

THE AVALANCHE REVIEW

March 30, 2014:

Alan Willard from the WSDOT North Central Region avalanche program fires the howitzer at the Liberty Bell paths above Highway 20 in Washington's North Cascades. Warming temperatures increased the likelihood for wet loose avalanches, necessitating mitigation. About 8-10' of debris covered the highway following the shot.

Photo John Stimberis, AAA president and WSDOT avalanche forecaster

MENTORSHIP & History

HISTORY LESSONS / 14

MENTORSHIP / 32

PIMENTÓN AND EL NIÑO / 24



THE AVALANCHE REVIEW

The *Avalanche Review* is published each fall through spring by the American Avalanche Association, Inc., a nonprofit corporation. *The Avalanche Review* welcomes the submission of articles, photographs and illustrations.

Please send submissions to:

Lynne Wolfe — Editor
PO Box 1135
Driggs, Idaho 83422
tel: (208) 709-4073
lwolfe.avalanchereview@gmail.com

Business and Subscription Office:

Jaime Musnicki — AAA Executive Director
PO Box 248
Victor, ID 83455
tel: (307) 699-2049
aaa.jaimem@gmail.com, aaa@avalanche.org

Advertising:

Jaime Musnicki
PO Box 248
Victor, ID 83455
tel: (307) 699-2049
aaa.jaimem@gmail.com

Production:

McKenzie Long
PO Box 9368
Mammoth Lakes, CA 93546
tel: (513) 515-0723
mckenzie@cardinalinnovative.com



AMERICAN
AVALANCHE
ASSOCIATION

AAA STATEMENT OF PURPOSE

The American Avalanche Association promotes and supports professionalism and excellence in avalanche safety, education, and research in the United States.

Executive Director . Jaime Musnicki

AAA Officers

- *President.....John Stimberis
- *Vice PresidentBill Williamson
- *Secretary.....Scott Savage
- *Treasurer.....Mike Ferrari

Committee Chairs

- AwardsHalsted Morris
- Data & IT/WebNed Bair
- Education.....Kirk Bachman
- EthicsAleph Johnston-Bloom, Dave Hendrickson
- Membership Stuart Thompson
- Research Jordy Hendrikx
- Search & Rescue ... Maura Longden, Nick Armitage
- Ski Area Bill Williamson
- *Publications..... Blase Reardon

Publications Committee

- Editor.....Lynne Wolfe
- Editor EmeritusSteve Conger
- Editor EmeritusSue Ferguson
- Editor EmeritusBlase Reardon
- Editor EmeritusBruce Tremper

Section Representatives

- Alaska.....Andy Dietrick
- Eastern Section.....Chris Joosen
- European Section.....Kristen Kristensen
- Intermountain North.....Mark Staples
- Intermountain South ...Damian Jackson
- Northwest.....Patty Morrison
- Rockies.....Beccs Hodgetts
- Sierra.....Gene Urie
- Member Rep.....Jonathan Shefftz
- Certified Instructor Rep..Jake Hutchinson

*Executive Committee denoted by **

Subscription: \$30 per year (4 issues). Subscription is included with membership dues to AAA. For subscription and membership information, see www.AmericanAvalancheAssociation.org.

Contributions: Please submit material eight weeks prior to publication date. Include address and telephone number. Please submit typed manuscripts by e-mail or disk (CD or DVD), using any popular word processing program. Submit any figures as an EPS (preferred), PDF, TIFF or JPG file (300 dpi resolution at 100%). We will return materials if you include a stamped, self-addressed envelope.

Articles, including editorials, appearing in *The Avalanche Review* reflect the individual views of the authors and not the official points of view adopted by AAA or the organizations with which the authors are affiliated unless otherwise stated.

Layout & Design: McKenzie Long, Cardinal Innovative, (513) 515-0723, mckenzie@cardinalinnovative.com.

©2015 by the American Avalanche Association.

Materials may be reproduced for research or classroom use. Permission is also granted for use of short quotations, figures, and tables in scientific books and journals. For permission for other uses, contact *The Avalanche Review*.

CONTRIBUTORS



Bill Williamson currently works at Schweitzer Mountain Resort outside of Sandpoint, ID. He has spent more than four decades in the Operations side of the Ski Industry and is still wondering what he will do when he grows up. He opens our History section with life lessons on page 14.



Don Bachman has had a long and interesting career in the avalanche world. He keeps up on current topics by reading TAR, participating in continuing education seminars, and through email correspondence with other crusty avalanche veterans like Art Judson and Ron Perla. He still has some nice coffee mugs from ISSW 2000 in his garage; his wife would love it if you'd take one (or two, or three, or the whole box).



Rod Newcomb and his wife Annie finally moved off Heck of a Hill in Wilson, Wyoming, to a little house in Jackson. Rod can still be found on the Glory boot-pack or the trail out to Avalanche Bowl, but he's added Snow King to his regimen and is pleasantly surprised by how active his social life is, now that he lives right in town.



Photo Scott Markewitz

Liam Fitzgerald lives with his wife and 15-year-old daughter in North Idaho, on Lake Pend Oreille. Most of his time is spent working on the house he built. Last winter he spent a couple days a week with the Schweitzer Patrol, but the weather pattern didn't allow for much avalanche work.



Jerry Roberts is holding down the fort in Ridgway, Colorado, where he writes haiku and comments on the current state of affairs at therobertreport.net.



Colin Mitchell spends his summers in Chile, where he is the avalanche program director for the Pimentón mine. He also works with the AIARE program in South America as an educator and instructor trainer. In the northern winter, he is a forecaster with the Colorado Avalanche Information Center.



Nick Barlow splits his winter guiding heliskiing in Southeast Alaska and managing snow safety for a snowcat operation along the Continental Divide. He is also a meteorologist, offering seasonal snow forecasts for the Rocky Mountain region on his non-profit website Barlometer.com. In the off-season, you can likely find him spying for brookies in Bear Creek near his home in Evergreen.



Doug Krause works as a patroller, guide, educator, and forecaster in Colorado, Alaska, Japan, Argentina, and Chile. Home base is currently Lima, Peru. The commutes are a bitch. See his article on teamwork on page 40.



Alex Bergeron has worked as a professional ski patroller for the last ten seasons, and was able to earn a B.S. and M.S. from Montana State University-Bozeman while doing so. Combining his interests, he was granted the opportunity to employ scholastic efforts in his thesis project aimed at helping ski patrollers avoid potential accidents while conducting dangerous avalanche mitigation work. Learn more on page 44.

CONTENTS / CROWN PROFILES

14 History Lessons

Bill Williamson
Sandy Bryson
Don Bachman
Rod Newcomb
Liam Fitzgerald

24 Pimentón and El Niño by Colin Mitchell

32 Mentorship

Lynne Wolfe
Josh Parker
Doug Krause
Margo Krisjansons
Aaron Diamond
Jerry Roberts
Jake Hutchinson
Tom Kimbrough
Larry Heywood
Margaret Wheeler
Don Bachman

CONTENTS / DEPARTMENTS

- 2 Letters
4 News
28 Snow Science: Whether the Weather by Nick Barlow
40 Decision-Making: Teamwork by Doug Krause
44 Decision-Making: Ski Patrollers and Complacency by Alex Bergeron

FROM THE EDITOR

BY LYNNE WOLFE

Hi folks- here's the second installment of our redesign. We've heard from many of you, saying how much you like the new format and that it was "about time" that TAR went to magazine style. Thanks! In response to other feedback, we've enlarged the font a bit for those of us with reading glasses, and highlighted our name on the cover so you won't think we're a Real Estate throw-away mag. Start digging in your archives for those high-resolution photos that you've been loathe to submit to the previous newsprint format; full color glossy will do them justice.

The themes for this issue, history and mentorship, are close to my heart. I've been working on a AAA history project off and on for years, and for this December I've managed to persuade a number of my mentors and pioneers in our community to write about their memories and their mentors. Each of them good-naturedly accepted their "homework assignment," and delivered some great stories, which will be filed in the history section of the Avalanche Library (as soon as the new AmericanAvalancheAssociation.org site launches, any day now) and one day we hope to include them in some kind of book, either hard copy or electronic. There's also support for mentor/ protégé pairs in the form of specific tips and tricks from the industry, news on the same topic from Margaret Wheeler of the AMGA, and some poignant anecdotes from a wide range of current avalanche professionals about interactions with their mentors. I also want to remind you that I am still running an informal mentorship program through TAR and the AAA for folks who wish to enter the professional avalanche world. Contact me for details.

Beyond the history and mentorship themes, we have an eye-catching variety of stories. There's another story about ski patrollers and complacency, this one from Alex Bergeron, who presents

us with some interesting findings about avalanche hazard reduction work and cortisol. We have a further installment in Doug Krause's decision-making series, about Operational Awareness and Teamwork; this piece is shovel-ready, it's already being used in ski patrol pre-season trainings around the West. We have one more chapter in the Pimenton Mine story, this version, from Colin Mitchell, shows us that avalanche safety progress is being made, albeit slowly, even in the back corners of Chile. Finally, Nick Barlow brings us a humorous but accurate take on the life of heli-ski weather forecaster.

So far this autumn I've been on the SAW circuit a bit. It's great to see familiar faces, meet new friends, and match smiles to names I have only known via email. Everyone is doing great work out there- here at TAR we hope you have a great winter and that you keep us in mind when you have striking photos, imminent questions, or dramatic avalanche cycles.▲



Photo Dan Powers

FROM THE PRESIDENT

BY JOHN STIMBERIS

Winter approaches again. As I sit down to write I'm looking at another great fall day but thinking about the season ahead. I've just returned from a few action-packed days in CO where I attended several productive and interesting meetings, including CSAW. It really was energizing to be surrounded by so many smart and interesting peers.

We continue to make strides here at the American Avalanche Association. Have you seen our new logo? How about the complete redesign of The Avalanche Review? I'm blown away by how great it looks. By the time you are reading this we should have a newly designed website up and running. Beneath the surface there are many big changes underway as well. The Pro-Rec split in education continues to move forward and promises to be a game changer. We've been making efforts to raise more funding to help support these changes.

Membership continues to grow and I am proud to be a part of your community. I really feel excited about this part since we make up a unique and exciting community. I could sense the energy and excitement at the AAA general meeting in Breckenridge, and it wasn't just the free beer and nachos either! Your membership is an important role in this association. If you haven't yet joined please consider it, and if you are a member encourage a friend or co-worker to join.

Along with the theme of AAA membership and being part of a community I think it's also important to recognize our mentors. Think back to those who took the time to help us join this profession, or those you may have helped get a start in the snow world. Mentorship is an important part of our community and we never outgrow the need for a mentor. There's always someone who will help you learn, inspire you to do your best, or encourage you to try again after you failed to meet a goal. Those women and men who inspire us to do better are right here in the American Avalanche Association. Don't be afraid to reach out to your fellow professionals.▲

sn^owmetrics.com



970-482-4279

METAMORPHISM

CONGRATULATIONS TO THE NEW CAIC FORECASTERS:



Jason Konigsberg will be one of two new avalanche and weather forecasters for the CAIC based out of the Boulder office. Jason comes to Colorado from Park City, Utah, where he patrolled for a decade and worked on the Canyons Resort snow safety team while also serving as an instructor for the American Avalanche Institute in his spare time. After three years of spending his summers forecasting in the Craigieburn Range of New Zealand, Jason has been trying to acclimate to summer heat as a wilderness ranger for the Forest Service. While Utah has had some of its own memorable snowpacks over the last few winters, he is looking forward to working in the challenging Colorado continental snowpack.



Jeff Davis will be joining the CAIC team this year as the San Juan Backcountry Forecaster. Jeff lives in the Telluride area, but looks forward to venturing about though Southwest Colorado. Jeff spent ten years working as a ski patroller and even enjoyed a few endless winters working at Mount Hutt in New Zealand. Jeff most recently held the position of Risk Manager for Telluride Ski and Golf and is excited to spread his passion for safety with the avalanche community. You may remember Jeff and his buddies from ISSW in Banff, when they decided to start their presentation with Britney Spear's "Baby One More Time." When not in the snow, Jeff enjoys riding his bike, rafting, playing hockey, working on his new house, and spending time with family on Lake Michigan.



Mike Cooperstein "Coop" comes to the CAIC as the other Boulder-based forecaster for the CAIC, after working in the mountains for the last 20 years. He began his snow career as a ski patroller at Snowshoe in West Virginia when he was 18 years old. He soon moved to Bozeman, Montana where he finished his undergraduate degree in biology. He was subsequently hired at the Yellowstone Club where he worked as the assistant snow safety and assistant ski patrol director for 11 seasons. In 2008, he completed his masters degree in earth sciences from Montana State University where he studied the effects of slope aspect on the formation of surface hoar and diurnally recrystallized near-surface faceted crystals. For the last six years, Coop has been working around the world as a mountain guide for Andes Mountain Guides.



Joe Messina will be taking over the new Steamboat avalanche forecaster position for the CAIC. Joe has been a ski patroller at Steamboat since the early 90s. He's also worked as a hydrologist for the NRCS Snow Survey in Denver and a meteorological technician for the Desert Research Institute's Storm Peak Laboratory atop the Steamboat Ski Area. He's got an MS in Civil Engineering and additional graduate work in Atmospheric Science, and is really looking forward to starting his new position with CAIC.

CONGRATULATIONS TO A NEW GALLATIN NATIONAL FOREST FORECASTER:



The Gallatin National Forest Avalanche Center welcomes Alex Marienthal to its forecasting team for the 2015-16 season. Through an agreement between the Friends of the Avalanche Center and the Forest Service, Alex will fill the third forecaster position that was vacated by Mark Staples. Later this winter the GNFAC will advertise a Lead Avalanche Specialist position for the 2016-17 season.

Alex has worked for the Friends of the Avalanche Center as an avalanche educator for the past five years with the last two as Education Coordinator. He was responsible for the GNFAC education program which taught close to 6,000 people in 102 classes last winter. During that time, he also ski patrolled at Bridger Bowl and finished his Master's degree in snow science at Montana State University. His Master's thesis focused on forecasting deep slab avalanches on persistent weak layers.

DON'T FORGET TO ADD THE AAA TO YOUR HOLIDAY LIST!
With 2015 drawing to a close, help us make 2016 the
best year yet for avalanche safety, education, & research.

DONATE NOW



AmericanAvalancheAssociation.org



AMERICAN
 AVALANCHE
 ASSOCIATION

CONGRATULATIONS TO THE NEW SAWTOOTH NATIONAL FOREST FORECASTERS:



Matt Wieland grew up playing and getting lost in the mountains of Montana and northern Wyoming. He moved to Bozeman to attend college and realized throwing bombs as a ski patroller at Moonlight Basin Ski Area was pretty fun. He eventually became an avalanche forecaster and worked at the ski hill for over a decade. Along the way he earned a Bachelor's of Science degree in Snow Geography at Montana State University - Bozeman. Not satisfied, he went back to MSU to earn a Master's degree focusing on surface hoar formation in meadow openings. He began forecasting for the Sawtooth Avalanche Center in 2015. In the winter he enjoys going out for a rip on his sled and occasionally brings his skis along. He spends his summers riding singletrack trails on anything with two wheels.



Ethan Davis began working as a forecaster with the Sawtooth Avalanche Center in 2015. His interest in snow started at Anthony Lakes, a mom-and-pop ski hill in rural Eastern Oregon. He attended the University of Idaho, where he earned his Bachelor of Science in Geography and a minor in Mathematics. Following an interest in winter storms he earned his Master's degree in Meteorology from Pennsylvania State University. After three years in a dark lab growing ice crystals, Ethan returned to the light as a forecaster in Alaska and Colorado before making his way home to Idaho. When not in the snow, you can find him and his wife Robyn brewing beer, fishing, biking or tying-in to climb at a local crag.

CONGRATULATIONS TO NEW FACES AND CHANGES AT THE FLATHEAD AVY CENTER:



The FAC welcomes **Mark Dundas** as the newest avalanche specialist, bringing the roster of full-time forecasters to three. Mark has over 20 years of snow safety and avalanche forecasting experience. This tremendous experience includes days lamenting over depth hoar at Berthoud Pass in Colorado as a guide and ski patroller to his time in Montana as a professional patroller for Whitefish Mountain Resort, a forecaster for Burlington Northern Santa Fe and the National Park Service with the Going-to-the-Sun Road avalanche program in Glacier NP. Mark has also been an avalanche educator for 24 years and is a professional member of the AAA. In the summer, Mark wields a Pulaski as if it were another limb as a trail crew supervisor in Glacier NP. We are excited to welcome him to the FAC.

The FAC will also have a volunteer intern this year. **Katie Borgen** will be assisting the forecasters in the field, in the classroom, and in the office. Mark and Katie will join returning lead forecaster Todd Hannan and center director Erich Peitzsch to provide a strong and skilled avalanche center team. The increase in resources will undoubtedly allow us to provide more accurate and robust products for the public and our partners. Now, all we need is for it snow.

Most notably, the FAC will provide daily advisories for the first time ever. The number of advisories per week increased from two a few years ago to four last season, and now to seven this upcoming season. This is due, in large part, to overall increased support for the avalanche center from the U.S. Forest Service Region 1, Glacier National Park, and the Friends of the Flathead Avalanche Center. Public safety is important to these agencies and organizations and we appreciate the support, and hope it continues into the future.

BRUCE TREMPER

RETIREMENT MUSINGS

BY BRUCE TREMPER

I have a funny story about back when Ian and others were really just beginning to develop more with the "Human Factor;" how to better understand it and communicate it to students. Bruce was writing his first book and he and I took a half day between meetings and teaching at the National Avalanche School to go on a hike in the Sierra. Well, on the drive back to the school we became so engaged in our discussion about all the human factor stuff that we completely missed our exit on the interstate and had to spend a half an hour backtracking.....speaking of human factors, "gotcha"! We still laugh about that one.

—Janet Kellam

I'll be the first to admit that my 29 years as Director of the Utah Avalanche Center was probably way too long, and my employees would likely agree. Term limits are a good thing. But hey, it was such a great gig. And it was also hard to leave because it's such an all-consuming job, one in which the UAC and I were completely enmeshed with no boundaries—pathologically enmeshed—as my friends and family would tell you. It's hard to leave an identity, a steady home. In fact, for nearly three decades, whenever I would write my name and address with a sharpie on my duffle bag, notebooks, camera bags, or anything else I didn't want to lose, I would always put the Utah Avalanche Center address because although my home address changed a half dozen times, my work address only changed once, when many years ago, the National Weather Service moved just a few blocks down the street from its original location.

Looking back on it, though, I'm especially proud of what our team has accomplished over nearly three decades so indulge me in some bragging. In 1980 when I first visited my mentor, Duain Bowles, who started the Utah Avalanche Center, it was a small operation, forecasting just for the Wasatch Range and the forecasts were usually just a couple of dry-sounding paragraphs recorded on a single-line telephone answer machine. It was slightly better six years later when I landed my dream job as the UAC Director. I remember my first meeting with all the ski area avalanche directors, I said, "There's no sense in putting out forecasts or teaching avalanche classes if nobody remembers what you say. After all, we're in the entertainment business." Everyone had a good laugh, but I was dead serious.

Although I got a Master's in geology, I took a lot of writing courses. So first, I followed my training and changed the writing style in the forecasts from passive voice to active voice, I told personal stories, used humor and lots of analogies and metaphors—I made them fun. Likewise, having learned from Jill Fredston and Doug Fesler, my mentors at my previous job, at the Alaska Avalanche Center, our avalanche classes suddenly changed from dry, scientific lectures on overhead projectors into exciting, multimedia presentations with cardboard models of avalanches, tilt-boards where we built avalanches out of sugar and flour, and there was always audience participation along with personal avalanche tales from the audience. In other words, I simply applied best-practice communication principles to the forecast and to avalanche education. The call numbers and class attendance skyrocketed—and continues to grow.

Today, we forecast statewide, have a staff of seven (soon to be eight) full time forecasters, several part time staff and 30-40 paid observers throughout the state. Our entertaining, very graphical forecasts have been emulated by most avalanche centers throughout the world, as have our education programs. The forecasts go out over the Internet and all the social media channels to a very wide audience and we use social media with gusto for two-way communication—both broadcasting critical information and crowd sourcing avalanche observations and activity from the

backcountry. And most exciting, under the amazing direction of the Executive Director, Paul Diegel, the nonprofit side of the Utah Avalanche Center now funds two thirds of the operation with private fundraising and grants. The UAC is a Forest Service – nonprofit partnership and the nonprofit side runs the website, teaches most of the classes, runs the Know Before You Go program, produces all the videos and conducts many avalanche education and fundraising events.

As for media coverage, we're regularly featured on both the local and national the news channels. We've been featured by a couple dozen national and international documentaries about avalanches including major productions by National Geographic, NOVA, Discovery Channel, PBS, History Channel and the Weather Channel. We have produced two avalanche awareness videos used as the standard introduction to most avalanche awareness class throughout North America and we're busy putting the finishing touches on an update of our famous Know Before You Go video in partnership with the avalanche centers in Canada and Colorado (a \$60 K project). Everyone wants to be part of it; the video features interviews from 15 of the most famous outdoor athletes in North America including Mikaela Shiffrin, Jimmy Chin, Travis Rice, Jeremy Jones and Chris Davenport.

Whew! I gotta brag when I get the chance. But no, it definitely wasn't just me. Our very talented, energetic staff of thoroughbreds continues to push the boundaries. As a supervisor, most of the time I was in the enviable position of saying "whoa" instead of "giddy up." My philosophy has always been to hire the best and let them run. Like modern tech companies we operate by the motto: "The key to success is to fail often and fail fast." And yes, I've had my share of spectacular failures through the years but almost all success comes from many failures. Or at least that's the story I prefer to tell.

