me know what you think.

Halsted Morris is the member affiliate’s representative on the AAA board. He was the education outreach director at the CAIC for 7 years. He now teaches as an independent instructor and runs Hacksaw Publishing, Inc. ❄️

NEW IN JANUARY!

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Jerry models a stunning cocktail gown at Tahoe's Cal Neva Lodge. In non-patrol garb, she was part of the area's social whirl.

In 1962, Jerry and her daughter Carol Louise moved to a small delightful home in San Leandro, where she found another exciting pastime. She would fly down to Jamaica to visit friends who ran a reptile zoo in Kingston. The friends also caught and sold wild crocodiles and Jerry became a crocodile hunter. How do you catch a crocodile? "Very carefully," says Jerry, who says she caught eight of them, one a 1200-pounder.

The crocodile is one of the most dangerous wild creatures on the planet. Its teeth can dismember a limb in seconds and the tail can kill with a twitch. To hunt a croc, Jerry explains that one needs to hook it with a spear, hold it down while winding a line around the jaws to close them, and then tie up the tail to immobilize it—all probably no more dangerous than riding an avalanche.

LADY & THE AVALAUNCHER
continued from page 22

projectiles around in her car—the equivalent of several pounds of TNT. A large sign pasted to the rear window proclaimed "EXPLOSIVES," but any collision could have blown the car into bits. In this hazardous manner, she managed to set up, fire, and sell a number of avalaunchers each summer.

Jerry put money into Avalanche Control Systems when funds were needed for raw materials. By 1973, after six years during which she sustained Monty as partner, supporter, and salesperson, she had sold 28 avalaunchers at an equivalent today of about \$3,000 each. Supplying that many avalaunchers with ammo was difficult. At an average use of 75-100 shells per avalauncher per season, Jerry and Monty had to produce 2800 projectiles per year, or 50 per week. Jerry pitched in to help him produce the projectiles in Monty's basement workshop, an obvious bottleneck. But the set-up expense to fabricate projectiles in a factory was cost prohibitive.

But Jerry found a production guru. In 1973, Jerry had begun dating Pete Peters, an all-around good guy who knew nothing about avalanches and did not ski, but was running his own kitchen-remodeling business. He had a brilliant sense for materials and manufacturing. On a hunch that Pete could be helpful, Jerry brought him out to meet Monty.

Pete proceeded to solve the manufacturing problems. He bought into Avalanche Control Systems by investing \$16,000 (capital Monty did not have) to build injection molds. These molds could turn out plastic projectiles en masse. Pete's plastic projectiles were cheap (\$4.40 each, compared to \$8.00 that Monty had been charging), could be made quickly in quantity, and gave a truer trajectory than metal projectiles.

There was a grand unveiling of the new system in 1974, but Monty didn't stay around very long to enjoy the success. He died of a heart attack in 1976. By then the avalauncher was on a sound footing.

Avalanche Control Systems manufactured roughly 100 avalaunchers, then turned the manufacture over to The Launcher Company of Nevada, leaving Peters the projectile business. Peters currently sells 15,000-20,000 projectiles annually to stock the 200-odd operating avalaunchers.

The Launcher Company currently sells about 20 avalaunchers a year—Monty's legacy is safe. So are the country's powder skiers, up to a point of course. But this gift to the nation's skiers is Jerry's legacy too. She pitched in not for money but because the sport needed the avalauncher.

Jerry continued selling avalaunchers from her Chevy Impala packed with explosives. In 1975, she met Jimmie Nunn at a ski patrol function. Jimmie had been on the Olympic patrol in 1960 with Jerry and was once the nation's second highest-ranking national ski patroller. Jimmie and Jerry had a whirlwind courtship and married within the year. Jimmie persuaded Jerry to sell her share of Avalanche Control Systems to Peters so she could stop carting explosives around the country in her car. The two settled in Flagstaff, Arizona, where Jimmie—a prize-winning Nevada architect—based his office.

The Nunns now live in Flagstaff's Roundtree subdivision. Naturally, Jimmie designed their house. The two live their daily lives under soaring ceilings in multilevel spaces with spiral staircases, wrought-iron railings, and a glass wall that opens on a pristine view of 12,000-foot San Francisco Peaks, where the Arizona Snowbowl is embedded in the rim of an ancient volcano. Jerry, at 85, remains petite and eager, with wide blue-green eyes...hip from her short auburn pageboy to her Birkenstocks, wearing jeans, a turtleneck, and a black sweater-vest with teddy bears on it. She caretakes a small ski museum the couple erected in their barn, eager to share the years of scrapbooks that detail her remarkable career.

Morten Lund graciously gave The Avalanche Review permission to reprint his article on Jerry Nunn, which originally appeared in Skiing Heritage, third issue, September 2002.