And for me, the gig is not quite over. My friends have gotten tired of my constant refrain these past few years; "I'm looking forward to retirement so I can get back to doing avalanche work again." I have a number of projects planned besides skiing a lot more with my recently retired wife, Susi. Besides finishing the KBYG video and PowerPoint for North American distribution, my publisher wants me to start work on the 3rd Edition of one of my first avalanche books, *Staying Alive in Avalanche Terrain*, plus some other book ideas. In addition, we hope to get some funding to work on a series of avalanche tutorial videos so I'm on retainer, part time, for the nonprofit side of the UAC. My long-suffering wife insists that I work no more than PART time and not work for free. She knows all too well about my workaholic tendencies, especially when it comes to avalanches. I would also like to revive my dormant photography business—part time, I promise, Susi. And most important, Susi and I have a long bucket list of outdoor adventures we would like to enjoy while we still can, both in North America and throughout the world. We're excited to get started.



Bruce and Susi in 2008.
Photo courtesy Bruce Tremper collection



A photo of Bruce Tremper at Big Daddy, a backcountry ski area favorite of Bruce's – somewhere near Kamas, UT. It isn't shown anywhere on a map or trail listing, so maybe it's a secret name that Bruce and Brad Barber came up with? To get in and ski the public land, you have to skulk through a privately owned dude ranch, cross a creek, and hope there are no firearms pointed in your direction!
Photo Kate Kopischke

Thanks so much, everyone, for putting up with me all these years. And most important, thanks so much for all your emotional and financial support to build the Utah Avalanche Center into what it is today. I feel like the luckiest person in the world to be part of this amazing outdoor and avalanche community we all have built, not just in Salt Lake, but around the country. It's been a fabulous journey—an incredible privilege. Most of all, I hope to talk to you all next time in the mountains instead of on the phone or in meetings. ▲



OUR OWN BRUCE TREMPER

BY KARL BIRKELAND

Our own Bruce Tremper is retiring from the Forest Service at the end of August. Though he may tell you that he spent a bit too much time inside, he also typically found some time to enjoy the legendary Wasatch snow. I've included a photo of him on one of those days last winter.

Bruce has been the Director of the Utah Avalanche Center for the past 29 years, and his influence has been felt throughout the avalanche industry both in the US and internationally. His avalanche career began in Montana, where he earned his MS degree at Montana State University working with Dr. John Montagne. He quickly took his work into the practical realm, doing avalanche control work at both Bridger Bowl and Big Sky. He also worked as an avalanche forecaster at the Alaska Avalanche Center with Doug Fesler, Jill Fredston, and Jim Woodmency. Bruce became the UAC Director in 1986, and continually strived to improve the products produced by the center for the public as our industry evolved from providing phone recorded avalanche advisories to a wide array of internet-based products. He and the UAC were innovators throughout this process, introducing icons and avalanche problems to their advisories.

Besides running the UAC, Bruce has always had a lot of other things on his plate. He served as the editor for

The Avalanche Review for six years and has published numerous

papers, produced a number of avalanche safety videos, and written two great books on avalanches. He was in charge of backcountry avalanche safety during Salt Lake's 2002 Olympics, and has presented our agency in the most positive light with hundreds of media interviews. He has taught at the National Avalanche School for decades, and he was a member of the working group that developed the conceptual model of avalanche danger and associated avalanche danger scale in 2010.

Luckily for us, Bruce plans to continue teaching, writing, and working on avalanche safety projects, so we are hoping he won't be too much of a stranger. However, I suspect the folks in the Wasatch and elsewhere will see Bruce and his wife Susi out skiing in the backcountry even more than before. Just so you know, you are going to have to stay in good shape if you want to try to keep up with them. Please join me in congratulating Bruce on his retirement from our agency, and wishing him the best in his future work and play! ▲



TREMPER'S TOP 10

10 THINGS I'VE LEARNED IN 38 YEARS AS AN AVALANCHE PROFESSIONAL

1. Most everyone overestimates their avalanche skills—beginners vastly overestimate them.
2. The world is far more random than most of us would like to believe.
3. Most of what we believe is not true.
4. Snow is just like people—it does not like rapid change.
5. Avalanches follow a “power law” (exponential increase in size with decreasing frequency). This means that no matter how big or how far you've seen it run before, it can always run bigger or farther.
6. Never underestimate the importance of reading terrain, which is mostly about steepness and consequences.
7. The snowpack is fickle, the weather is even more so, humans are the most fickle of all, so when snowpack, weather or human are the question, TERRAIN is always the answer.
8. The best sign of avalanches are avalanches.
9. People are hard wired for pattern recognition and social interaction. We are idiots at probability and logic. Thus, humans are easily led astray.
10. The SYSTEM is the solution.

BRUCE AND HIS EDITOR, DUAIN BOWLES

BY TOM KIMBROUGH

Now don't get me wrong, I love Bruce. He was certainly the best boss I ever had ever and I have had some good ones. He also ranks very high on my list of mentors, perhaps at the top of that list. I could sing his praises for the duration of this piece but instead, in the spirit of a roast, I will tell of one of Bruce's little slip-ups. I know this will embarrass him but it's probably good to be embarrassed occasionally.

So we will drop way back in time to Bruce's early days at the UAC. So far back that the information from data loggers for weather instrumentation was just starting to be automatically sent to the Salt Lake Weather Service. Some of the various snow safety folks around the Wasatch (myself included) were not all that computer savvy. Back then many of us in the business had our degrees in Advanced Rock Climbing from the University of Yosemite or maybe Gate Running or Powder Skiing from a similar institution.

Bruce, on the other hand, had a real Masters Degree from a real University.

Knowing way more about how these new gadgets worked than anybody else at the UAC, it fell to Bruce to get all the kinks of the new programs worked out. Given the level of computer illiteracy of some of us, it wasn't going to be an easy job.

So Bruce wrote a letter describing in careful detail just how to set up the data loggers and how the information would be sent to the Weather Service. I think it was a good technical letter telling folks just what they needed to know. But there was a problem. He meant it as a joke, but it wasn't all that funny. He titled the letter, **"From the Smart Guy to the Dumb Guys."**

He was right. Lots of us were Dumb Guys, especially where computers were concerned. But there were some that didn't fit in the Dumb Guy category. Chief among those was Duain Bowles who was forecasting for UDOT. Duain had all sorts of real degrees. He knew everything there

was to know about computers and data loggers. Alta's Onno Wieringa called Duain the smartest person he had ever met.

One morning I came into the office for my forecasting shift and there on the desk was Bruce's letter. Duain had gone over it with a red pen, marking every misspelled word and punctuation error of which there were more than a few. He had sent it back to Bruce titled, **"To the Smart Guy from the Dumb Guy."** ▲



Bruce sent this photo of him and wife Susi from 1993, saying "don't we look young?"
Photo courtesy Bruce Tremper collection

TRYING TO TELL SKIERS TO STAY OFF *STEEP SLOPES* IS LIKE TELLING GOLFERS TO STAY OFF **FLAT GREENS.**

—Bruce Tremper quote remembered by Dale Atkins

CHANGES IN OUR INDUSTRY: THANKS TO BRUCE

BY PAUL DIEGEL

Bruce Tremper retired as Director of the Forest Service Utah Avalanche Center on August 31 after 29 years in that position. Mark Staples has stepped into the Director role, continuing the tradition of looking to Bozeman for directors.

When Bruce came to Utah, the advisory phone line got about 50,000 calls per day, skis were 55 mm wide and 210 cm long, boots were made from cows, bindings were made from bent wire, snowmobiles had more power than lawnmowers but not by much, and the words "internet" and "splitboard" did not appear in the paper dictionary. The annual budget for avalanche forecasting in Utah was about \$50,000 and meeting someone unfamiliar in the Wasatch backcountry was unusual and a bit disturbing.

Bruce's DNA is spread all over avalanche forecasting and awareness products that we take for granted today. Forecasts went from NOAA radio-like spewing of facts in all caps to being entertaining, engaging, and educational. End-of-season analytics, user surveys, and focus groups were used to refine messaging and channels of communication. Danger ratings were refined. Graphical representations of avalanche concerns and danger ratings replaced jargon-filled text. Avalanche messaging went to the interwebs, email, and social media. Smartphones replaced radios, inclinometers, calculators, cameras, and more. Local media came to rely on briefings and interviews with pros, replacing stories about mountains falling down due to loud noises. Field observations from an educated public became a significant source of forecast data. Near real-time photos and videos became a heavily used source of backcountry beta. Human factors became a legitimate part of avalanche education. Marketing became a term used in avalanche

conversations. Non-profit Friends groups became major contributors in the avalanche world. These are all part of forecasting best practices that Bruce had a role in developing.

Bruce plans to continue contributing to the avalanche world working part time for the non-profit Utah Avalanche Center, beginning with working pretty much every single day in September on the new Know Before You Go revision. He dreams of skiing for fun and never again working on a spreadsheet on a powder day. ▲



Bruce Tremper checks out a fresh slide in West Monitor with a lot of hang fire around.
Photo Mark White



Introducing the Halo 28 JetForce

Black Diamond®

BlackDiamondEquipment.com



Photographer: Adam Clark

IN MEMORIAM: GJ STONE

BY JAKE HUTCHINSON

Canyons Ski Patrol Snow Safety Manager Gary Jay “GJ” Stone Jr. passed out of this world on October 20, 2015, to find sick singletrack and endless powder on the other side.

GJ grew up in Troy NH, and at an early age he had a passion for snow and the outdoors. Winter weekends were spent skiing with his best friend, his dad, who used to “drag him up the t-bar in a headlock,” at least for the first ride or two. By 18 he was an accomplished Olympic-hopeful mogul skier, before moving to Utah at 19 in search of the mythical and legendary Utah powder.

GJ worked on the Canyons Professional Ski Patrol for 18 years and filled many roles during that time; lead patroller, training supervisor, Wasatch Backcountry Rescue Level ‘A’ dog handler, snow safety specialist, patrol manager/assistant patrol director, patrol director/senior patrol manager. He was also the on-hill patrol union rep for many years and proudly represented the patrol in more than a few contract negotiations. He was looking forward to tackling his newly role as head of the snow safety department at Canyons Resort after stepping down as patrol director role, a position he held since 2011.

In 2000 GJ married the love of his life, Teresa Sanders, in classic silent but effective GJ style, they had a drive-thru wedding in Vegas, not telling any friends or family until they returned. GJ was a devoted husband and proud father of two great kids, Oliver and Evelyn.

For me, GJ was a friend, coworker and adversary, he was always my reality check dressed in devil’s clothes, looking at things from a different angle than I and never hesitant to put me in check. We spent many great days in the hills skiing all the varieties and qualities of snow that patrol life has to offer. In the summers we spent many years on multi-day bike trips, where once again he went from the quiet rookie in the corner to the guy who organized the permits, logistics, and mayhem of his own trips. GJ was the silent leader, leading from the front by his actions, but always there to pick up those who needed it and provide coaching and encouragement.

GJ’s passion for skiing, biking, and the outdoors will live on through the legacy he left behind. His friendship, sense of humor, and extraordinarily brutal sarcasm will be greatly missed.

Unknown to many who worked with him for many years, GJ was a Type 1 diabetic and was passionate that a cure could be found one day; a donation in his name at diabetes.org/donate would be an appropriate way to celebrate his life and his legacy.

For a little guy, he leaves a giant hole in so many lives and our industry and community.▲



GJ and his dog Voodoo.
Photo Lauren Edwards

A fund has also been set up to assist Teresa and the kids with future expenses:

<https://www.gofundme.com/5u6s5jmc>

Jake was a long-time ski patroller at the Canyons; he is now lead instructor for AAI in Utah and Certified Instructor Representative to the AAA Governing Board. Like many of GJ’s friends, he was stunned and surprised by his sudden loss.

Fast enough for a pro.



AMGA "Outstanding Guide of the Year" Joey Thompson, Colorado Mountain School.

There's a reason the majority of North American patrollers and guides use Tracker: it's **fast**.

For the rest of us, there's an even better reason: it's **easy**.

Pro and fleet pricing (800) 670-8735.

TRACKER3™

Tracker's legendary speed and ease-of-use, now in a smaller package.

Intuitive enough for the rest of us.



The most trusted name in backcountry safety.™

www.backcountryaccess.com



KNOW BEFORE YOU GO: THE LATEST VERSION

BY PAUL DIEGEL

A **new avalanche** education program is available to the North American avalanche community. The Utah Avalanche Center, Colorado Avalanche Information Center, National Avalanche Center, Avalanche Canada, Sherpas Cinema, BrainFarm, Redbull Media, BCA, AAA, and AIARE have teamed up this summer to revise the Know Before You Go introductory avalanche awareness program content.

The KBYG program introduces avalanche awareness to new and prospective backcountry users and is the first exposure to avalanche issues for many people. Short on science and long on stoke and peer pressure, KBYG uses pro athletes, state-of-the-art marketing and messaging, and high energy professional video to convey why avalanches are a big deal and create a path to more advanced avalanche education. This program is aimed at backcountry and sidecountry skiers and snowboarders, snowmobilers, hikers and mountain bikers on snow – anyone new to the backcountry. The intent is to make them aware of the hazards they face and how they can mitigate those with education and adherence to some basic risk-reduction steps.

The KBYG program was originally developed by the Utah Avalanche Center in 2004 to save lives by building basic avalanche awareness among inexperienced and potential backcountry users. KBYG is intended for a youth audience and the presentation, consisting of an introductory video, slide presentation, and Q&A session, is designed for a 50 minute school period. The program is approved for middle school elective PE credit in Utah. KBYG has been popular with adult audiences as well, appealing to the 8th grader in all of us. While originally intended for presentation in middle and high schools, the program is popular at snowsports shops and clubs, community centers, scout groups, and more. Since inception, nearly 200,000 Utahans have seen the presentation, along with many more around North America. For many backcountry users and potential users, a KBYG presentation is their first exposure to avalanche education.

The new content features video and images from around the world and was developed by a team from across North America to create a standard program for any English-speaking region and can be viewed by anyone. The video and slide deck content are available by download or on a DVD to any avalanche educator wishing to present the program. To learn more about the program, including links to view the content, instructions to get the content for local use, a packet of best practices for funding and administering the program at a local level, and more, visit www.KBYG.org.

Avalanche Hazard Consulting

Avalanche Hazard Mapping for Industry, Residential and Government

Avalanche Forecasting and Safety Training for Mining Facilities

Winter Operations Plans for Mines, Avalanche Dynamics Modeling
Submittal Assistance for Planning Boards and Local Governments

TRAUTNER GEOTECH LLC

Contact: J. Andrew Gleason 970-259-5095
agleason@trautnergeotech.com
www.trautnergeotech.com



**SAWTOOTH
NATIONAL FOREST
AVALANCHE CENTER**

Editor's Note: apologies to the Sawtooth National Forest Avalanche Center for inadvertently omitting their season summary in the October 2015 TAR.

Weird weather makes weird avalanches...or does it? South-central Idaho experienced above average snowfall with unseasonably warm temperatures through December, producing a more coastal early season snowpack than typically observed in this area. A couple of robust storms in December necessitated issuing Avalanche Warnings, but stability quickly improved following the storm events as faceted layers were almost non-existent. High pressure dominated January and February's weather, producing many record high temperatures and a tremendous extended corn cycles. Winter attempted to reappear in the spring, but temperatures remained mild and the small to medium-sized storms did not appreciably stress existing layers in the snowpack. A couple of rain events extending to 11,000' elevation created widespread wet loose cycles on shady aspects, but the "winter" basically went out with a whimper.

We had no fatalities within the advisory area. A few snowmobilers triggered small persistent slabs in December, but human involvements were well below historical averages. We listed 'Persistent Slab' as an Avalanche Problem fewer than 10 times this season – a typical season would see over 40 'Persistent Slab' advisories.

The SAC had one returning forecaster last year on a staff of three, so the early start to winter stressed the operation. In October and November, we literally wore our construction hats as we built a new office space for the center. Little did the new forecasters know they would become semi-skilled sheetrockers, drywall tapers and mudders, I/T wiring installers, painters, and finish carpenters – this wasn't in the job description! Once the



SAWTOOTH NATIONAL FOREST: A regular SAC public observer sent us this photo of a little natural avalanche that failed on small, near-surface faceted crystals in December 2014 in the headwaters of the Salmon River drainage. This was the only avalanche confirmed to involve faceted crystals in the area during that storm cycle. Interestingly, the staunchwall formed on an old snowmobile track that likely affected the weak layer. Makes you wonder if this slope would have avalanched if there was a second previous snowmobile track going across the slope a little ways below where the crown formed? Or how many tracks it would have taken to prevent this avalanche?

Photo Jeremy Lato

new forecasters became acclimated to the operation and the office construction was completed, we were able to devote time to a few key projects:

We worked with Scott Havens of Snowbound Solutions to create a Google Map based product to access remote weather station and webcam information (<http://www.sawtoothavalanche.com/StationMap.php>). This flexible product allows users to look at regional conditions or focus on specific weather station data via tables and charts created with/by Scott the previous year. The National Avalanche Center is currently working to make this product available to interested operations at a minimal cost (see article on page 26 of TAR 34.1).

We hosted what to our knowledge was Idaho's first motorized-specific Level 1 Avalanche Course using the AAA's Snowmobile Avalanche Education guidelines. Scott Schmidt, formerly of the Gallatin NF Avalanche Center, instructed the

course with SAC forecasters.

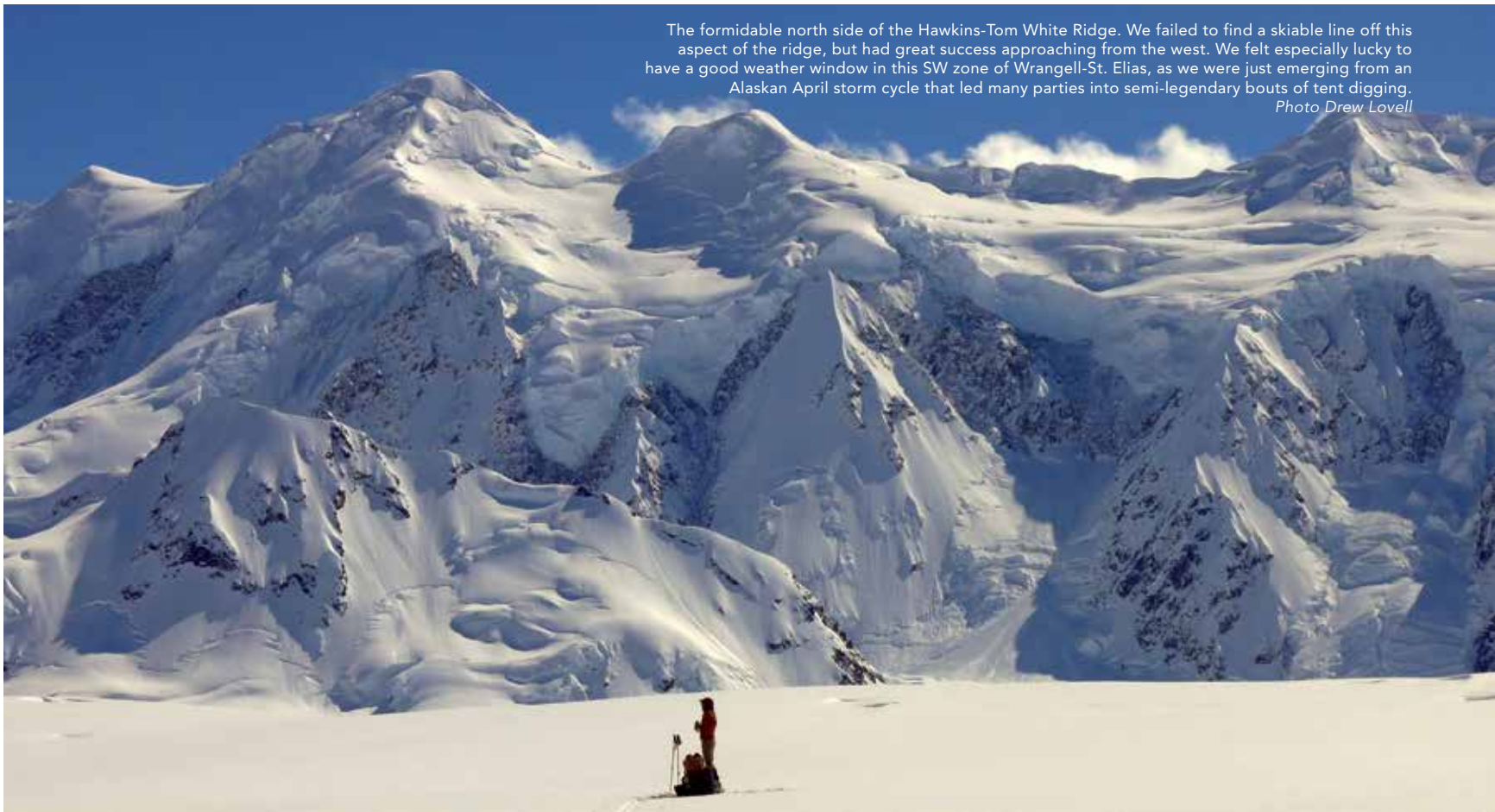
We continued working to site and procure equipment for three new weather stations being installed in 2015. A combination of state and federal grants and Friends' dollars are making this collaborative effort between the SAC, H.P. Marshall at Boise State University, local landowners, and other USFS staff move forward. The project also involves robust electrical grounding and surge protection/fusing to operate the SAC's new and existing weather stations year-round.

To cap off the year, the SAC won the Sawtooth National Forest's Group and Individual Safety Awards in May. We're planning to complete the weather station project in September 2015 and are keeping our fingers crossed that last winter's missing snows don't come early this fall...

—Scott Savage,

Director, Sawtooth National Forest Avalanche Center

The formidable north side of the Hawkins-Tom White Ridge. We failed to find a skiable line off this aspect of the ridge, but had great success approaching from the west. We felt especially lucky to have a good weather window in this SW zone of Wrangell-St. Elias, as we were just emerging from an Alaskan April storm cycle that led many parties into semi-legendary bouts of tent digging.
Photo Drew Lovell



THE 2015 GNFAC PRO DEVELOPMENT WORKSHOP: WHAT I WOULD TELL MYSELF AS A 25-YEAR-OLD ROOKIE

BY ALEX MARIENTHAL, FORECASTER, GALLATIN NATIONAL FOREST AVALANCHE CENTER

You can view the presentations, as well as previous GNFAC workshops at:
www.mtavalanche.com/education/watchlectures

Editor's Note: You can find in-depth versions of many of these stories in this issue of TAR.

Don Bachman – page 17

Liam Fitzgerald – page 22

Rod Newcomb – page 20

Bill Williamson – page 14

Thanks to Mark Staples for sharing his notes from the workshop, which helped me create a more thorough review. Also, thanks to the American Avalanche Association for providing a grant to support the professional development workshop.

Reference

McCammon, I., 2002. Evidence of heuristic traps in recreational avalanche accidents. *Proceedings of the 2002 International Snow Science Workshop, Penticton, BC, p. 244-251.*

There is a start and finish to every outing in the mountains. Each journey is filled with decisions and consequences that help determine the quality of the experience as well as the ultimate outcome of who returns home. Beginning with our decision to travel in avalanche terrain, those decisions and their consequences ultimately determine whether we come home or not.

There were 'only' 11 avalanche fatalities in the United States last season, and many more in other countries. I feel like every fatality was not more than two degrees of separation away. Maybe social media amplifies this feeling, but I personally know many who have lost a close ski partner, best friend, or were at the scene of an avalanche fatality.

Last season I lost a close friend to the mountains, worked up to 60 hrs/week on ski patrol and teaching avalanche classes, attended and presented at many conferences, and completed my Master's degree in snow science. I often asked myself, **"How do we make it to 40 years of experience in this industry/hobby/lifestyle/passion/etc. when so many of those lost and remembered were experienced alpinists and skiers?"**

The Gallatin National Forest Avalanche Center's annual professional development workshop last April offered some insights into the above question by asking professionals with 40+ years of experience in the industry, *"What would you tell yourself as a 25-year-old rookie?"* I was a 25-year old rookie just two years ago, so this was a very welcome topic. My notes from the workshop echo many basic decision-making principles that I recognize from training and literature. The speakers also provided wisdom that was completely new to me.

The speakers told stories of their careers as ski patrollers, avalanche instructors, forecasters, program managers, consultants, and skiers. All presenters provided great insight from vast experience. You can learn more about each of them by reading their work in issues of *The Avalanche Review* and various other publications.

Don Bachman talked about his experience with search and rescue where he witnessed the consequences to those who went beyond a manageable level of risk. He said a long, full life has to be balanced with some level of risk. This level is different for everybody, and our capabilities should be greater than our risk tolerance. He also suggested to ski spring corn.

Liam Fitzgerald stated that depth hoar is likely to fool you (e.g., deep slabs, persistent layers). He said that it is important to recognize our mistakes. Appreciating accomplishments leads to complacency, appreciating mistakes leads to avoiding them. He also said indecision is the key



Introducing: **AVACASTER** avalauncher system

Featuring

- Compatible with all CIL Snowlaunchers and Delta Lancers
- Electric remote switch capability
- Ammunition sits in the barrel ahead of heavy breach metals
- Inert rounds of all styles for target registry
- Removable end caps on the pressure vessels enables proper clean out
- Custom trailers, approved blast shields, shooting towers available
- On-site set up of every device by a trained CIL technician
- Annual servicing contracts available



(250) 744-8765 • davidsly@mapleleafpowder.com

to flexibility. When analyzing the data focus on the relevant (e.g., wind, precipitation intensity, avalanche activity), not other influences (e.g., heuristic traps, F.A.C.E.T.S.).

Rod Newcomb encouraged us to be curious. Provoke an avalanche in avalanche courses (safely). Avalanche control with explosives is the best hypothesis testing. We can't do that in courses, so investigate avalanche crowns and ask, "Why is it there?" This is the essence of good route finding.

Dale Atkins suggested that we don't ask, "Can we do this?" but instead, "What conditions do we need to do this safely?" In other words, don't adjust our acceptable risk to the present conditions, but act when the conditions accommodate our acceptable risk.

Dave Hamre talked about how "wild cards" (unexpected or unforeseen events) happen every season. During his time at Alta, he experienced how avalanches can fracture long distances. Dave's lessons ranged from dealing with fluctuating freezing levels and bands of instability to developing new avalanche programs.

Bill Williamson had some advice for 25-year-old Bill that included: be lucky, learn from mistakes, avoid hubris, be professional, be a good listener, pick good mentors, be a team player, and have fun.

Enduring this career/lifestyle/hobby/passion comes down to living the journey. Our decisions and consequences during a tour in the mountains are often linked to decisions and events at work or home. We gradually transition from desk or dinner table to speaking of a desired summit with a ski partner, to descending from that summit two days later. What happens in between our day at the office and our next day in the mountains may play a large role in the decisions we make during our tour up and down the mountain and whether or not we return home for dinner. The days and minutes of planning before a tour, as well as our long-term plans, goals, and decisions over the weeks of each season, affect our decision making at any moment.

One question to ask is, "Are we making this decision based on objective facts and what we have witnessed in education or experience, or is our decision based on our ambition to get to the top, or the money and time spent on this trip, or to be the most rad, etc.?" The latter refer to heuristic traps. Heuristic traps have been regarded as subjective biases to our decision-making, and are the subconscious perpetrators when obvious hazards get overlooked (e.g., McCammon, 2002).

The most common heuristic traps are referred to as F.A.C.E.T.S. (familiarity, acceptance, commitment, expertise, tracks, and scarcity). FACETS are always there, persistent. However, we don't need to see these heuristic traps as a checklist. As in, if they are there, then we add points towards instability (e.g., lemons). We need to think about if they are distracting us from identifying a hazard, or leading us to falsely justify the absence of hazard or instability. And then we should focus on the relevant information, such as precipitation, wind, and avalanches.

All of the presenters, with a combined 240 years of experience, mentioned luck. We all look at the same basic data and principles based on our training (level 1,2,3 etc.), and those that accompany their training with 30-40 years of experience in the field have typically used the data and observations more effectively and objectively. And they've all been lucky. ▲

Give the gift of avalanche safety, education, and research this holiday season!



- HATS
- BUFFS
- STAINLESS STEEL PINTS
- T-SHIRTS
- TAR SUBSCRIPTIONS



AMERICAN
AVALANCHE
ASSOCIATION

AmericanAvalancheAssociation.org/Store

www.tas.fr

tns
Natural Hazards Control Solutions
By MND Group

Project Consultation, Design, Installation, & Maintenance Support



jay.bristow@mnd-group.com | brandon.dodge@mnd-group.com | 970-328-5330

History Lessons

Editor's Note: In the last issue of TAR (34.1) we reprinted Larry Heywood's article about the 1992 Alpine Meadows avalanche, which originally appeared in TAR10.5. Alongside it we printed an update by Greg Gagne about where Anna Conrad is today. The following two articles continue in this theme, discussing lessons learned from Alpine Meadows.

LIFE LESSONS

BE LUCKY

MISTAKES—LEARN FROM THEM

BE PROFESSIONAL (HEAD IN THE GAME)

AVOID HAVING HUBRIS

BE A GOOD LISTENER (RESPECT EXPERIENCE)

PICK GOOD MENTORS

BE A GOOD TEAM MEMBER

HAVE FUN

LESSONS FOR MY YOUNGER SELF

BY BILL WILLIAMSON

Last spring I was honored and flattered when asked to present at a couple of Professional Development Workshops, sponsored by two different forecast centers. When putting my presentation together I thought the last thing anyone might want to hear is someone talking about themselves, or telling old “war stories.” Unfortunately for you that is exactly what I did; here are a couple of intertwined stories from earlier years in my career. At the end there are a couple of requested lists of Life Lessons, and what you might tell your younger self if given the chance.

March 31, 1982, ago my life and many others' lives changed forever. A slide path that had been shot w/ artillery that morning “Poma Rocks,” approximately 800 vertical feet pulled out about 5' deep on the interface of the melt freeze spring pack and new snow, took the entire slope's worth of new snow and came across the base area of Alpine Meadows, destroying the building that covered the bull wheel for the main Summit lift. It also threw snow across the deck of the main lodge and through its doors, while adjacent paths off the Buttress and Pond slopes covered large portions of the parking lots.

It was nine years earlier that I left Hawaii for the mainland, I had lived there throughout my teens and with the exception of when I was attending College in Southern CA, I spent most of my life on the beaches of the North Shore of Oahu. When I arrived in CA my cousin took me skiing a couple times, and the following fall, after not being able to take some courses at a local school, I decided to learn how to ski and get a job at a ski area.

At Alpine the Summit lift building also held the locker rooms and offices for several departments including Ski School, Lift Operations, and Ski Patrol. The air blast and snow along with 200+ year old trees totally demolished the building. There were seven employees in it including my boss the Mountain Manager Bernie Kingery, when the slide hit, there were other employees around the area, but the majority of the patrollers had gone out to do control on Alpine's access road. There were also non-employees in the parking lots. When it was all said and done 11 people were involved with the slide; three of the ones in the Summit terminal building were thrown from the building and were either totally or partially buried, but were quickly recovered with little to no injuries, leaving 8 unaccounted for.

My first job at the ski area was in the hotel, I quickly moved to the maintenance department where my job was driving a snow cat. After a few weeks I got a roommate who was a ski patroller, he changed my life forever.

On the 31st I was on top of the mountain when the slide occurred, I had been there from early on during this storm, 2 ½ days. We were there, as was done for most large storms, to get out and do control so vehicles could access the top and make sure the lift was clear to run. Shortly after the slide occurred we received some frantic calls from the base area then all communication through phones shut down. When we finally put together what may have happened I had a concern that several patrollers had been trapped in the building from the avalanche. These were not only co-workers but also best friends and mentors. Fortunately, the majority of the patrollers were on the road when it occurred, we contacted them to return, which they did and started the search.

I've always thought I've been lucky and I certainly was in my early days working at ski areas, lucky with the people I met, lucky with “some” of the decisions I made, definitely lucky with the outcome of the decisions, lucky with jobs I took, and lucky with the teachers I had. My roommate turned into a good friend, a good teacher, and then a good mentor.

Another teacher turned mentor that I met back then lived down the road (Donner Pass Road), who was with Monty at Squaw in the original “Avalanche Hunters” days and was a great sounding board for many years, in all aspects of avalanche work .

After a couple years of learning how to ski and a couple years patrolling at the smaller area Sugar Bowl, I got a job at Alpine Meadows, home of the most recorded avalanches annually in the US back then. There I met another friend, teacher, turned mentor. I was very lucky to meet Doug Richmond, Norm Wilson, and Tom Kimbrough.



Anna is extracted from the wreckage of the locker room.
Photo Bill Williamson collection

TOP 10 TO TELL YOUNG BILL

Rescue crews left late that night due to exhaustion and building avalanche hazard. The next morning, ironically bluebird, I walked out to the end of the Point, and it appeared that every slide path that could be seen had slid, and the debris across the base area was huge. The large avalanche rescue cache that was stored in the Summit bottom terminal building was strewn across the entire base area along with walls, lockers, clothes, and anything else that might be in an office or locker room. Fortunately, we had an additional 100 probes stored at the top of the lift and by mid-morning a helicopter showed up so we loaded the probes, flew down and joined the rescue efforts. Three bodies had already been found in the parking lot, including a little girl and her father. Another victim, a friend and trail crew member was found not far from his snowmobile, and we started digging through the building looking for other victims. By the end of the day we found two more bodies; one in the doorway to the lift office and the other under one of the large walls. This told us that at least one (it turned out to be two) had been blown out the window by the air blast before the walls were knocked over.

My first years patrolling I tried to be a sponge; learning what I could from my mentors, from senior patroller's experiences, from classes, and books, lots of books. Learned from my experiences; my first full year of patrolling my partner and I were caught in four slides (can you say rookie moves)? Most memorable: both of us standing in a bomb hole, shot goes off and we're both going down on a 2 ½ foot hard slab. I grab Jim's collar and hike up on top of the slab to the top of it and fall off at the staunchwall. Lots of hairy times back then like with most inexperienced avy workers, I was lucky that there weren't any fatal mistakes that I made or my comrades made. But that changed.

I don't have a creepier memory in my life than April 1st in '82 when I was alone in the first aid room that was attached to the main lodge, no power and snow had avalanched into the doors, I was arranging the frozen bodies that were stored in there, making room for a couple more. Shortly after that we left the rescue efforts and site due to escalating hazard from the storm that had settled back in. We wouldn't return for a couple days, after heli bombing the shit out of the place. It would be five days after the slide and we were still missing two people; a lift operator named Anna Conrad and our Mountain Manager Bernie.

Between winters at Sugarbowl and Alpine I spent the summer in New Zealand working at a place called Porter Heights, filling me with lots of experiences and again introducing me to several great people. I actually met LaChapelle there for the first time when I was one of about 20 people who attended the first NZ National Avalanche Workshop. It was weird that over the next ten years that many of us would be affected catastrophically by avalanche incidents. There was me and the 82 slide, my roommate Tom Snyder down there who would be killed while leading a control route in Highlands Bowl in 84, Jos Lang, a fellow patroller, was involved in a slide in Canada while guiding for CMH in '91, she survived but nine guests didn't. Then Dave McNulty who ran our small patrol at Porters also passed in 87 in an avalanche while heli guiding down in New Zealand. My days of not seeing people pay the ultimate price for not making the right decision were way behind me.

At Alpine when we returned to the site I think it was on Sunday, most of us had attended Jake's (the trail crew member) funeral service the day before, we had body recovery in mind. The "process" of the rescue was unlike anything we had ever trained for, the basic probe line method was problematic and dogs (one of whom had been buried in the building for the first day and night) had problems because of all of the debris. Probe, then a snowcat comes in, then you use a chainsaw to cut a wall into manageable pieces, then you probe again. It took hours and seemed even longer.

I'm not sure if it was Lanny or Bernard who saw it first, but under a pile of lockers and snow they saw a hand move, it was Anna and she had lived five days eating snow. As we extricated her and got her into the helicopter all 100+ rescuers stopped and when it got airborne they let out a great cheer, a true miracle during what had been five tormenting days. (see related story about Anna Conrad on page 20 of TAR 34.1) I remember Kimbrough yelling "now let's find Bernie." And we did, it took a couple more hours and he was in much worse shape. He was in a tree well that was over 75 feet from the building, and he had obviously struck the tree at a high rate of speed. The search was over.

We became pretty gun shy at Alpine after spring of '82, we used more explosives, performed rescue practices frequently, and had an incredible comradery amongst the patrollers. For me I was trying to learn as much as possible, attending classes, ISSWs, and local workshops. Litigation continued on for years over the slide, dividing avalanche experts. I got to meet some very knowledgeable people during that time: Chris Stetham, spent some time with Liam, lots of time with Norm Wilson, and most notably André Roch, who won the jury over and whose testimony probably was a key reason that we prevailed in the litigation.

This is an experience that I remember back on frequently and a defining moment in decisions I would make for the rest of my career. I left Alpine 13 years later to work as a patrol director in Washington. That's where I sold out to big time management and became an Ops. Director and that's what I continue to do today. ▲

1. TAKE LOTS OF PHOTOS, BECAUSE SOME DAY SOMEONE MIGHT ASK YOU TO DO A PRESENTATION ABOUT YOUR LAST 40 YEARS.
2. DON'T WASTE TIME TRYING TO FIGURE OUT WHAT YOU'RE GOING TO DO WHEN YOU GROW UP—YOU DON'T.
3. SNOW SCIENCE-WISE I WOULD PROBABLY MENTION "BE MORE AWARE OF THOSE SURFACE HOAR LAYERS," "PAY MORE ATTENTION TO THE SWEET SPOTS, SPATIAL VARIABILITY" AND SHOW HIM THE SHOVEL SHEAR TEST.
4. HAVE FUN, AND TAKE ADVANTAGE OF THE LOOSE RULES EVERYWHERE, BECAUSE IT WON'T BE ALLOWED DOWN THE ROAD.
5. APPRECIATE EVERY DAY.
6. YOU MIGHT NEED TO "MOVE TO MOVE."—ROGER MCCARTHY
7. REMEMBER: THE #1 QUALITY FOR A GOOD WINTER EMPLOYEE IS TO HAVE A GOOD SUMMER JOB.
8. DURING TOUGH TIMES; KEEP YOUR COOL AND SOME SENSE OF HUMOR.
9. APPRECIATE THE WEALTH OF GOOD FRIENDS AND GOOD MENTORS; HOLD THEM IN THE HIGHEST REGARD AND RESPECT.



A young Bill, whose first job was at a ski resort.
Photo Bill Williamson collection

FINDING ANNA CONRAD

BY SANDY BRYSON

Bridget whacks me across the legs with a jagged piece of wood almost as long as she is. The handsome German shepherd's determined stance, dark head, and fierce black eyes demand response: "Throw this!"

First, she had alerted—sniffing a black crevice in the jumbled snow and debris that was once the ski-lift terminal building at Alpine Meadows Ski Area. Briefly she had tried to dig into the huge frozen avalanche deposition but, unable to gain access, grabbed a piece of the pile and tossed it. Bridget's handler Roberta [Huber] Ward had seen the search dog give her typical reaction to detecting a live person and started playing retrieve with her. I had seen that alert before too, both in training and on SAR [search and rescue] missions. Now I was with the dog team for shoveling and safety. I tossed the stick a few feet across the wickedly jagged, slippery debris.

Prying icy wood, metal, and other detritus, Roberta and I tried to force our way deeper into the sharp, frozen mess. We yelled down. We listened. No answer. We radioed for more personnel with heavy rescue gear. Bridget stayed focused, insistent.

But the sky was gray and dense with more snow falling. The temperature was falling. We were on top of a big pile, and whoever was down there was buried deep inside that pile. All the search and rescue teams were at risk of re-avalanche. It was not our call. Incident Command pulled everybody out. It was Friday, April 2, 1982, and the next two days were the longest of our lives.

Anna Conrad Allen's survival in the avalanche that ravaged California's Alpine Meadows and claimed seven lives on March 31, 1982, is an amazing story of resilience and hope that reaches far beyond that disaster. Her sheer grit while trapped for five days in the darkness and cold, injured and losing consciousness shows her depth of character. The mental and physical challenges that Anna faced and surmounted in recovery—before post-traumatic stress disorder became recognized as PTSD—match those suffered by men, women and children in disasters and war worldwide to this day.

I knew that Bridget was not the first trained search dog to locate a live avalanche victim. In the 1970s, I had worked in Europe with French and Swiss police and rescue dog teams. The training techniques for K9 air scenting and tracking were well known throughout the Continent and Great Britain. Canadian R.C.M.P. dog teams had shared their knowledge and methods with U.S. teams. But, as David Cupp wrote in "I'm OK, I'm Alive!" National Geographic, September 1982, Bridget's alert signaled the first time in North America that an avalanche dog had found a person alive. Key to success was Roberta, who interpreted her dog's body language—called reading the dog—and advised rescuers.

This was a watershed operation for search dogs in the United States. Not only did the event motivate ski patrols to train avy dogs, but it raised many important questions about K9 capabilities: What can dogs scent? What do they hear? What do they see? How do their senses compare with other animals? Our relationship with search dogs drives us to ask how dogs think and communicate, both with other dogs and with other species, primarily us. Did Bridget actually scent Anna, distinguishing that scent from the myriad of other human scents in the lockers and on other objects buried along with her? Did she hear Anna? Anna said she called out when she heard human voices above her. Did Bridget put her initial detection of Anna on April 2nd together with the Anna rescuers extracted from the rubble on April 5th when she ran over and nuzzled her? Did she actually recognize her?

Decades after the Alpine avalanche, the important roles that trained dogs play in our lives, side-by-side with technology, surprise me. Dogs detect illness. Dogs have critical roles in conservation detecting fresh scat, old scat, exotic animal scat, bugs, plants. Dogs detect dead people, some long dead. Drugs, bombs, money, ... Why do dogs continue to be relevant when dogs cannot fly like drones? They cannot see through snow or walls like radar. They require food and defecate and generally complicate our lives.

Dogs see in scent and other sensory pictures more rapidly and with higher acuity than humans or our present devices. Dogs can identify multiple targets simultaneously, move under their own power, take direction, make accurate decisions, and do not use batteries.

As technology evolves, new devices will undoubtedly take over many functions dogs now perform. Meanwhile, we continue to learn from them. Keeping the records of their performance accurate and clear benefits not only their memory but also our selves. ▲

Sandy Bryson learned to think in engineering physics then escaped outside to a career in law enforcement and K9, starting in Yosemite, now at Lake Tahoe, with years of adventures in mountains and aircraft worldwide. She has written books (Search & Rescue Dog Training, Search Dog Training, Police Dog Tactics), papers ("The Role of Canines in Police Work," co-author, UC Davis), articles ("The Six Sheriffs," California Sheriff, July 2015), and designed ICS STAR: Computerized Incident Command System. After two terms as Commissioner, California Board of Parole Hearings, Bryson keeps her ideas fired up on her Mac.

TOP: Roberta & Bridget at the blown-out lift building excavation in the spring. Note: The top of the avalanche deposition was above the snow sticking to the A-beam in the foreground. Anna was buried below the level of the worker in a white shirt.

MIDDLE: Anna, Roberta & Bridget in hospital a month after her rescue.

BOTTOM: Anna & Bridget in Hope Valley, Alpine County, July 1982.
Photos Sandy Bryson



A BRIEF HISTORY OF MY AVALANCHE-RELATED INTEREST, CAREER, AND COLLEAGUES

BY DON BACHMAN

My interest in snow began with skiing at Dodge Ridge in California with my father, who worked for the Forest Service, in the early 1950s. I was becoming able to comfortably turn left and right when I enrolled at Oregon State College in 1958 and joined the OSC Mountain Club, falling into the good company of Willie Unsoeld, Chuck Hollister, Steve Roper, Pat Callis and Art Judson. I took an Advanced First Aid course and in January 1959 joined the Hoodoo Bowl Ski Patrol. The following winter, Ross Petrie taught a Circle A National Ski Patrol course, and I began to learn about avalanches.

In the spring of 1960 I drove to Tuckerman's ravine and witnessed my first control mission. The Forest Service Ranger was firing a .50 Caliber at the icicles on the headwall. I opted to ski Hillman's Highway to the left of the headwall, skiing out below the main face where I was picked up by my first avalanche; a wet slide (triggered by someone above) and carried slowly on the debris surface down to lunch rock and the cheers of the picnickers. The lesson: always look uphill when coming to an intersection.

That fall of 1960, upon being kicked out of the OSC Forestry School, I fled to Golden, Colorado, at the invitation of Art and Millie Judson and thence to the Berthoud Pass Ski Area, where I became their weekday ski patroller under the tutelage of Ed Henion; ex-10th Mountain Troops enlisted man and denizen of Winter Park, whose wife Evy was an alternate on the 1948 Winter Olympic Team. Ed was the "mountain manager" for the ski area. Dick Stillman, also a 10th Mountain veteran, was a 1960 Olympic Avalanche team member, winter sports specialist for the Arapaho National Forest and avalanche researcher, who had established a snow and avalanche observatory at Berthoud Pass in 1950.

Dick, my first real mentor, taught me how, where, and when to use explosives on the dozen or so avalanche paths on and adjacent to the ski area. His rules of thumb became basic guidance for the future. In exchange for bunk space in the snow ranger shack adjacent to the ski area garage, I maintained weather instruments and records and helped Whit Borland, Reserve Colonel in the US Army Corp of Engineers, dig and analyze biweekly pits from the study plot just off the ski area.

I enrolled in Colorado State University's Forestry School the following year, but faithfully drove to Berthoud Pass each weekend to continue that association for a second winter (1961-62). It was that winter I was caught in my second avalanche which released while I stood in an explosion crater at the top of the Timber South of the Trough path in the ski area. Though only partially buried, I was mostly worried about the rush of rescuers who rapidly skied toward my head and shoulders in the debris which had slid 300 vertical feet through the trees to bottom. I was dug out none the worse for the experience, but I learned a valuable concept; the possibility of a Post Blast Release (PBR) exists.

That late spring I was drafted into the Army and ultimately stationed with the 11th Air As-

sault Division at Fort Benning, Georgia. Among other lessons I learned through that experience was a familiarity with helicopters which would serve me well when I

was later engaged in search and rescue and avalanche reconnaissance and control. I was discharged in 1964 at age 25, and took a seasonal naturalist position at Rocky Mountain National Park.

Georgetown, Colorado became my home in late 1964, when I tended bar at the Holy Cat and spent several days per week at Loveland, A-Basin, and Berthoud as a National Ski Patroller. The spring of 1965 I skied several fourteens and other peaks in vicinity, and went back to Rocky Mountain NP as a seasonal ranger in Wild Basin. The following winter I took a patrol job at Crested Butte doing avalanche control work including assisting Snow Ranger Shabby Somrak with the 75mm Recoilless Rifle. The next three years I was Patrol Director as well as lead avalanche person. The following two summers were spent as Rocky Mountain National Park's Longs Peak Ranger. While owning and operating Tony's Tavern, in Crested Butte and skiing for fun at the area and backcountry, in the spring of 1971 I got a call from the University of Colorado's Institute of Arctic and Alpine Research. They asked if I would set up logistics for the establishment of a Bureau of Reclamation funded project on snow properties and avalanche assessment in the vicinity of Silverton, Colorado. I quickly went to Boulder for a briefing, thence to Silverton to arrange for an office and living space, and secured permission from a mining claim owner to use an old cabin, outhouse, and nearby meadow atop the notorious US Highway 550, Red Mountain Pass, for our observatory.

In the summer of 1971 I moved into the long term lease office/living quarters and our team began the research project. Project instrumentation was sited and developed with guidance from INSTAAR's climate specialist, John Clark. Principal consultant was Ed LaChapelle who became my second real mentor. Eventual Field Director and co-PI Richard Armstrong and I attended the first National Avalanche School in Reno that fall of 1971. Rod Newcomb joined the project the following year. Project emphasis the next four years was captured in the publication, "Avalanche Release and Snow Characteristics." This was accomplished with the establishment of remote weather instrumentation, three study plots, systematic full data pit excavation, selected avalanche path release timers, fracture line profiles, and systematic activity observations of 156 avalanche paths which directly affect a 58-km section of the highway and 14 km of a county road and the Silverton environs. We worked

TOP: Velocity Basin during the speed skiing preparation. Chris George in the foreground 1983. Yes, we did get dusted but were on a knob. Photo Don Bachman collection

BOTTOM: Don says "too much digging!" at Wolf Creek Pass in the 90s. Photo Denny Hogan



Stay connected.

Even in the worst conditions.



Effective communication can make the difference between an all-time day in the backcountry or a major junk show. Keep your crew tight with the BC Link.

Winterized controls, remote/accessible Smart Mic, long-lasting battery, and compatibility with all FRS/GMRS radios.

Pro and fleet pricing (800) 670-8735.

BC Link™
Never alone.



The most trusted name
in backcountry safety™

www.backcountryaccess.com

Photo: Freya Fenwood Photography
Leif Whitaker and crew on East Kariba peak in Shimamaki, Hokkaido, Japan.

closely with the Colorado Department of Highways avalanche control personnel, including highway engineer and pack howitzer wizard Noel Peterson.

At the end of these first four project years, in 1975 Art Judson suggested I come to Fort Collins and join the US Forest Service Avalanche Warning Center under the leadership of Knox Williams. Those next four winters were packed with installation and maintenance of snow and weather instrumentation, weather and avalanche information archiving from the infamous blue and green sheets, developed by Judson, occasional accident investigation, avalanche course instruction, and public avalanche advisories. Other colleagues were RA Schmidt, Dick Sommerfeld, and overall Snow and Avalanche Project leader Pete Martinelli. After the late spring 1979 "Snow in Motion Conference" which brought international delegates for a symposium in Fort Collins and tour around state avalanche hot spots, I left to return to Crested Butte, with hope for additional employment opportunities from a mountain setting.

I did not anticipate a mountain/salt-water setting, but sure enough, I was soon driving north to Alaska that early winter of 1980 to take a position with the Forest Service in charge of the forecast and control program for the Seward Highway from Bird Flats to mile 23 north of Seward. I hooked up with Jim Hackett, Dave Hamre, and Jack Morrow of Alaska Highway and had quite an intense winter of big avalanche cycles and road closures; pretty serious when 3,000 cars per day are trying to go somewhere. I drove back down in late May, and was basking on a hot rock during a Dolores River-trip a week later when I decided "I guess I'd rather be in Colorado."

I was to be close to Colorado for the following winter, on the recommendation of Rod Newcomb, I ran an avalanche control program for the Sun Oil - Murphy Creek, Wyoming drill site in the Salt River Range. The Forest Service chose to site the rig and man-camp in the run-out zone of several 900-1200 foot avalanche paths over a company-preferred environmentally sensitive wetlands location. While the rig platform itself was not threatened, the camp and facilities were, and it was necessary to position an Avalauncher so blasting could be accomplished at a minimum of risk. Minimized, except the explosive projectile trajectory had to be launched over the camp living area. Art Mears had supervised the installation of cylindrical water storage tanks to block any debris from camp. The only safe crew protection from a short round falling on the row of trailers was the community room, where persons would assemble during a firing mission - or on the floor of the drill rig itself. The crews were outfitted and trained with Ramer Echo II rescue beacons whenever they stepped out of the man-camp trailers. Fortunately it was a very light winter necessitating less than a dozen control missions. The well was capped after bottoming out at about 16,000'.

That spring, I was presented with the Avalauncher as a bonus, and headed directly to the International Speed Skiing venue in the high cirque at the headwaters of the Middle Fork of Cement Creek above Silverton. Though the site had been recognized a couple of years earlier, it was not utilized to its potential due to delayed course preparation and avalanche danger. Chris George and I were hired to rectify that situation and over the next two winters we developed an avalanche evaluation and control program that utilized a helicopter and the Avalauncher.

The site was located up the valley 1.5 miles above the Standard Metals Mine where we parked and staged the Helicopter and snowcat fuel depot. Venue access was by snowcat shuttle, skiing or as Steven Stills learned in 1983 - walking. Course preparation was accomplished with the help of grooming equipment from Pisten-Bully, and operators from Squaw Valley and Purgatory. The winter's avalanche debris with inherent high density made for ideal compaction and contouring conditions from just above the timing trap on down the run-out. The 50 degree start area and in-run were prepared by a dedicated crew of Crested Butte gelaendesprung jumpers under the direction of Bart Austin, and lived on-site for two weeks prior to the events in the support camp managed by Lois McKenzie from Silverton. Helicopter logistics was performed by Thunderbird Helicopters, Bert Metcalf proprietor; while Archie Archuleta of the Crested Butte Fire Hotshot Helitac crew orchestrated the up-transport for skiers and workers to the starting line boot-pack. Franz Weber set a new world speed skiing record of 129 mph, establishing The Velocity Peak course as world class. The site is adjacent to the more recently established Silverton Mountain Ski Area.

For the next 6 years I functioned as an independent consultant engaged in a variety of temporary jobs, including a number of field and classroom assignments, accident investigations and expert witness retainers, helicopter skiing terrain assessments, an initial ski area feasibility study, and a couple of mine property avalanche assessments. I also spent 3 winters as a groomer operator for the Crested Butte Ski Area, who would graciously give me leave for brief avalanche-related assignments.

In 1989 I moved to Bozeman to take a position with the Greater Yellowstone Coalition. That job was over in mid-1991 and in the early fall of 1992, I was asked to join the staff of the Colorado Avalanche Information Center. The previous winter had seen a tragic avalanche which killed a Department of Transportation rotary operator while burying his partner for over 12 hours near the avalanche shed entrance of the East Riverside Path. The Colorado Department of Highways engaged CAIC in a systematic forecasting program for their avalanche prone highway system, beginning



Alaska railroad vs. Super Scooper - January, 1980. ...and one car caught; no injuries. The highway at the time runs across the middle of the path.
Photo Don Bachman

with US 550. I moved back to Silverton, selected Denny Hogan as my partner and initiated a forecast and evaluation program for the road from Ouray over Red Mountain and Molas to Coal Bank Pass. This program also included Colorado Highway 110, up Cement Creek. Our CDOT liaisons were Ed Fink from the State Office, Ted Vickers from the Durango Section and Gary King from the Silverton Barn. CAIC staff from Denver were Knox Williams, Nick Logan, Dale Atkins and Scott Toepfer. We set up study plots and remote weather instrumentation similar in purpose to the San Juan Project of the 1970s, but far more sophisticated and usable than those old analog days. Denny and I developed protocols for highway closure and control that were adopted by CDOT and we accompanied all control missions including those utilizing the Avalauncher, artillery and helicopter bombing, the latter through contract with Telluride Helitracs with Mike Friedman, "Speed" Miller and pilot Tom Sharp. We also assisted in development of systematic avalanche programs on US 141, Lizard Head Pass, US 160, Wolf Creek Pass and Colorado Hy 133, McClure Pass. At the end of the 1994-95 season, I resigned to join my wife Cathy Cripps in Bozeman upon her completion of a Ph.D in Mycology from Virginia Tech. Her specialty is Arctic and Alpine Fungi, in addition to fungi associated with white bark pine and snow-bank fungi.

At the 1996 International Snow Science Workshop in Banff, the American Association of Avalanche Professionals Board of Directors determined that if the organization was to grow it should have an Executive Director rather than be dependent upon a volunteer president and in January 1997 I drove out to Truckee and picked up all the records from Executive Secretary Peggy Ricketts and became a part-time ED. I remained in that position through spring of 2000 when Jeff Brown briefly assumed the position until Mark Mueller was appointed in 2001, and subsequently served through 2013. I was honored to receive the Bernie Kingery Award in 2000 and the Honorary Member Award in 2008.

In 2003 I joined The Center for Snow and Avalanche Studies as Board of Director President as Executive Director Chris Landry developed its program at Silverton and Red Mountain Pass. Chris is a renowned ski mountaineering pioneer, avalanche forecaster and Masters Graduate of Montana State University. The US Forest Service-permitted site, including the Senator Beck Basin, contains paired complete instrument arrays at 11,060' and 12,180' and a regional wind and temperature site one mile east at 12,225'. These sites are at the alpine headwaters of three San Juan Mountain rivers near the continental divide. Primary focus has been on hydrologic research, specifically dust on snow, while multiple summer and winter-hosted science and education users are accommodated. I remained in that board position for ten years, and continue in an ex-officio role. Jeff Derry, arctic and high mountain hydrology specialist has since succeeded Chris as ED.

I've been fortunate to have had an organizing role for the International Snow Science Workshop at Aspen in 1986 and Bozeman in 2000 and participated in most ISSWs since 1982. I have attended international conferences in Norway, Switzerland and Austria and have presented at a conference in northern Russia, 2001, at ISSW, 1992 and Society of Explosive Engineers in 2006. That year, I also served under the Volunteer in Parks program for Glacier National Park in development of an Environmental Impact Statement for the avalanche mitigation program along the BNSF rail corridor which is now competently managed by Ted Steiner.

I maintain an active interest in avalanche matters through attendance at ISSW meetings and web surfing of avalanche centers and in active communication with American Avalanche Association principals and old colleagues. I feel fortunate to have settled in Bozeman where there is a community of avalanche professionals with the USFS National Avalanche Center, Karl Birkland – Director and the Gallatin National Forest Avalanche Center staffed by Doug Chabot, Eric Knoff and Alex Marienthal. Montana State University provides a Snow Science curriculum under the direction of Jordy Hendrikx, building on the pioneering work of Charles Bradley and John Montagne. ▲



Don is a big guy, but the snow-eater is even bigger. Mother Kline on the north side of Hwy 550. You can see the Ruby Cliffs in the background.
Photo Denny Hogan

A PARTIAL HISTORY OF THE AVALANCHE INDUSTRY IN THE 60S AND 70S

BY ROD NEWCOMB

The 1963-64 early winter weather in the Tetons and Wasatch was cause for the development of a continental snowpack. Snow King, Jackson's town hill, had an unusually active winter. A ski instructor was completely buried, but survived. A patroller lost a ski in a slide that ran halfway to the valley floor and outside the open area a patroller died in the classic deep slab, delayed action avalanche in March. When I arrived at Alta in late January to fill a vacancy on the patrol I found the same conditions.

Ray Lindquist was the head Snow Ranger with three assistants to cover the entire ski area. Ed LaChapelle was director and scientist of the Alta Avalanche Study Center and known to many Forest Service personnel and National Ski Patrolmen who had attended the Forest Service Avalanche School at Alta or Berthoud Pass. On routine control days Lindquist would line out the day's work unless there was a full shoot on the road and ski area at which time LaChapelle would take over. For a ski bum interested in the phenomena of snow and avalanches Alta was the place. Hanging out with LaChapelle and Lindquist I learned a little about snow, but a great deal about running a route. I learned that when ski cutting be prepared to take a ride. I learned that when throwing bombs, throw then back up to the nearest anchor. I learned that there will occasionally be disagreements between ski area management and the control team as to when runs should be open or closed.

The next winter (64-65) was at Vail for another winter dealing with depth hoar. The patrol knew about depth hoar and where they should throw a few bombs on the "front side", but did not pay much attention to general instability after a storm or in the back bowls served by lift 5. A classic comment came from mid-management "Sun Up Bowl would not slide if you put it on wheels." This was after a significant storm with large collapses.

The Jackson Hole Tram finally opened the winter of '66-67 with 4,000 vertical feet of avalanche paths. The right man for the job of snow ranger was a fellow by the name of Juris Krisjansons. Jurie immigrated from Latvia, received a degree in aeronautical engineering in Chicago, headed west and ended up at Squaw Valley. He had as a mentor Norm Wilson, who was a protege of Monte Atwater who started the Alta Avalanche Study Center in 1945. With his experience in the maritime climate and my background with the intermountain climate we made a good team. When I went to work as his assistant in the fall of 66, he had wind and temperature data over the



Early Alta School.
Photo Ron Perla



Ed LaChappelle.
Photo Rod Newcomb collection

AIARE

Training for backcountry enthusiasts and mountain professionals.

- Instructor Training Courses
- Level 1 & 2 Program Materials
- AAA Professional Certification Courses

www.avtraining.org
(303) 817-7378



Jackson Hole Ski Area.
Photo Rod Newcomb collection

entire 4000 vertical feet of ski area from 10,400 down to 6,400 feet and snow depth and water content at the midway study plot at 8,200 feet. He was very intuitive about terrain and hazard. Management once asked how we could reduce the amount of open terrain. During the 1960s, 85 per cent of the entire ski area and every run from the top of the Tram was an avalanche path. His answer was to close Rendezvous Bowl, the main run off the top. He described it as a sleeper, meaning that it was not steep enough to slide on a regular basis, but when it did would produce a large and dangerous avalanche. Krisjansons believed in hard work, which, looking back, made up for limited experience for both of us. I would be remiss not to mention Art Judson and his infamous green sheets, one for weather and one for avalanche activity, which needed to be filled out daily. After a full control day, add on an extra hour for this chore.

While Krisjansons and I were doing our best to reduce the risk at Jackson Hole, courses in snow and avalanches were being held at Montana State and experiments on reducing cornice buildup were ongoing at Bridger Bowl by John Montagne and Charles Bradley. Montagne came to Jackson in the late 60s with a super 8 movie he made of a cornice growing over a 24-hour time span. As a budding snow worker I was duly impressed.

In the spring of 1971 a dream job opened working out of Silverton, CO. It was an offshoot of a cloud seeding project by the Bureau of Reclamation in the San Juans. Along with the project to study the environmental affects of silver iodide from cloud seeding, a project was awarded to the Institute of Arctic and Alpine Research of the University of Colorado to come up with a forecast model for highway 550 from Ouray to Durango and to describe the snowpack and snow climate in Southwest Colorado. We called this the San Juan Project with Ed LaChapelle as the principal investigator. From my colleagues, especially LaChapelle, along with Don Bachman and Betsy and Richard Armstrong, my understanding of the snowpack took a giant leap forward. It is a great learning experience to watch the development of facets in the cold room.

In 1974 changes were beginning to take place within the ski industry. The first was our discovery of skinny skis, glue-on skins, and double backcountry boots to enable us to ski farther into avalanche terrain. The second was the beginning of ski areas in Colorado to spread out into avalanche terrain and the need for patrol avalanche education. The third was an interest from ski and alpine guides and Forest Service personnel for avalanche education. The fourth was that the San Juan Project was ending and I needed a winter job. By 1974 the Alta Avalanche School was now a two-phased USFS funded and supported school with a five-day classroom session in November, held in Reno, and a three-day follow up session held in January or February in the mountains. In 1974 LaChapelle agreed to hold one of the three-day winter field Phase 2 sessions in Silverton with 15 students. Thirty folks showed up and LaChapelle called on all of us at the San Juan Project to give him help with field sessions. With this apparent interest in learning about snow and avalanches in the field, it made sense that there may be a market for avalanche education other than the National School.

The first winter of the American Avalanche Institute, 1974-75, there was a ready supply of instructors in Silverton left over from the San Juan Project. There was also a fellow by the name of Art Mears who had been paying visits to the San Juan Project from time to time. Art has degrees in geology and engineering, had just completed a study of avalanche paths affecting Colorado highways, was unemployed, lived in Gunnison, was a backcountry skier and mountaineer, and liked to teach. All told a prime candidate for an avalanche instructor. On one of the courses in Silverton he gave a presentation on avalanche dynamics, and as far as I know the first on this topic in the U.S. This would have been in 1976 or '77.

Finding instructors in and around Jackson in 1974 was a different story. Norm Wilson had just hung out his shingle as an avalanche consultant in California and was available to fly from Reno to Jackson to work with me on Jackson courses.

This brings me to the topic that the editor of *The Avalanche Review* charged me with: **Who have been my mentors?** I begin with the aforementioned individuals: Ray Lindquist, Ed LaChapelle, Juris Krisjansons, Norm Wilson, John Montagne, Don Bachman, Richard and Betsy Armstrong, and Art Mears. But just as important are the men and women who worked with me over the time span of 36 years on courses from Bridger Bowl to Taos, from Alpine Meadows to Crystal Mountain, from Alaska to Tuckerman's Ravine and many points inbetween. All of you number close to 200. Each of you passed on bits of information from your snowpack and knowledge from your experience working as a forecaster, patroller, ski guide, researcher, educator, mountaineer, and on and on. If you read this you know who you are. Thank you all for the good times and great courses. ▲

AVALANCHE RECORD STORAGE

BY DON BACHMAN

I hope that pursuing the Silverton Historical Society Archive Building for an eventual archive repository for avalanche-related material will be fruitful. As I explained, the building itself was state of the art design when completed in c. 1988 and intended to house the mining and community history of Silverton and the San Juans. The museum curator and Society President welcomed the LaChapelle collection, especially since Dolores had spent her last 35 years as a resident, and Ed and his son were frequent visitors. I really don't know its mission and vision for further archives, but my impression is – there may not be many other industry or community collections destined for accession there.

The Silverton Avalanche School originated across the courtyard in the Sheriff's office in partnership with Don Fritch of the USFS in 1963(?). This was the first non-Forest Service-sponsored school for ordinary people like plow drivers, law enforcement, game wardens, and ski area and backcountry folks. Of course there was the NSPS courses but they were only for members and the USFS Alta/Berthoud schools were pretty exclusive too. Silverton is also the home of the Center for Snow and Avalanche Studies, now completing its 12th year. I consider Silverton the center of the Avalanche Universe – though Alta does have history, but a narrow geographic legacy.

Another major collection of material rests with the National Avalanche Center in Karl's office here in Bozeman. This contains the Pete Martirelli collection of books and reports (nope – no old skis or avalanche cords)

The American Alpine Club facility in Golden may be another spot, and I think they are endowed to maintain mountaineering records. I don't know if there is yet a connection (or should be) between avalanches and mountaineering – seems a little distant but maybe not.

Anyway, I know Bev Rich, the San Juan County Historian and have contact with Jim Donovan the Silverton Avalanche School Director and could inquire further. ▲

Document your field days.

- waterproof paper
- zero failure rate



To order: www.hacksawpublishing.com
www.facebook.com/HacksawPublishing

ADVICE TO MY YOUNGER SELF

BY LIAM FITZGERALD

*Play for more than you
can afford to lose, and
you will learn the game.*

—Winston Churchill



Post-Control avalanche in the Middle Cirque at Snowbird, opening day, November 1982.
Photo Unknown



Early Snowbird days, before rescue shovels had been invented. (Picture was in 1970's Avalanche Handbook).
Photo Ron Perla



Avalanche on LCC Road, April 1974.
Photo John Stratton

I will start by saying that I think advice is easier to give than it is to take. But, since I have been given the opportunity, I will offer some advice that might be of some help in dealing with the challenges facing a young avalanche worker in the same way others passed advice along to me.

Whatever advice I would offer would be tempered by the experience of several decades of working in Little Cottonwood Canyon, Utah, where in 1972, as a naïve and relatively inexperienced ski patroller from Squaw Valley, I was put in charge of the avalanche program at the newly opened Snowbird Ski Area. It was a somewhat daunting situation, but fortunately, in those early years of my career I had wise and patient mentors who had spent decades battling innumerable storms and treacherous avalanche cycles that contributed to the long and rich avalanche history of the canyon. The stories they told of the events and legendary characters of the past captivated me as a young avalanche worker, and inspired me to try and become as deeply involved with the study of avalanches as those who had preceded me.

Little Cottonwood Canyon is a challenging place for any avalanche worker, regardless of experience. The abundant snowfall and steep terrain combine to create frequent and extensive avalanche activity. There are scores of inhabited buildings located within avalanche runout zones, and with nearly a million people living within an hour's drive of the canyon, there are plenty of opportunities for avalanches and humans to interact. This environment requires a steep learning curve, with little room for error. The advice I received from luminaries like Ray Lindquist, Warren Baldsiefen, Ron Perla, and others didn't keep me completely out of trouble but gave me a head start to what ended up being a difficult but rewarding journey.

"Smooth Water Makes for Poor Sailors"

Many of you work in difficult and challenging environments, and at times, I'm sure the job can seem overwhelming. But by being continually tested, you are likely to become better at what you do than you would if you worked someplace where things were easy. In a challenging environment, mistakes seem to be unavoidable, try to learn from them if you can.

I think I have learned more from my mistakes than I have from my accomplishments. Appreciation of one's accomplishments can lead to complacency. Appreciation of one's mistakes makes you want to avoid having them happen again. I made many mistakes in my career, thankfully, most of them resulted only in close calls, sadly however, some of them resulted in tragedy. But as a wise and revered mentor once told me; "You do the best you can do, knowing that sooner or later, something bad may happen. If and when it does, if you feel you did everything you thought you should have done to prevent it, you can look at yourself in the mirror the next morning, and go back to work." Because of the capricious nature of snow and avalanches, mistakes in our chosen profession seem to be unavoidable. Accept the fact that underestimation and miscalculation will likely be as much a part of your career as insight and perception. It is important to remember that when things go wrong under your watch, try not to be too hard on yourself. If things do go wrong, you will most likely need to rise to the occasion and be at the top of your game. Guilt, self-blame and recrimination can have a crippling affect, and may prevent you from operating at the highest level, which will only serve to make matters worse! Hopefully your mistakes will not be so disastrous as to turn you away from a career that offers so much opportunity to learn.

Don't try to be too smart...

The job of predicting and controlling avalanches is hard enough, don't make it harder by trying to "think it to death." Any success I experienced as an avalanche professional was primarily the result of three things; Luck, Timing, and Hard Work. How smart I may have been was a distant fourth. Realize that whatever is going on, even if it is unusual, and something that you personally may have never experienced, you are probably not witnessing anything that hasn't happened before. Focus on the basics and the fundamentals. Adhere to principals that have worked well in the past. Advancements in the avalanche field will be made, perhaps even by you, and when they happen, they are more likely to have evolved slowly, from experiences that are sometimes painful, rather than from revolutionary "new" ideas that are based primarily on the desire to be trying something "new". At the same time however, it is important to keep an open mind. Listen to what other avalanche workers from the past and the present, from near and from far away, have to say, and don't be too certain that the way you are doing things is necessarily the best, or the only way. Be willing to experiment, take the ideas and methods others have taught you, and try to improve upon them. Commit yourself to life-long learning. Consider the Buddhist teaching that says, "In the mind of the expert the possibilities are limited. But in the mind of the beginner, the possibilities are endless." By recognizing the fact that there is still so much we have to learn about snow and avalanches, we can keep the open mind of the beginner.

Controlling the Ego...

Our Ego, which may be a necessity in order for us to be strong individuals, if unchecked, can also be a stumbling block. It can limit our ability to listen and to see. It can convince us that we know what's going on, when in reality we are setting ourselves up for failure. Arrogance, like recklessness or inattention, will likely lead to trouble for avalanche workers. Unfortunately it's easy to get wrapped up in our own image, and a feeling of self-importance, after all, what we get to do is pretty cool! But these feelings are dangerous traps that can cloud our reasoning, and limit our ability to see what is going on around us. I have come to believe that it is more important to strive to be a "good" avalanche worker, one who humbly and diligently deals with the day-to-day challenges of keeping the public safe, rather than to want to be the "best" avalanche guy in the world.

It's a Delicate Balance, Don't Push Things Too Far...

Many avalanche careers revolve around the issue of when to close and when to open highways or ski areas. These decisions usually come down to our perception of the level of hazard. Accurately assessing the avalanche hazard remains one of the great challenges facing avalanche professionals, and it's hard to say whether in the past 75 years we have gotten much better at it. Most all of the mistakes I made during my career were the result of underestimating the level of hazard. I often found myself waiting for that final bit of evidence that things were about to get out of control before I took action. If you wait too long, it is often only a matter of luck that prevents something really bad from happening. And even though luck plays a significant role in the success of any avalanche worker, it is not something to rely upon.

It often takes more courage to implement a closure in a timely manner than it does to keep an area open during an increasing hazard. It is often the case that a closure is felt to be a retreat, or as having a negative impact on business, customer satisfaction, or the overall economy of the area. In reality, closures represent a very small period of time in comparison to the amount of time a ski area or a highway is open. Ski areas or mountain communities that are at times adversely affected by closures brought about by avalanche concerns also attract thousands of visitors each year who travel to those areas to enjoy the steep terrain and abundant snowfall that not only contribute to the avalanche problem, but are also highlighted in advertisements and on websites. Reaping the benefits from one side of the issue hopefully outweigh the inconvenience of the other side. Whereas the reason there are avalanche forecasting and control programs (and for that matter, avalanche professionals) is to provide a way to mitigate the avalanche hazard and keep closures to a minimum, it is a fact that we remain outmatched by the avalanche phenomenon, and still lack the ability to understand exactly what is going on under the snow surface. We can't close an area down at the first sign of instability, but we must recognize the limitations of our knowledge and try to take a balanced, but in the end, more conservative approach. History will remember avalanche accidents much longer than it will remember avalanche closures.

"Remain Firm Yet Flexible, Like the Bamboo"

There may be many outside forces that try to influence what you do and how you do it. Listen to what people have to say, but realize that their agenda may be different from yours. Try to accommodate the interests of others, but don't let their needs weigh too heavily in your decision-making. Be willing to accept "Objective" well-intended advice, and change plans if presented with a compelling reason to do so. But realize that it's unlikely that anyone is paying as much attention to the situation as you are. Many people may be willing to offer you advice and tell you how things should be done, but very few are willing to share the blame when things go wrong. Avalanche workers are often forced to operate in gray areas, where information may be lacking, and there is no clear choice of what to do. It is in these situations that we can be the most vulnerable to subjective advice. Others may sense your level of uncertainty, and may feel that you are in need of direction. Be careful whom you listen to, and what their interests may be.

Strive to remain consistently rational and objective. Focus on what you know is important, like wind, precipitation intensity, and avalanche activity, not on what others might be thinking about your decisions. Don't become distracted by irrelevant concerns; if given the opportunity, you and your team will likely come to the right conclusion. Listen to your inner voice, it is probably telling you what you should do. If you have carefully analyzed the situation, then without arrogance or ego be confident in your decision, you are doing the best you can do. Is there really anyone else who would want to shoulder the responsibility of what you are doing?

This would be some of the advice I might offer to those of you embarking on a career as an avalanche professional, or to my younger self if I had the chance. Whether or not my younger self would listen to that advice is another matter. In the end, it's just a job, but for many of us it defines who we are. It is just a job, but it's an important one, and it's HARD! Learning from what has happened in the past, and from those who have preceded us might help make the job a little easier. ▲



Picture taken at FX of "Valerie's Slide". In Dec. 1973 it ran into Snowbird Village, doing lots of damage, and burying two people in a trailer in the parking lot. No serious injuries, but quite a story behind this event.
Photo Unknown



Back in the days before rime-free anemometers. De-riming the cups on top of Hidden Peak at Snowbird.
Photo John Collins



Me and my mentors. Snowbird, Spring 1973. Ray Lindquist on the left, and Warren Baldsiefen (Baldy) in the striped pants on the right.
Photo Liam Fitzgerald Collection

PIMENTÓN AND EL NIÑO

Big storms test the avalanche program at one of Chile's most dangerous mines.



PistenBully cleaning debris off the road.
Photo by Colin Mitchell



PistenBully cleaning the access road.
Photo by Brian Pollick



Jeep driving through a large debris pile on the road.
Photo by Brian Pollick



Pimentón Mine from across the valley.
Photo by Matt Primomo



On the tower during the peak of the storm.
Photo by Colin Mitchell

BY COLIN MITCHELL

When I first came to the Pimentón mine in May of 2012, I admit I had some reservations about my new job. I had read articles in this publication by former forecasters Matt McKee (TAR 28.2) and Matt Primomo (TAR 30.2). Matt Primomo interviewed me for the job, and he described the situation very clearly. It was not a pretty picture.

The mine sits in a hanging valley at 3380 m, in the heart of the central Chilean Andes. Buildings and facilities are located where they provide the best support for the operation with little regard for avalanche hazard. Many are located at the bottom of large avalanche paths, with others built right in the track. The terrain is big, with ridgetop elevations between 4,000 and 5,000 meters, and huge vertical relief. The mining camp and support facilities have been completely destroyed by avalanches in the past, and the current camp buildings have been hit and damaged numerous times. Access is via a narrow dirt road crossed by over 140 known avalanche paths. The area is notorious for big storms that roll in off of the nearby Pacific Ocean with

snowfall measured in meters, and precipitation rates of 5–10 cm an hour commonly recorded. Additionally, the mine staff was known for complacency, and expectations from management were often at odds with the forecasting team's recommendations. There were no weather stations, and little in the way of historical records or data.

The first rumblings of change came in 2011 when the mine increased our staffing and budget. Hal Hartman came down, re-designed our ineffective avalanche deflectors, and helped us create a snow safety plan. Our snow safety strategy is straightforward. Due to the nature of the terrain, hand routes are nearly impossible and control work is done almost exclusively with avalanchers. We start early in the storm, and a mission is done with every additional 25–40 cms of snow. The idea is to release many small avalanches and avoid the large events that would affect buildings and workplaces. The access road sees some explosive control, but is largely managed by closures.



The Cumbre Slide, an overview to a zoomed in view with a skier for scale.
Top photo by Brian Pollick
Bottom photos by Nelson Cortez

Since 2012, we have installed three weather stations and mounted an avalauncher on a tracked vehicle, giving us more options on the road. Our Internet service has improved, and we now have wifi and even a telephone in the storage container that serves as our office and bedroom. Perhaps most importantly, the forecasting team made a comprehensive effort to understand operations, and develop good relationships with operational decision-makers.

By the fall of 2015, things were looking up. Still, the reality was that the new program had never been tested. Neither had the deflectors. Snowfall for the last five years had been well below normal. 2015 would prove to be a different kind of winter. Things started slowly; as of July 1st, we had recorded only 10 cms for the season, and rumors abounded about ski areas and other operations throwing in the towel and closing for the season. Then we began to see a change in the pattern; the storm track was drifting north and lining up right over Pimentón.

The first big storm of the season arrived July 9th. Over the next four days, we received 163 cm of snow. Smaller storms earlier that week brought our snow total for the first two weeks of July to 199.5 cms. Two weeks of dry weather and cold temperatures followed, creating a thick layer of near-surface facets over what was now a well-consolidated base. Snow returned on July 31st, with a massive storm lining up for later that week. Control work results didn't bode well for the upcoming storm, with slides running unusually far on the weak snow surface.

On the 5th of August, the largest storm to hit Pimentón in seven years arrived. The forecast was ominous. The storm would come in cold, but a spike in temperatures, precipitation rates, and wind, would follow. The first 12 hours of the storm produced around 30 cms of 8% snow. By the next morning, we had 66 cm of snow with 101 mm of water on our storm board. 36 cms of 21% snow had fallen overnight. Heavy snow continued through the day, and several more control missions were done. Poor visibility made results difficult to assess, but we did know that several of the large, lower-angled slopes had not run, including Tim's Nemesis, the large path directly above camp, named after former forecaster Tim Lane, who was washed from the tower and fully buried during a control mission.

Before the deflector redesign, this path had a history of jumping the berm and hitting the main camp building and the avalauncher tower. Morning obs the next day showed another 100 cms with 101 of water in the last 24 hours. We headed for the tower. Snow was falling at S5 when we turned the gun towards Tim's Nemesis and fired. A few long seconds went by before the gunner called out. A powder cloud was drifting ghost-like through the white-out about 50 m down from the tower. The deflector had worked!

When the storm ended, we were left with a total of 193 cms of snow with 236 mm of water. A break in the clouds revealed the extent of the avalanche cycle. Every path around the mine had run. A glimpse at the access road running down the valley showed a similar situation. The road was almost completely covered with debris. It took two days to clean up around camp and get the mine working again.

We spent the next four days skiing out the valley floor; we ski-cut road cuts, looked for the road with probes, and laid a track for the PistenBully to follow. The valley floor drops away quickly from Pimentón, but start zone elevations remain unchanged. As a result, the avalanches got larger and larger the further down the valley we went. Soon we realized that we had experienced a historic cycle. Massive slides littered the valley floor, and many debris piles four to eight meters deep covered the road. The largest was 15 meters deep on centerline, and covered 235 meters of the road. Crews worked from both sides of the road, night and day, for 10 days to open the road. It took four days to cut a path through the largest of the slides.



RAPID OBSERVATIONS
AND RED FLAG ANALYTICS

ROUTE PLANNING
AND TRACKING

TERRAIN
VISUALIZATION

& SP SMARTPROBE TECHNOLOGY HARDWARE FOR PROFESSIONALS



WWW.AVATECH.COM



An excavator cleaning debris.
Photo by Colin Mitchell

Overall, our strategy of aggressive avalanche control at camp had worked. Several buildings had been hit, but only lightly damaged. A loader left outside of a mine portal had been buried, as had been many of the vehicles at the maintenance shop, but all were undamaged. An unprecedented level of cooperation between operations and forecasting allowed us to time control work so that we managed the hazard and maximized operational gains. The mine was shut down in an orderly way, and all workers moved to camp safely.

When we first wrote the avalanche atlas for the road, we naively recorded all of the paths that were visible from the road. As it turned out, the real threat came from large upper elevation bowls that were hidden from below. Most of these paths had run, some for over three kms. Vertical fall was in the neighborhood of 1,500 m. These large slides crossed hundreds of meters of what had been dry ground before the storm, entraining tons of rock, dirt, and many large boulders in the debris. Although we were well aware of the terrain that loomed above the valley, it had been hard to imagine slides as large and powerful as these. Interviews with long-time employees and former forecasters confirmed that they were the largest avalanches to affect the road since the mine opened in 1993.

El Niño is associated with big winters and big storms in central Chile. Despite a slow start, 2015 delivered the highest seasonal snowfall since 2008. We learned a lot about our operation this winter. Next season, we will be revisiting the snow safety plan, revising the avalanche atlas, and continuing to work on our Spanish. We also hope to see those deflectors a little taller. ▲



279er fully-loaded with clients and gear, headed to the front range.

WHETHER THE WEATHER...

STORY AND PHOTOS BY NICK BARLOW

Rarely would you ever meet a self-proclaimed “hobbyist” of quantum mechanics, an “amateur” biochemist, or someone immersed in the principles of astrophysics as simply a “pastime.” Though, concerning the intricacies of the atmosphere, and specifically weather prediction, the aspirant novice time and again finds their voice. What is it about the atmosphere that inherently sparks our interests, or more simply – opens our mouths?

As snow professionals, the answer is clear: the weather is our driver. It serves as the primary forcing mechanism on the snowpack – it creates the snowpack, it changes the snowpack, in the spring – it melts the snowpack. Weather fills the role as both cause and culprit, though, in reality, it is guilty of nothing. It is also our savior, our livelihood, and at the end of the day – our career. The weather is the be-all end-all when working in the mountains.

For us, there doesn’t exist a question more pertinent, more pressing, more poignant as, “What’s the weather going to do?”

As a result, we witness (or offer) our fair share of armchair forecasts every winter – those obnoxious “bar-casts” you hear around town, or, the late night “beer-cast” and soon to be “botched-cast” by morning. But in defense of us all – we are allowed to have an opinion. That’s fair. Concerning the basics of mountain meteorology, we’re pretty darn good. We have (some) training, we study it, we read, we listen. Furthermore, this understanding is a basic requirement for doing our jobs, and we do our jobs well.

As my first TAR contribution, I offer a light-hearted look and a tribute to all the weather forecasters out there. The trials & tribulations, daily struggles, defeats and triumphs. It is a short summary of my path, and some of the observations I’ve made along the way.

In 2010, the onset of my guiding career coincided with a stint as the staff weather forecaster for Alaska Heliskiing in Haines, Alaska. As an apprentice guide, I wasn’t skiing much in those days, but what I did have was job security. Looking back, it’s somewhat unclear how I fell into that role. I suppose somewhere along the way, I expressed an “above average” enthusiasm for the weather. Concerning the rest of the staff, I’m not sure if I knew the most, or simply tried the hardest? Was it an “A for effort” type thing, or was I really the right man for the job?

Perhaps the rest of the staff knew better than to strive for such “prominence” – which in retrospect, was clearly an illusion. Operating helicopters in coastal Alaska during the winter is inherently difficult. The weatherman is often the most hated, shunned, and “complicated” member of the staff. They are also the most misunderstood.

Returning to Haines last April after obtaining a degree in meteorology, I was struck by some of the oddities of day-to-day operations up there. Particularly, the role of the weather forecaster, how they are received and perceived, and some of the absurdities that result.



TOP: Alaska Heliskiing’s central base operations, flight following, and guide office. Affectionately known as the “pirate shack.”

BOTTOM: Flying out of the Haines airport late in the afternoon, in search of cold snow at higher elevations.

Allow me to take you through a “typical” day, from the perspective of the weatherman:

4:25am: The morning alarm clock, and the first of many “weather checks” of the day. In this case, a peer out my bedroom window. I wake to see the mountains basked in brilliant moonlight, not a cloud in the sky.

“**Night-bird**,” I say to myself, as I struggle out of bed. Fumbling for the light switch, I make towards the GORE-TEX and begin to assemble my costume. Before leaving, I take an extra moment to admire the comforts of my bed. So warm, soft, and cozy. “The bed does not judge, it does not ask about the weather,” I think to myself as I begin a 15-hour day.

5:00am: Time to plug in – boot the computer, trip the coffee maker and turn up the heat (it’s freezing in here). With a check of the email and a visit to the news site, the first whispers of society begin to take shape – slowly. Archaic internet speeds continue to wreak havoc in this part of Alaska. I also pull up aviation webcams from SE Alaska to get the big picture.

“Let’s see where she’s at,” I say as I pull up the latest water-vapor satellite loop of the Gulf. “She” – referring to a 976mb surface low barreling towards the AK Panhandle, queued (as of last night) for the evening hours.

To my surprise (...I’m not surprised anymore), I see the frontal boundary marching north along the Panhandle & the associated cloud/precip shield nearly to Juneau – a mere ~75 miles from Haines.

“We’re **hosed**,” I think to myself as I peer out the window again. I start to see the first glimpses of high **milk** streaking in from the south. The high-budget film crew is slotted to lift at 7:00am, hoping to get some work done in morning light. Compounding the situation, there are four helicopters sitting out there, 54 free-skiing customers and 14 guides who want to go heliskiing today. Though in that brief moment, I take great comfort in having the office (and coffee) to myself for another hour, while customers and athletes dream of sunny days.

5:15am: Time to do the deed. The “deed” in this case is writing a digestible weather forecast for the staff, emailing it to regional partners, and picking products to outline my main “points.”

With a palpable “gulp” of my morning sludge, I realize the Juneau forecast office is noticeably flustered. As I know already, the storm is off-track. Typically a useful tool, the NOAA area forecast discussion (AFD) for SE Alaska is awful for heliskiing operations. It requires weeding through several paragraphs of boating content, in this case, small-craft advisories and gale warnings. What results is a small blurb about the northern Panhandle/Lynn Canal, with utter disregard that someone is operating helicopters 33 miles up the road from Haines.

I subsequently open roughly 15 preset tabs on my internet browser, and play the waiting game. From METARs to meteograms, WRFs to GooFiS output (GFS), I leave no stone unturned. SE Alaska is greatly neglected by numerical weather output and reliable surface data. Despite the models running globally, it’s difficult to find maps that incorporate the Alaska domain. As a result, we have much fewer resources at our disposal. Add archaic internet to the bunch, and man, it’s time for another cup of coffee.

Suddenly, the internet locks up, lurching to a halt. I can almost hear the gears grinding in the modem. “Son of a bitch,” I mutter. Naturally, a trip to the non-co-located restroom is in order, roughly 200 yards from the office.

5:45am: I finish my work with time to spare before the 6:00am meeting. With the extra time, I retrace my steps a bit, check out the webcams again, and look for typos in my forecast (I hate typos).

A staff member rattles the front door, and I feel the first surge of cold Alaskan air whisk in. It’s an intern, half asleep, and he looks lost, though he’s in exactly the right place, and literally the only place he could be at 5:45am, 33-miles up the Haines highway.

“So...how’s it lookin’ for today?” he inquires, cautiously. I’m immediately irritated by the sudden collapse of my solitude. Yet he’s a good lad, and the question is innocent, so I entertain.

“It’s kind of a tough one. I think we’ll have a window this morning, but definitely **shwag** coming in during afternoon.” He nods his head, shrugs. I’ve given him a generally vague response, but I definitely cover my bases, and that’s important. Within less than 10 minutes, the rest of the staff shuffles in like a herd of water buffalo.

5:55am: The coffee maker is attacked violently. Before long, it’s pumping out boiling hot motor oil at a rate it was never meant for. Yet despite persistent eruptions of steam and boisterous gurgles, it presses on unphased. I wonder how it keeps up.

Before long, bandwidth bandits have taken control of the internet network, and they’re into the mainframe. Roughly 10 laptops, five smart phones, and a few tablets simultaneously fight for precious megabytes. The blinking green light on the internet router is nothing more than a desperate cry for help. Before long, they begin to speak.

“I think this is just local valley stuff, Old Faithful is beaming. We’ll get a **pop** this morning,” Guide (A) proclaims, clearly consulting “sources” on his iPhone. I don’t inquire further. “The weekend still looks good though, right Barlow?” another guide asks, referencing some fictional forecast novel of the past, I think the genre was fantasy. No, that’s not what I said. “Ted says it’s closed out already across the river, looks to be coming in early?” Guide (B) says looking over to me. I nod my head as I plug in the projector. A final glimpse out the window shows the front range completely shrouded in shwag, potentially **precipisnaining** as well.

A WEATHERMAN'S GLOSSARY

night-bird (noun) – cloudless sky during the evening or early-morning hours, only to be replaced by morning cloud-cover.

*see also: blue-bird (sunny, clear), gray-bird (cloudy), white-bird (snowing)

hosed (adjective/noun) – when otherwise optimistic heliskiing dreams are thwarted by unpredictable Alaskan weather.

*usage: “Did you go skiing? No, we got hosed.”

milk (noun) – high clouds (cirrus) increasing over the mountains

*see also: milking (verb), milk-toast (milk for breakfast)

shwag (noun) – dense cloud cover, especially at or below mountaintop level

*see also: shwagging (verb), bowl-of-shwag (shwag, everywhere)

pop (noun) – when the sun comes out

*see also: AMpop, PMpop, notapop, sucker-hole

precipisnaining (verb) – a unique form of mixed precipitation that only falls in SE Alaska



One of three liquor stores in the Haines Borough. Weather in town can be particularly volatile during the winter months, as pacific storms track up the Lynn Canal and encounter strong thermal and pressure gradients.

A WEATHERMAN'S GLOSSARY

aggressive standby (phrase) – the condition of being ready to go heliskiing without actually being ready

*see also: hurry up and wait (phrase)

dragon's breath (noun) – low level valley clouds (stratus or fog), often preceding a frontal boundary

orbing (adjective) – when the sun is visible through a thin layer of clouds, reminiscent of a glowing “orb”

*see also: acute-orbing, widespread-orbing

bridging (adjective) – sucker holes connecting the dots, can often precede a “pop”

layer-thinning (noun) – the thinning of cloud cover at any level in the atmosphere, not to be confused with surface hoar and snow stability.



On a fine spring afternoon, the mountains surrounding Haines paint an impressive backdrop for Chilkat Lake and Old Glory.



Coastal Helicopter's N207 buried deep by a classic SE Alaska storm cycle. I believe this was a down day...

6:00am: The forecast briefing passes without incident, with a general emphasis on uncertainty. Dozens of parameters and meteorological indices aside, all that really matters is localized cloud cover – the most difficult to predict. “Potentially” has become my most cherished word, and very much a go-to hallmark for a variety of situations I find myself in as the weather forecaster.

Though, these can be very difficult forecast scenarios for our operating area, as storms typically slow down and weaken as they track north. Persistent Yukon high pressure is the reason, as offshore/onshore flow regimes fight it out. 33-mile often sees flyable weather directly preceding strong storm cycles, or even mid-cycle, regardless of what it's doing in the town of Haines. This is affectionately known as 33-Mile Magic.

“Get in touch with your freeski groups, have them up here at 8:00 and let them know the deal. **Aggressive standby**,” the lead guide announces. “My guys (the film crew) are going to fly out anyway, see if we can get into Prinsep or 4-Winds, maybe get a few shots,” says another guide.

I look out the window in time to see a conversion van pull into the parking lot, and a crew of Austrian athletes and camera guys spill out. They seem optimistic. Or maybe it's just their bright jackets and pompom hats. Nearly every color of the rainbow, amazing. “Skittles,” I say to myself.

7:05am: The film crew lifts, and the first crackles resonate over the radio. The entire staff is now officially “working,” going through their gear in between bites of breakfast, prepping for the day. I'm starting to think about 2nd breakfast...

To a passerby, it's actually an interesting scene at 7:00am for our “up the road” operation, now in its 23rd season. Employees take advantage of the last precious moments before clients arrive. A group chops wood for the stove, a few guys are waxing skis, while a team of interns practice tying a knot-pass, each of them hoping they'll never have to use it. Chalk bottles are refilled, Clif bars stuffed into backpacks, and load manifests recorded in guide field books. Pretty much anything you need to do to get ready for a possible 10-hour day in the mountains.

“33-mile, copy Tim.” “Go for 33.” “Yeah, just getting out of the valley here, plus-2 Celsius at 2500', winds are moderate out of the south. I'm seeing dragon's breath coming up the Chilkat, dense shwag over the Jarvis. The Back-9 looks closed.”

“Roger, plus-2, shwag, **dragon's breath**,” the flight follower confirms.

“We're going over to Nataga, 7:30 next.”

“Roger 7:30 next.”

9:30am: The filmers arrive back at 33-mile, unloading with generally long faces. They didn't get anything. I see their guide Tim talking with the producer, it looks like a serious conversation. He points to the sky, waves his hands, then shrugs his shoulders. The athletes do the same. I then notice him point towards my general direction, and they all turn to look. Like a rare animal, suddenly observed for the first time, they see the weatherman in all his glory. In this case, eating an oversized oatmeal raisin cookie and sipping coffee out of a styrofoam cup. I immediately retreat indoors for fear of interrogation.

Meanwhile, herding cats is already underway as we get clients ready to go heliskiing, but not too ready. The weather is not flyable at this point, and from my vantage point – it's not even close. We're waiting for the lead guide to give the go-ahead or the no-ahead, and he's looking at me to offer up something more than “potentially.”

“I'm going for a weather check,” I proclaim. Hurrying out the door, I head towards the company van and head down the road. The weather check is a tremendous opportunity to break the monotony of a long Alaskan day. Sometimes it's just nice to get off the base, enjoy a cup of coffee in silence, reflect on life, and look at beautiful mountains (and clouds). As I round the corner at the Chilkat Bridge, I see

the first glimpses of morning sunshine.

“33-mile, copy Nick?”

“Go for 33!!!”

Well she's certainly chipper this morning... “Um yeah, I'm seeing some **orbing** up towards Johnny Ward, perhaps **bridging** back towards the Takine. I'll keep an eye on it.”

“Rodg, let us know if you see a trend or any further **layer-thinning**!”

I pop the “Hank Williams Greatest Hits” cassette into the deck (the only source of music) and continue my morning meditation & meteorological mantras. I spy a young bald eagle enjoying his breakfast, along with some smaller spring fauna, apparently nesting. Only to be interrupted once more, “Yeaahhh, we're going to need you back at base. Tim wants to talk about the weather this weekend.”

“Tim, Tim, Tim...” I mutter as I flip a u-turn and head back to base.

2:45pm: Various versions of the previous conversation play out throughout the day, each employee offering their “expert” opinions and observations along the way. Or as I like to call them “ex-parte” opinions. Guides have even been known to meet in private and discuss the weather, this time incorporating several iPhones. Luckily, the weatherman isn't privilege to such conversations. Norwegians have their own “Norwegian weather model,” the same can be said with Canadians. God only knows what the Austrian film crew has cooked up in their motel room. We have a guy who attributes high pressure to chem-trails and government conspiracy, while another offers the highly-accurate proclamation, “it's going to pop, I can feel it.” I've even been taken aside by staff members, asking for the “real forecast,” as if I've been holding out on them all along. They offer hot breakfast at the café and fresh coffee as peacemaking tokens.

The day would not be complete without at least one fire drill, the errant boot-up, or a phone call to the pilots. And always, more than a few questions like, “Where is Barlow? I need him to look at the satellite.” Believe me, more than a few afternoon naps have been interrupted by benign orbiting.

Though by early afternoon, the ceiling has lowered once again, and it has started to snow in the Klehini valley. Regional observations eventually confirm the next cycle is upon us, and the lead guide calls it. With still time to savor an afternoon fishing for dolly’s (or maybe a steelhead), skinning in Canada, or playing on snow machines, we learn that today will in fact be a down day.

Indeed, every season has its own unique personality. Despite the context of this article, more times than not we actually do take people skiing. I can remember flying 28 days straight during the 2013 season. We couldn’t buy a down day, much less a snowstorm. Yet the work of the weatherman is never truly finished. I don’t have the luxury of taking a day off, simply offering a “no-cast.” Though in reality, aside from the financial burdens of helicopters meeting their minimum costs and reservation deposits, as operators – the weather forecast barely matters. Yes. It barely matters. If it’s sunny, we take people skiing. If we can’t fly, we can’t fly. If it snowed, we fly out and investigate. Try as we might to “read between the lines,” we are at the mercy of Mother Nature.

Like any forecast, despite hours of analysis, the weather forecast remains only a “best guess.” In my opinion, it is very much tertiary to the avalanche forecast or daily plan of operations. And also like any information, it’s important to take it as it comes, be skeptical, and ask questions. We need to prepare for the unexpected, and respect the limitations of the science – and the weather forecaster. So I say, let the banter continue. Let the closet meteorologists have their day and the unfounded meteorological prophecies resonate to the rafters. Carry on. Though, please, please – don’t bug me. I’m having my coffee.

“What’s the weather going to do?” – Whatever the heck it wants to. ▲



On top of “Hangover” for our last run of the day. One of my clients looks on as the sun begins to set and fog rolls in off Glacier Bay. Late April, Haines, Alaska.

Editor’s Note: This photo came in a close runner-up for winning the cover shot for this issue of TAR. Thanks Nick for sharing it!

SNOWFALL PREDICTION

Have you heard? About El Niño? Weatherman Joe Ramey, at the 2015 CSAW in Breckenridge, Colorado, offered a helpful graphic summarizing central Colorado’s prognosis for the coming winter. I’m no NOAA forecaster, but I am taking this straight to the bank. It sure looks to me like a country-wide forecast and should be treated as the authoritative tool for planning everything from pow ski purchases to guide staffing to control routes.

— Jediah Porter

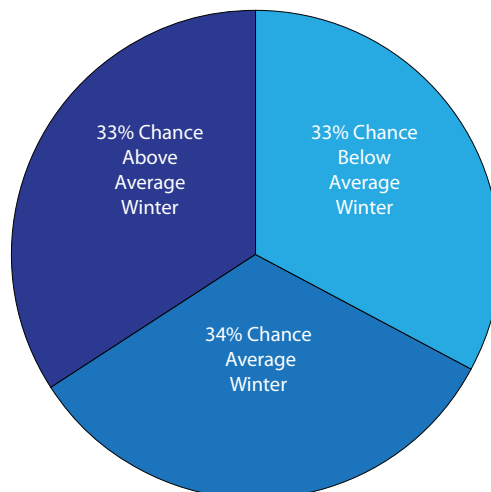


PHOTO COURTESY CENTER FOR SNOW AND AVALANCHE STUDIES

Rugged, Versatile Weather Stations

Senator Beck Study Site
Red Mountain Pass, Colorado



Real-Time Data

- Live graphs
- Web-based data display
- Datalogger with built-in web server

Wireless Networks

- Base stations w/remote substations
- Easily configured
- Multiple communication paths



Call or visit: 435.227.9080

campbellsci.com/avalanche



MENTORSHIP

How Does Guidance Affect Recreation Culture?

Mentoring and Coaching: Useful Distinctions

BY LYNNE WOLFE

In my research for this issue of TAR, I found several subtle distinctions within the overall heading of mentorship; most useful might be differentiating between the mentor and the coach. Coaching is usually implemented within an organization such as a guide service or ski patrol where a new hire can be assigned a coach, whose role includes identifying next steps/ improvements/ strengths/ technical skills necessary for the trainee to successfully complete the job or progress to the next level. The relationship can stretch to cover emotional and social topics required to be effective in the job.

As trainees enter a program, a structured/ assigned coaching process can be beneficial to each person and to the overall program. The older workers (think ski patrol or senior guides here) have years of tricks and insight, plus they understand how important it is to create big picture understanding at every level of experience in the organization. New guides and patrol can get personalized feedback, allowed to watch or participate as comfort levels rise, and become “young strong bucks” who have also had the benefit of their mentor’s experience.

A mentoring/ protégé relationship can evolve from that of a coach/ trainee, but the two aren’t necessarily employed by the same organization. It’s a very personal relationship, arrived upon mutually.

A mentor can certainly ask “how did the day go?,” but usually asks bigger picture, more penetrating questions that help the protégé progress personally. The mentor needs to have technical knowledge and insight based on experience, and listen well enough to help clarify the questions. The mentoring relationship helps process complex, wisdom related issues.

While exploring the coach/ mentor distinction, I was directed by Exum chief guide Christian Santelices towards Rick Beaton and Linda Wagener of Marigold Associates, as Exum and the larger mountain guide industry continue to explore the role of mentors and coaches in guide training. A phone conversation with Rick shed further light on the topics above, but one line of conversation got me thinking for days. Rick explained to me that, after the age of 50, people become less competitive and ego-involved in furthering their own careers, and more concerned with the big picture of their community and industry. As the mass of baby boomers exits the workforce, we need to replace ourselves with competent and energetic people who can take over effectively. Being an effective mentor becomes a higher priority as this older generation realizes that they don’t lose power through empowering others.

For about ten years now, I have run a very informal mentoring program through the AAA. A few people here and there have taken advantage of our position at the center of the community and industry to boost them on their way to professional status, including the late Craig Patterson. Right now it feels like time to add structure and theory to our program and inform a new generation of avalanche aspirants of how we could help them.

We’d like to offer you some tools to help you succeed as coach or mentor, as trainee or protégé, whichever vocabulary you’d like to use. Here are some tips and tricks for mentoring and coaching relationships taken from a seminar I took through Womomentum, based in Jackson, Wyoming. ▲

Here are some tips for mentoring relationships taken from material developed by the Center for Creative Leadership

Successful mentoring programs have:

- Organizational support for the program;
- Clarity of purpose, expectations, and roles;
- Participant choice, involvement and careful matching procedures;
- Continuous monitoring and evaluation.

Acquire Organizational Support:

- Program is part of an integrated management-development effort
- Organizational structures are created or modified to foster mentoring
- Mentoring is included in performance-appraisal process
- Communications processes for distributing program information within organization are anticipated and planned

Clarify Purpose, Expectations, and Roles:

- Goals and intended outcomes have been articulated and drive program structure
- Clearly stated time frames, expectations and responsibilities are established
- Orientation sessions are conducted in order to clarify roles and responsibilities
- Mentors participate in training sessions in order to clarify roles and improve mentoring skills
- Potential problems, such as unmet expectations, and their solutions regarding roles and responsibilities are anticipated

Emphasize Choice, Involvement & Careful Matching Procedures:

- Participation is voluntary and participants can withdraw from program at any time with no negative consequences
- Structured flexibility is built into program (participants are allowed some freedom in defining their relationship and program activities)
- Both mentors are involved in the selection process
- Mentor pairs are matched carefully based on program objectives and criteria
- Mentors work in teams of two
- Participant input is encouraged in ongoing program design, implementation, and evaluation

Include Continuous Monitoring and Evaluation:

- Monitoring and evaluation processes are ongoing and consistent, modifications to program structure are made based on results
- Program evaluation utilizes multiple criteria (both process & outcome criteria)
- Short-term and long-term criteria are included in program evaluation
- Mentor pairs are monitored by self, peer and supervisor (Research from Center for Creative Leadership)



Mentoring helps the new guide see beyond surface conditions into layers of importance.
Photo Josh Parker

The Importance of Mentoring

BY JOSH PARKER

After spending much of the last 10 years working in dynamic natural environments as a backcountry ski guide and wildland firefighter (hotshot), I have become a huge advocate of mentorship. We work in fields that require complex analysis pertaining to risk management: a working knowledge not only of terrain, weather, and snowpack, but also that of the Self.

While important—even crucial—learning comes from your peers, where you have an opportunity to develop your personal style and the space to make decisions, mentoring provides exposure to specific systems such as ritualized safe travel protocols, information gathering, formal and informal communication styles, technical systems, leadership, as well as broader topics including local history, self-awareness, and risk tolerance. The importance of this becomes ever more crucial as complexity increases.

We are in a very exciting time, with amazing access to formal training. Avalanche education, through research, application, and practice has been taken to new heights. The guide certification track offered by the AMGA is becoming/has become the industry standard for guiding. Mentorship remains to be the link to continuing education and the professional development necessary to excel (survive) at our trade.

As we continue to see growth and interest in backcountry conditions the role of mentoring becomes more and more important if we are to instill active participation and engagement in our avalanche communities. Will we keep up?

If I really look back on the various skills I've developed as a skier, firefighter, life-partner, friend, and hack carpenter, in every situation there was a mentor whether formal or informal, to frame and model those skills. When I reflect on the experiences shared with these individuals it's not only the skills or techniques acquired, but ultimately the very model by which I choose to conduct myself. We put ourselves in a position to be successful by aligning ourselves with those who are. We reward those who seek to become better, who humbly and willfully acknowledge what is unknown. Becoming a mentor brings into focus the processes we have adopted. These processes allow not just for the growth of the student, but also that of the mentor.

I remember the days of being young and bold and truly wanting to KNOW avalanches, and being frustrated as a student. To my mind at the time it had to be black and white. What I have fortunately had is time. Time to let those lessons set in. Time to reflect on what my instructors, friends, and mentors wish they could've, in the moment, been able to impart. Wisdom. Acknowledging that "stability detection is an incomplete science" (I just checked my level III evaluation) and therefore to behave accordingly. That wisdom has come, at least enough to know there is a whole heck of a lot I don't know, through patient and diligent mentorship.

Coming up for air after a long fire season here in the northwest I was not surprised to feel the nudge from a familiar source, a friend and mentor asking if I had a few words on the importance of mentorship, the turn once again to break a little trail and I can't help but smile anytime the familiar words "get out there youth" now leave my own lips. ▲

Josh Parker spent thirteen winters chasing snow on the Westside of the Tetons. He now lives in Cashmere, Washington where he is a Senior Firefighter with the Entiat Hotshots. He spends his winters guiding for Teton Backcountry Guides and in the spring months guiding for Black Ops Valdez. He is crazy about his wife Sarah and dog Eddy, and strives to be on the cutting edge of caffeination.



ON MENTORSHIP

BY DOUG KRAUSE

I feel like I had to learn most everything the hard way, and that made learning slow and difficult. It's remarkable that I was able to navigate that early to mid-avalanche learning curve mostly unscathed: some cuts and bruises, close calls and small rides, but nothing dramatically traumatic. I suppose those difficulties and close calls are part of the reason I believe strongly in training and mentorship, just part of the reason though.

Effective mentorship makes life better for everyone. For mentors, it's easy to feel like it's a burden, but if we raise the operational competency of those around us (whether fellow bc skiers or junior professionals) doesn't that ultimately make everyone safer and everybody's job easier? For professionals, I think mentorship is a responsibility.

We have to be proactively available for and open to communication. I see mentorship as more of an open dialogue than a hand-holding process. Crusty vets can seem unapproachable. If you're a vet, solicit questions and opinions. Go out of your way to make sure the juniors understand that we're all in this together, and we can talk. Be sincere.

If you're a rookie, or shorter in the tooth, don't be afraid to approach. Speak up. That question you ask may be the one that saves your life. None of us have it all figured out. If your learning curve is slowed by lack of input or feedback, the whole team suffers, not just you. Mentorship is a shared responsibility.

It took me a while to start asking questions, but when I did, folk responded. There have been a few critical times in my career when I reached out, gasping for air: nobody left me hanging. If you crave input, and it ain't coming your way, make it happen. Not everyone will respond, but some will.

Professionally, I consider it a small victory whenever some timid soul hesitantly approaches me with a question or a problem. I worry most about the ones that never ask. If they fuck up, I feel partly responsible, maybe I should have tried harder to be available. ▲

MENTOR (In the Odyssey) a loyal adviser of Odysseus entrusted with the care and education of Telemachus. A wise and trusted counselor or teacher.



Juris Krisjansons and a 75 recoilless rifle, early days at Jackson Hole.
Photo courtesy Margo Krisjansons

BY MARGO KRISJANSONS

I have been so very fortunate to have had numerous mentors in my life and they have had a great influence on me. The following two stand out.

Jim Kanzler, (Rat Hole), introduced me to the rock climbing world and avalanche awareness. Jim took me under his watch during snow reduction work at the Jackson Hole Ski Resort. Our routes were serious and he always had me posted in the right place to spot him and observe exactly what he was doing. He always explained carefully his thoughts and prepared me for what he was about to do. I felt I was respected and trusted. Jim believed I would be able to locate him with a transceiver and probe and shovel if need be. Because of his trust, I gained confidence in what I was doing and it made me want to keep learning as much as possible and train and train and be the best ever. There is a quote from Jim I always remember and share it quite often, “Always watch out for the first bluebird day after a storm period.”

Juris Krisjansons, master of terrain management! I climbed with Juris on many big alpine peaks in the Canadian Rockies. We worked together for Mike Weigele Heli Skiing. Our work guiding placed complete emphasis on snowpack, weather, and reading the terrain. There was no use of explosives for mitigation of avalanches. The trust and belief he had in me to follow his directions, keep a cool head in moments of uncertainty and while working around helicopters was invaluable. I listened carefully and worked hard to keep his confidence and trust in me and gain the respect of the other guides. Becoming a valuable member of the team is the reward. A quote from Juris I always remember, “Don’t be too quick to jump out there, hang out a bit and get the feel for what you’re getting into. You can’t miss a trick.”

Now at my age it feels only natural to start passing on the wise and kind mentoring that I was so lucky to have had passed on to me. ▲

BY AARON DIAMOND

“What makes someone a good mentor?” Its an question that inevitably pops up at some point during a level 1; usually it follows an introduction of techniques to combat the wick-ed learning environment. As a young avalanche professional I find that I’ve finally acquired enough skill to usually make the right calls on a day-to-day basis but lack the necessary road time to recognize the strange stuff that might only pop up once every decade or two (or three!) that will kill me just as fast as a bad call on a new windslab.

So, what does it? What make someone a good mentor? I polled a few coworkers and friends (Mostly mid to late 20s with 1-5 years experience as a snow pro) and across the board most of the responses were quite similar and not surprisingly they are the same things that make up a good ski partner in general. Here’s the top seven:

1. **Similar Goals** - The mentor and mentee had to have similar goals for the days they spend together. If two people leave the cars with different plans for the day most likely no one will return to the car 100% happy with whatever compromise what made to their plans. Which ties into the second point...
2. **Risk Tolerance** - Although in the long run a conservative mentor might be a good thing for an aggressive decision-maker, if the difference in risk tolerance is too large once again its likely the mentee will likely return home disappointed with the choices of the more conservative mentor. It goes the opposite way as well (aggressive mentor/conservative mentee) but with much less frequency in the professional world.
3. **Communication** – A good mentor should be in relatively constant communication with their mentee about why they want to make the go or no-go call as well as the observations that they make along the way.
4. **Patience** - A good mentor should have the patients to answer the questions that might come up along the way, as well as the patience to let a mentee figure out a problem on their own or make (non-fatal) a mistake or two.
5. **A willingness to hand over the reins** - If a mentee is never in the lead, they can find themselves a bit lost when their mentor is not around. Having a mentor that lets a mentee take the lead while reinforcing the good choices and helping (not shaming) them away from poor choices is invaluable to growth.
6. **Knowledge** - This one probably goes without saying. If you don’t know you can’t show.
7. **Humility** - I learn much more from the times I have botched a call or gotten in over my head then the times everything went perfectly. A mentor that is willing to admit when they made a mistake will teach somebody much more than somebody who brushes off a near miss or close call.

I’d like to thank the folks that helped me out on this: Ty Guarino, Opie Jahn, Joel Bettner, Derek Lennon, Brian Johnson, Kevin Chartier, and Stuart Slay. ▲



Jerry Roberts dispenses knowledge to his Prescott College Avalanche Forecasting class, except for one student, who is intent on figuring it out for himself.
Photo Jerry Roberts collection



MENTOR: a wise and trusted counselor or teacher.

GURU: an intellectual or spiritual guide or leader. Any person who counsels or advises.

BY JERRY ROBERTS



Ed LaChapelle stands here holding a rain perennator. In 1972, he was a consultant for BSAAR, a research group associated with the University of Colorado and directed by Dr. Jack Ken. Ed was responsible for getting the contract from the Bureau of Reclamation for the project in Silverton. He reported Richard Armstrong to run it. The glacier and snow physics report from the University of Washington began spending his winters in Silverton instead of Mo. Then and now, Ed LaChapelle is considered one of North America's premier avalanche experts. Photos from Dickson LaChapelle Collection.

A photo of Ed LaChapelle from Jerry's book about the San Juans, *Living (and Dying) in Avalanche Country*.

I usually avoid using the word guru... not that its meaning cannot be inspiring. It just seems cliché. But I found a workingman's definition that expresses the essential nature of both mentor and Guru. "One who knows how to say the right thing at the right time and get the best out of you." That felt about right when reflecting on two influential people in my early avalanche years and throughout my life of snow viewing: Rod Newcomb and Ed LaChapelle.

I met Rod in Silverton in the 70s. He was quiet, energetic and a keen observer. A minimalist with words, but when he did talk it was definitely worth paying attention. I think Rod's general educational philosophy was "learn by doing."

Time spent with Ed was filled with stories about Chile and the mines that we both worked and discussion of the perfect Pisco sour recipe. He loved scientific methodology and empirical evidence as a scientist but was also intuitive. He was a mentor to many and I think he and Rod shared the teacher/student role with one another. The Evolutionary Snow Science Tree has LaChapelle's fingerprints on everyone in the industry because of his teaching, fieldwork, published books and papers.

I took my first avalanche course in Silverton, Colorado from Newcomb and LaChapelle in the early 70s. A small group of us stood on a high peak sharing space with them after digging a few pits that surely exposed a typical weak pack, but we were too ignorant to realize the danger at the time. They engaged us with questions and dialogue in their Socratic methodology (discussion between individuals, based on asking and answering questions to stimulate critical thinking and to illuminate ideas). We talked about options and then skied the edge of the open slope. Later, after the maestros carefully worked their way down the old-man route (safe route in the trees, spotting one another), I remember Ed saying, "You'll probably die skiing lines like that in this snow climate." It was a direct, matter-of-fact response, not a sermon. His gentle admonishment stuck with me. He was a natural teacher.

Rod's review of our decision was instructive and spoken with humility. "You've got a tiger of a snow-pack in the San Juan. You can never be too careful." When I was out hunting Newcomb's tigers later in life I often reflected on his sage words. It helped keep me on edge. A good dose of fear makes one more humble and open to ideas.

Both dispensed their wisdom with ease. What they had to say about the fragile continental snow-pack or any snow subject was always pondered and absorbed. These guys were pro and if you had the opportunity to spend time with them, of course you did. There were no finer mentors sharing their knowledge and experience. I was fortunate to have interacted with them.

Over the years I had the privilege and pleasure of working avalanche courses with Rod and can't remember a time I didn't learn from him. Things that I stashed under my guide's 'hat of tricks' for staying alive and for the 'someday' I might mentor.

My opportunities came later down the road. I had more than 20 years teaching and interacting with Prescott College students who arrived every year in Silverton to spend the month of January studying snow science and avalanche forecasting. Relations were good with the Prescotters, always looking forward to each season, the mother duck and her ducklings wandering around the San Juans. The program allowed enough time to pass on local knowledge and the rules of the road that I think were beneficial to those folks, whether they knew it or not. It was good fun and I always picked the next year's student assistant who was the current "star" of the month. Quite a few folks from those courses went on to teach for outdoor educational programs and a nice percentage took forecasting & snow safety positions at various places. I also mentored my wife to help make her a better person.

My years forecasting for CDOT/CAIC on Red Mountain Pass allowed me to work with interns we handpicked; each usually stayed two seasons... Five interns became forecasters and remained to work the Hwy. 550 corridor. Three are still sweeping storm boards and shooting avalanches on Red. Most of the others who labored out of the Silverton office joined snow safety programs in North and South America. The intern program was a proven winner; it provided the intern two seasons for picking up skills and experience needed to work for CAIC, CDOT, and other snow safety programs.

Abstract/Random thoughts for student/mentor relationship:
Respect... Humility... Share knowledge/experiences....
Learning is symbiotic.... Mentoring is an honor, so is learning
... Have some fun... and don't take yourself too seriously.

Good student/mentor relations are important and can be challenging at times. But, generally they evolve into delightful connections with someone who will probably take your job, but isn't that what they are supposed to do? ▲



Rod Newcomb: "I still have a thousand lessons to learn. If I survive avalanches, I'll die of old age before I become an expert." Photo from Rod Newcomb.

Rod Newcomb, deep in the snowpack, in a shot from Jerry's book, *Living (and Dying) in Avalanche Country*.



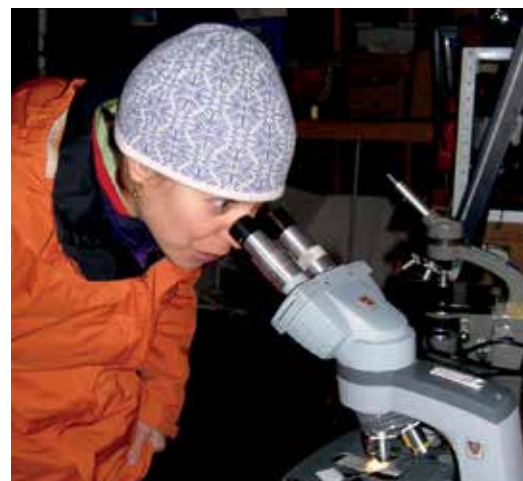
"The word 'slave' is so degrading. Why don't we call you 'intern'."



Tim Lane, star CAIC intern, and his famous cowboy hat CDOT helmet.



Author Jerry Roberts on the right, next to the Brit, Mark Rawisthorne, and his now grown-up avalanche dog Reggie.



One of Jerry's Prescott College students, Lisa Issenberg, now Mrs. Roberts and, as Kuitellä, the maker of our AAA biennial awards.

OF MASTERS AND APPRENTICES

BY JAKE HUTCHINSON

More than once in my life I've been told *"It's better to be lucky than good"* and as I look back, I think I got lucky more than once, and with a little good fortune, some hard work and some people seeing something in me that I didn't at the time, it all came together to forge this career in the snow and avalanche world.

The reality for me is that I was in the right place at the right time to have the opportunity to take a chance on a few jobs I wasn't truly ready or qualified for, but I wasn't afraid to tackle the challenge. I'll start with the obvious; there are a few moments in my life that no one can take from me, that I

hold of great importance in forging who I have become. The first is the day I walked across the parade deck at MCRD San Diego – the moment I had earned the title US Marine. The second is the day Rod Newcomb called me on the phone and asked if I would be interested in working for him and the American Avalanche Institute. I had worked damn hard to earn the title Marine, but Rod's invite caught me off guard, I had previously given a quick season history talk or two for AAI but didn't really consider myself an educator and certainly wasn't ready or qualified to work for Rod, I mean hell, I had only recently completed my Level 2 the previous season, but like the ambitious (possibly aggressive?) person I am, I said yes. As I look back, the obvious mentors stand out as being so important to how I developed as an avalanche instructor and professional: Rod Newcomb, Tom Kimbrough and Rick Wyatt primarily filled that role, but it dawned on me as I began to write this piece that it started much earlier...

Ultimately, and maybe obviously, it started with my parents; Dad was a volunteer patroller at Parkwest, which provided a free season pass from the time I could walk, Mom came up the hill on Saturdays and was a critical part of teaching me to ski. After that, I have to give some credit to my grandfather; he fairly but very firmly taught me the value of hard work and an honest

work ethic while I worked for him after school in high school. The Marine Corps taught me something about doing the right thing and doing things right despite the obstacles, or maybe because of them? Once I became a ski patroller I realized that to varying degrees my original patrol director and then the assistant snow safety director had huge influences on me, but the big mentor that was just under my nose all these years was Mike Ruth. Mike was largely responsible for bringing AAI to Park City and in turn was directly responsible for my introduction to Rod. Mike is a tough love type of mentor, he tells you exactly what you're doing well and pulls exactly no punches in making sure you know what you're doing wrong, often without regard for the recipient's feelings or state of mind. For me, it was a motivational learning style that pushed me to get better with each course I taught.

So back to my early career with AAI, here I was a young and motivated instructor teaching and learning alongside these legends of our career. They all had extremely contrasting styles and backgrounds but the depth of knowledge was overwhelming. I have a Rite-in-the-Rain book that is full of one-liners and sound bites that caught my ear over the years, as I glance back at it, some of them make no sense without the surrounding context and others are gems that helped various lights go on over the years.

In time, Rod trusted me enough to essentially take over AAI in Utah, which planted the seeds to begin my transition away from my resort job and into the full time teaching world. Ownership of AAI changed, Rod retired, then Tom retired, Rick moved on to other things but in the new ownership of AAI I was suddenly working side by side with Don Sharaf. I didn't know Don, and was a little intimidated to be honest, but with a little time I realized he was a mentor and a contemporary, I like to think we both push each other to be better at what we do and better understand this crazy world of snow and avalanches.

But finally, I realize my most valuable mentors are the snow, the mountains and the students. The snow and mountains will likely teach me as long as I venture into them, I have no notions that I've figured it all out and I approach with an open mind ready to learn. The students are key to my learning though, they bring enthusiasm for topics I have grown long bored with, they ask questions I've never heard, look at snow in different and sometimes exciting ways that open my eyes and mind to different ways of looking at things. They force me to always be on my 'A' game – no one wants a teacher that isn't knowledgeable and enthusiastic – but ultimately they challenge me, they ask about things I'm unsure of or don't know, requiring me to spend time learning and researching, they look to me for answers I may not be able to provide, maybe no one can, and I like to think the honesty and experiences I've had, help the students realize how much uncertainty may lie on any given slope on a given day.

I think the biggest thanks I can give to those who mentored me is to continue to pass along the things they gave me and to be a mentor to others, I like to think I'm doing an ok job at mentoring the younger folks around me and I continually strive to be better. In the end though, the snow and mountains will always be my master and I will forever be the apprentice. ▲



For photographer Jake Hutchinson, this photo captures his mentors, Tom Kimbrough (left) and Rod Newcomb (right) at home in the mountains.
Photo Jake Hutchinson

**We are all apprentices
in a craft where no one
ever becomes a master.**

—Ernest Hemingway, *The Wild Years*

OF TIME AND TEACHERS

BY TOM KIMBROUGH

Imagine a time when there were no avalanche classes, no advisories, not even any books on avalanches. It wasn't a big deal though because there were only a handful of backcountry skiers and zero snowboarders or snowmobilers. But gradually ski equipment got better and a few resorts were beginning to put their guests onto avalanche terrain. Here and there a small number of Forest Service rangers began paying attention to the snow and the weather and the terrain. Their job was to keep people from getting killed on public land...

I only saw him on a handful of occasions. A few times I came into the patrol room and there he was, sitting with Norm Wilson in the office. I quietly did my business got the hell out. The first time I saw him, Bernie whispered in my direction, "That's Monty!" Monty Atwater, that is, the Man, the guy who, along with Ed LaChapelle, invented the whole thing... snow science, avalanche control, the nomenclature, the whole idea of "avalanche professional" as we know it in North America. He authored the first edition of "The Avalanche Handbook" in 1952. He was Alta in the 40s and 50s, the Squaw Valley Olympics, the Avalanche Hunter.

Monty was very old, ancient really, in my eyes, but we would see him out skiing from time to time. Once he stopped on the unloading ramp where I was on stand-by. He thought we should close the High Traverse: It was a warm spring day and the snow was getting dangerously sloppy. I said, "Sure" and checked with Norm. The answer was quick, "If Monty says it should be closed, close it!" He was Norm Wilson's mentor.

This was about forty years ago, California in the 60s, the Age of the Hippy, Haight-Asbury in full swing, the Golden Age in Yosemite. Monty didn't live much longer and his health faded towards the end. I heard that he put in an appearance at the first National Avalanche School to a standing ovation. And with good reason: Atwater started the first organized avalanche training at Alta in the 50s.

In the 50s and 60s if you wanted to learn about avalanches, you had to get a job at a ski resort that had avalanche problems. As snow ranger jobs were scarce as hen's teeth your best shot was getting on as a ski patroller. Then, if you showed interest and aptitude, somebody might start feeding you the basics.

When I arrived at Alpine Meadows in 1967, Norm Wilson was already carrying Monty's teaching into the future. Those of us lucky enough to be at Alpine in that period had our guru just as Norm had Monty at Squaw. The early morning pre-control work briefing sessions were pure gold, followed by a practical lesson in terrain and route finding, snowpack layering and avalanche behavior, topped off by some good powder skiing! Life as a young patroller was good. I'm sure it still is.

There was still no way in the early seventies for a person to learn about avalanches without being somehow involved with the ski industry. The National Avalanche School was the only organized class, taught once every two years and mostly attended by Forest Service people, ski patrollers, and a few guides and ski instructors. But now backcountry skiing was looming on the horizon. Ski touring equipment was improving and becoming more available. The Telemark turn was resurrected and resort powder was getting tracked out ever faster. In the sixties around Tahoe I don't recall ever meeting a backcountry skier that was not in my group. When I frequented Teton Pass in the winter of '72-'73 there were others out there; not many, but sometimes there would be an up track in and a few lines skied on the better runs. One of the Teton Pass skiers was a guy named Rod Newcomb. I didn't get to know him because most of the time he was off in Colorado doing avalanche research.

At the end of the next winter Rod's research job ended, probably due to lack of funding; not because they had learned all there was to know about snow. Rod saw the developing thirst for avalanche education and started the American Avalanche Institute in the fall of 1974. That first winter he taught in Wyoming and Colorado but the need for education was also growing in Utah and in the Sierras.

Norm quit working at Alpine Meadows in the early seventies to work full time as an avalanche consultant and when Newcomb looked for someone to help him with AAI courses in California, Norm was the obvious choice. Lean, steely-eyed and endowed with a razor sharp mind coupled with a ready smile, he had long since earned Monty Atwater's mantle as the Avalanche Guru of the Sierra.

Over the years Norm taught hundreds of students, passing on Monty's legacy and his own hard won wisdom. A generation of students grew up under his instruction at National Avalanche Schools, AAI courses, and as his plentiful personal apprentices. Those students are a magnificent monument to Norm's life work. Who knows how many are alive because of his teaching? Some of them now teach to a new generation what they first learned from Norm.

It is a different world now. There are avalanche centers in every western state. A couple of clicks of your mouse get you a fancy graphic avalanche advisory with links to remote weather stations. The Salt Lake area alone will have about 20 avalanche courses this winter. Last winter in Salt Lake over 10,000 high school and junior high kids heard avalanche awareness talks. A Wasatch snow and avalanche conditions internet site had 93,000 hits last year. Backcountry skiing, snowshoeing, boarding and snowmobiling are big business with lots of \$\$\$\$ at stake.

And now I'm very old, ancient really. I suppose a few young ski patrollers whisper behind my back, "That's Tom Kimbrough!" and think I know something about avalanches. Of course, I have mostly learned how much I don't know about avalanches. Monty expressed the same feelings in his conclusion to "The Avalanche Hunters" and I'll bet Norm felt the same way. The Young Hunters "were tough, eager, their nerves still unfrayed by too many close calls, their confidence still unshaken by too many bad decisions." (Even if you luck out, those bad decisions haunt you.)

But those Young Hunters that Norm has taught will go on to learn more than we can imagine about the snow; better ways to evaluate conditions and better methods for teaching what they learn to still newer students. Some of the people that I have mentored are breaking new ground; they are the legacy of Monty and Norm and Rod and the others of our generation and a fine legacy it is.

Atwater wrote on the last page of "The Avalanche Hunters": "I feel privileged to have been fated to play my part. I have loved every minute of it: the triumphs, the defeats: the frustrations, the half victories; the controversies, the Hearts games; the rescues that ended in tears and those that ended in the nearest bar; the Spectaculars, and the day-to-day drudgery."

Good words from Monty for Norm and myself.

Thanks, Norm. You gave me my life's work. ▲



Editor's Note: The story at left first appeared in TAR 24.4, almost ten years ago. We thought that it was worth reprinting in this History and Mentorship issue of TAR. Thanks, Tom Kimbrough.

MY MENTORS

BY TOM KIMBROUGH

Stearnie died last winter. He was 93. His passing wasn't an ordeal. He told me recently that he slipped and fell while going out to the wood pile and lying there in the snow felt so good that he almost just stayed there. But he didn't; he got up, fetched the wood and kept the fire going.

My older mentors are just about gone. There is one old guy left over there on the west side of the Tetons but he didn't look so good when I saw him at Stearnie's memorial. There are several people younger than me that were also mentors. Most of them are still in fine fettle.

Drew Hardesty recently asked me about my mentors and I realized that I should be paying tribute to them. Here is a partial list:

Norm Wilson: My life model, an impeccable avalanche professional. He taught me the basics that kept me alive through a long career.

Bernie Kingery: Hard work always pays off. (I am honored to be a recipient of the Bernie Kingery Award.)

Peter Lev: Charts make more sense than just numbers.

Onno Weiringa: Keep notes. Always write things down. They will make sense later and they keep you from fooling yourself.

Bruce Tremper: He gave me the space to learn to trust myself and he showed me how to teach others.

Brad Meicklejohn: He showed me what was possible in the backcountry.

Steve Jones: My route leader on High Greeley and North Rustler at Alta.

Tom Milligan: Taught me what it means to be tough.

Stearnie: The consummate woodsman who gave me the Far North.

There are more, many more. I have learned from my students in Level 1 classes. I have learned from my own protégés. I have learned from my wives and my son.

I guess that's the message. Don't stop learning. ▲



The 1970/71 Alpine Meadows Ski Patrol. Norm is in the center and I am behind him and to the left (photo left). That was my first winter at Alpine and the winter of my ski cutting experience with Norm. — Larry Heywood
Photo Robie Wilson Litchfield Collection

Norm Wilson, My Mentor

BY LARRY HEYWOOD



All photos of Norm from the Robie Wilson Litchfield collection

Larry Heywood was a long time patroller, Patrol Director and Director of Mountain Operations at Alpine Meadows. He is currently a part time avalanche and ski safety consultant and a full time fly fisher.



I first met Norm during a ski patrol job interview in the fall of 1970. He was the seasoned Mountain Manager at Alpine Meadows. I was the 22-year-old looking for an adventure. This was an interesting time in the U.S. with flower people, war protestations, drug experimentation, Dr. Timothy Leary, and long hair, none of which Norm approved of. That winter I had a steep learning curve, avalanches, explosives, fierce storms, zero vis and learning to ski powder. My first route with Bernie Kingery, in a white out carrying 40 pounds of explosives scared the shit out of me. In the years to come this would all become somewhat routine but that first year was exciting and especially memorable.

One day an avalanche route that first year particularly stand out from the many I have experienced. I was assigned with Norm to do the Low Peril Route, a relatively easy wind-protected route on the lower mountain. But nevertheless somewhat intimidating. I was still working on my powder turns and I was with the Man, Norm. Low on the route in Gunner's Cirque, Norm instructed me to cut the slope. This was new to me and unlike more recent times, well, let's say there wasn't a lot of training. As I cut across the slope it fractured above me, knocked me over and I was carried a short distance down the slope. To this day I think Norm know exactly what was going to happen, knew I'd be OK and decided to teach the rookie something about avalanches. That experience, probably more than any other that season, sparked my lifelong interest and career in snow and avalanches.

Late in Norm's life I spent some time with him recalling some of his experiences and discussing snow and avalanche behavior. He shared many of his experiences with me during these visits. During the 1970s and 80s Norm was one of the few avalanche consultants working in North America. His work took him all over South America, Canada, Alaska and Western Europe. One of my favorite stories was from Norm's time working on the Alaska Pipeline. Norm was out in a small two-man bubble helicopter conducting an avalanche assessment for the pipeline. After conducting some survey work, Norm and the pilot were preparing to take off from a windswept ridge somewhere in the middle of nowhere. Unbeknown to them the helicopter had disturbed a large mother brown bear and her cubs. As the helicopter was winding up, the mother bear started to charge it from a distance. Needless to say there were some tense moments as the pilot tried to rush the takeoff with some colorful encouragement from Norm. As the helicopter lifted off the bear rose up to its full height and reached out to grab it, just missing the skid by inches. Norm recalled looking down at a very large, very pissed off bear only a few feet away and that if the bear had reached the skid, it would have brought the helicopter down.

Several years ago, after Norm's death, the California Department of Transportation hired me to do an assessment of the Highway 88 Carson Pass Avalanche Program. This is one gnarly road over one of the snowiest passes in the west. Apparently prior to the 1970s the road was closed in the winters but with the opening of the Kirkwood Ski Area and an increasing need for an alternative road in the winter, Cal Trans decided to explore the feasibility of keeping the road open in the winter. Sometime in the early 70s Cal Trans hired Norm to do an avalanche hazard evaluation and to develop a control program. As part of my review over 30 years later I was provided Norm's field notes from his evaluation. Norm had kept detailed daily notes of his fieldwork. At the time of Norm's work this was a very remote area completely isolated in the winter by snowed in roads. Norm's notes described his solo surveys during fierce winter storms, stashing explosives along the ridgelines above the road during the fall for later use in the winter and then his solo explosive control in the winter along the Pacific Crest. Something that Cal OSHA might frown on nowadays and worlds apart for the resources available to current avalanche programs.

Norm used to like to say something like, "I get paid for what others pay to do for vacation." He was an avalanche hunter, the likes of which do not exist in today's highly regulated world. I am forever indebted to Norm for putting me on to a path that would become my life's work. That one moment it time in Gunner's Cirque when Norm when showed me the power, excitement and beauty of avalanches. ▲

Mentorship in the Guiding Community

BY MARGARET WHEELER

In recent years mentorship has emerged as a key piece for guides to gain valuable experience as they move through their AMGA education. The AMGA encourages students to seek mentors as a vital part of gaining experience in the industry. Skills and techniques taught on AMGA programs require focused practice in application, and mentorship is a way to gain this practice with some guidance.

Yet we hear from our students that they are struggling to find mentors, and we see on programs that students are not gaining the experience they need to develop between courses and exams. As a result, we see consequences on both ends of the spectrum; some candidates struggle to achieve the level they need to succeed on advanced courses and exams, and some finish their AMGA programs easily, but are more likely to fall prey to the trap of overconfidence. This situation is at best frustrating, and at worst, dangerous.

The problem is this: mentorship takes time, and time translates to money (or time spent not making money). So even though the AMGA encourages students to find mentorship as they progress through their AMGA education, we haven't provided enough structure or resources to do so. As a result, those folks who are naturally outgoing, or 'in-the-know', or good at networking – they tend to be able to find some mentorship. But that leaves a lot of folks behind.

What can we do to foster more mentoring across the population of guides?

At the October 2015 Annual Meeting, the AMGA hosted a workshop entitled 'Building an Inclusive Culture in AMGA,' facilitated by Erica Engle and Derek DeBruin. The focus for this first session was women and the guiding industry; the event went so well that it has become the kickoff for the AMGA's big picture goal to better support diversity of all kinds, both on our programs and out in the workplace.

There was so much great stuff – discussions and ideas – but one of the main action items was to build resources for mentorship for everyone. Some resources will be specifically designed to increase mentorship for women in the AMGA and guiding industry, but the overall design aims to accomplish two goals: First, give mentors resources about what to do and how to do it. Second, provide resources (info, events, and tools) for guides seeking mentorship. Stay tuned! ▲

Margaret Wheeler learned to ski and climb at an early age in New England. Her guiding career began in the northwest in 2002 when she began working for Pro Guiding Service as an aspiring guide. In 2006, she became the second woman in the United States to complete her international AMGA/ IFMGA guide certification. She is an instructor/examiner of guide training for the AMGA and serves on its board of directors. She is involved in avalanche education as an AIARE instructor and trainer. Margaret is co-author of the book *Backcountry Skiing: Skills for Ski Touring and Ski Mountaineering*.



ON MENTORSHIP

BY DON BACHMAN

My mentors were Dick Stillman and Ed LaChapelle. I was fortunate to become attached to these legends who learned their craft through experience so that their successors (if there were such people) could benefit from their misfortune and lessons. The influence of Noel Peterson (avalanche gunner for CDOT) and Jack Morrow (Alaska DOT Maintenance chief for south central) introduced me to the public and administrative realities of avalanche forecasting and control. I saw plenty of avalanches in motion in my early years so knew that non-involvement with such motion was far more certain in the spring, and I confined most of my backcountry descents to spring sweet corn and mild temperatures.

My advice would be daily familiarity with terrain in question, development of pattern recognition instincts, and safety options in all circumstances of choice. Occasionally there would be little choice in rescue and some control situations; thus the build-up and accumulation of good Karma would also be utilized. ▲

PHOTO: Hansi Heckmair

BEING PREPARED
EDUCATION AND PRODUCTS
FOR MAXIMUM PROTECTION

We show you how to stay safe –
in the **SAFETY ACADEMY LAB**
on ortovox.com

ORTOVOX

TEAMWORK

Seal Team Soup

BY DOUG KRAUSE

Teamwork is a critical skill for avalanche operations. Teams enhance productivity and increase our margins of safety. Strong teams are highly adaptive, resilient, and able to implement complex solutions. They can be more creative and have broader bases of knowledge and experience than individuals. Whenever possible, we operate in avalanche environments as a team because that is the safe and smart way to do it. But often, what we think is a team is no more than a group.

A team is a well-defined set of two or more people who interact dynamically, interdependently, and adaptively towards a common goal (Salas, 1992). Teamwork describes how teams get things done. In contrast, a group has members with more individual autonomy that are less interdependent. Groups may have multiple conflicting goals, and they do not cooperate the same way as teams. It's a subtle distinction but an important one. A group is a loose collection of dudes on a mountain, all mostly doing their own thing; a team requires leadership, communication, operational awareness, cooperation, and the appropriate culture.

How many of us train for teamwork in our avalanche worlds? Crickets? Hopefully at least a few nodding heads. Team building should be a priority for those who expose themselves to avalanche hazard; that requires knowledge of the individual and collective skills that enhance teamwork. Fill your cup of coffee and crack a window; we're dropping in.

Leadership

Every team needs a leader, right? Well, I will grant you that every team needs leadership, but whether that needs to always be concentrated in a single authority figure is a different issue. Leadership responsibilities include planning, oversight, example, and empowerment.

Planning is more than developing an algorithm for process. Planning establishes goals and priorities: what needs to be done, what parts of that are most important, and what parts are less critical.

We want to open runs A-Z today. I'd like to have A-F open by 09:00 and G-R by noon. If we can't get S-Z, that sucks, but that's the way it is. Let me know ASAP if anyone encounters problems.

TOP: Tsugaiko Kohen Ski Area in Japan: A team's diversity can be a strength and a challenge.

BOTTOM: SMSA Correctional Facility: Guiding is teamwork.
Photos Doug Krause



During planning, leadership establishes the roles and responsibilities of team members. Members need to know their place and the place of their peers with respect to each other and the goal. Roles should be clear, but not so rigid they inhibit flexibility.

Leadership ensures that everyone is on the same page and has a common frame of reference; this type of awareness is called a **shared mental model**. Planning initializes the shared mental model that guides situational and operational awareness. The shared model is a communal understanding of the problem and the plan for addressing it. The model needs to be clearly articulated at the beginning of a process, like during an AM meeting. *Here we are today, this is the problem, this is what we're going to do about it, and this is how we're going to do it. Questions? Get to work.* Shared mental models are a critical component of teamwork.

Leadership is responsible for oversight in the sense of keeping tabs on the big picture and managing the flow. Effective oversight syncs action, resources, and knowledge to maximize safety and efficiency. It reassesses context; have things changed? Sometimes oversight requires disruption: *Hey, wtf is going on here? Why is that on fire?* Oversight guides the team's flow along the most efficient path. It keeps us on target and guards against task fixation.

Leadership owns the culture, and it does that by setting the example. Teamwork culture has vital elements that need to be supported, demonstrated, and perpetuated, not just dictated. Exemplifying the cultural ideal sets a standard and defines expectations. Walk the walk.

Empowerment of team members enables distributed leadership. A dynamic interdependent system is fragile if the entire system is dependent on a single point, a single leader. Overly authoritarian leadership can cripple a team with incessant requirements to ask for permission or pass judgment. Authoritarians promote a culture of dependence and often suffer from communication challenges. Speaking truth to power does not come naturally. Distributed decision-making complements authority. It facilitates timely judgment and action.

Communication

If you are not communicating, you are alone. Teamwork competencies require proactive communication. (See TAR 31.4 and 32.2 for two lengthy stumps on communication.) Let's review some of the basics, because everything rests on communication.

At its simplest level, communication is information exchange. With respect to teamwork, individual ideas and observations need to be uploaded to the collective consciousness so that everyone stays on the same page i.e., the shared mental model needs regular refreshers. You must share with the group. There are rules for efficient information exchange: timely, clear, complete, concise, and acknowledged. Rules.

The rules are balanced with responsibilities. Everyone shares the twin responsibilities of inquiry and advocacy. If you don't get it, or if you have a relevant opinion, speak up. Getting it is important. Failure to voice relevant opinions is a common precursor of tragedy, but how do we know where relevance separates the signal from the noise? Relevant information provides *decision advantage*. It enhances the team's collective awareness and

There are rules for efficient information exchange:

**timely,
clear,
complete,
concise,
acknowledged.
Rules.**

ability to make decisions. Consider what your information will add to the group's understanding of the problems at hand. Will it part the clouds or muddy the waters? Establishing relevance particularly challenges novices, who have a less well-developed understanding of operational challenges.

Operational Awareness

Operational awareness (OA) is situational awareness with broader scope. It is situational awareness that encompasses multiple team members in a distributed environment: lots of stuff going on. Each member may have a unique niche, but they are all part of the same system. Operational awareness includes the entire system. (See three-part series on Situational Awareness in TARs 32.4, 33.2, and 33.4 for the skinny on SA.)

The **shared mental model**, articulated in the planning stages of teamwork, is critical for maintaining OA; it needs to be routinely updated via communication. This common frame of reference promotes common understanding and action, which fosters implicit coordination: coordination without obvious effort. OA enables us to anticipate the physical and informational needs of our teammates, leading to compatible judgment, decision, and cue interpretation. It allows team members to forecast each other's actions and define expectations based on those forecasts. The expectations may serve as benchmarks to assess whether the team is still on target, or if something has gone awry. *If I forecast, Lenny should be done with his route before me, and if he is not, that triggers a reassessment. Did Carl have another igniter malfunction? Is there trouble? Fire in the barn? Maybe I should grab Mo and head to the barn to see if we can help.*

Implicit coordination, resulting from highly developed operational awareness, manifests in teams that cooperate so well they appear to read each other's minds, partners that run through a route with not a wasted word, the guy you never hear on the radio who always seems to be in the right place at the right time.

Operational awareness includes knowledge of all the concepts mentioned in the planning activity: objectives, priorities, and roles. It also includes information on the knowledge, skills, and abilities of other team members. Maintaining OA requires keeping tabs on the operation's current status, how it is changing, how you anticipate it may change in the future, and informing those judgments through communication and coordination with your team. Thou shalt forecast operational dynamics.

Cooperation

Teamwork's cooperation requirements exist at multiple levels. They go well beyond carrying heavy things up a mountain as a group. Coordinated team action requires cooperation. Adaptability requires cooperation in the form of collaboratively modifying plans and actions. Backup behavior is the most fraternal form of cooperation: *I got your back*. Coordination, adaptability, and backup behavior are the core of teamwork's cooperation requirements.

Coordination entails correct and timely action by all members of the team; this streamlines collaborative effort. I can count on Lenny executing a specific task, in a specific way, at a specific time. We need to be aware that others are counting on us in the same way. Highly evolved coordination is implicit; it requires less communication.

Adaptability adds value to teamwork; failure to adapt carries the potential for gnarly crash and burn. When the situation changes, the mental model is updated, and the new model is shared amongst the team. Well developed situational and operational awareness help identify change and suggest possible alternative courses of action. Knowledge of goals and priorities is used to assess the new situation. Empowered team members decide and act in the face of change. That is how teams adapt.

Backup behavior and mutual performance modeling optimize the allocation of resources



Ranger Tucker Chenoweth sets up a training scenario on Kahiltna Dome, Denali National Park and Preserve.
Photo Doug Krause

Operational awareness is situational awareness

with broader scope.

Operational awareness includes knowledge of all the concepts mentioned in planning:

**objectives,
priorities,
roles.**

through team members' anticipation of each other's needs. Mutual performance modeling is the process of monitoring peer behavior for needs, lapses, and errors. An underutilized team member may help out one that has more on his or her plate. An overburdened member can count on a hand. A casual word may highlight something that was missed. A warning cry pierces distraction. The combination of operational awareness and backup behavior enhances efficiency, problem capture, and resolution: working together makes shit go smooth like buttah.

Culture

Groups that do not buy into team culture will forever remain just a bunch of dudes putzing about a mountain. Teams have to establish a cli-

mate of trust and cultivate a high degree of social competence.

Trust makes coordination, backup behavior, and feedback possible. One must rely on peers to perform the correct and timely actions that support coordination. Without trust, backup behavior and performance modeling get caught up in ego and may be perceived as meddling or condescension. A climate of honest and proactive feedback is impossible without trust. Discussing errors and critiquing the performance of your peers is hard; it requires mutual respect and the assurance that we're all in it together. We are more than a group of individuals.

Subjugation of individualism for the greater good is part of teamwork. You are not going to get everything you want, because it's not all about

you. Some days the individual makes sacrifices and some days the individual is the beneficiary of the sacrifices of others. This implies voluntarism, which is hard to teach; it is fragile too. The mere perception of a lack of teamwork will alter group dynamics. As it was put to me many moons ago, *"If you're not pulling your weight, you're gonna stick out like a dog's balls."* (author's note: this is an actual quotation from the guy that gave me my first patrol job.)

When trust is not there, or it is not enough, social skills that channel conflict in an appropriate way are required. An environment of constructive conflict is advantageous but requires practice. How team members handle conflict is a measure of social competence; some call it maturity.

Making Better Soup

There are a lot of teamwork ingredients. Carefully reading the recipe does not guarantee a hearty batch of Seal Team Soup. Enhancing teamwork at our local operational level requires conscious effort. We can apply tactics for improving leadership, communication, operational awareness, cooperation, and culture. These are skills.

Team leadership skills include planning, oversight, example, and empowerment. *"Show up for work, every day, with a plan."* That is some of the best advice I ever received. Don't wait for someone else to spoon-feed you, be proactive in assessing the day's challenges. Understand the operational priorities and each team member's role in the big picture. This understanding facilitates a high level view of operations and the flow of information and action. Leading by example is not trite; it is an important part of how rookies learn and a critical component of work ethic. That example should include a respect for collaborative leadership. A respect for individuals operating in

a high-risk environment includes acknowledging an individual's right to decide and act. Shared decision-making authority cultivates a sense of collective responsibility.

Communication skills include knowledge of rules, responsibilities and relevance. Practice economy and precision of speech. Protocols establish routines for information exchange. Assess where your responsibility to communicate lies along the speak-up vs. pipe-down continuum. Novices must sometimes risk being thought a fool, and experts must avoid painting ignorance as incompetence. Relevant information adds decision advantage; don't be a squirrel chaser.

Flattening communication hierarchies may be the most important step you can take to facilitate the flow of information on a small team. Surgeons routinely rate their team's quality of communication as high, while the other members of surgical teams are less impressed. Following orders is not the same as communicating. Rigid hierarchies, like those in the operating room, create bubbles. Practicing mitigated speech (hint, question, opinion, command, etc.) helps pierce bubbles from the outside, and environments that actively encourage speaking truth to power are more efficient and ultimately safer. A valuable rookie knows how to comfortably say he or she is not comfortable; a valuable leader encourages that.

Listening will enhance your operational awareness immeasurably. Hold yourself responsible for all the information that is available to you, and confirm your understanding. "So...you want me to ski over there and jump on that cornice?"

Cultivating knowledge of peer roles and competencies; understanding priorities; and pre-mortem brainstorming of what could possibly go wrong will help you forecast operational flow.

A team that cooperates well is doing more than just playing nice. Task mastery at an individual level facilitates coordination, as will communication protocols and timeliness. Periodic reassessment supports adaptability and coordination. If we all accept backup behavior as a responsibility, someone will have the hose ready when the shit hits the fan.

Building a strong team takes time and effort but teamwork culture is self-perpetuating. It is worth the investment. I learned voluntarism as a rule, it was expected of us every morning. *Who is going to volunteer for this crappy job?* Team culture respects the delicacy of trust. Trust is a responsibility. Fostering conflict resolution skills helps avert the situations that undermine trust and respect. Strong teams establish expectations that conflict will be addressed directly and professionally. Discontent will not be stuffed into a tight ball of rage in one's chest nor excised during recess in the schoolyard. Identifying the type and source of conflict helps separate the constructive from the destructive. Disagreement is feedback. The volume, timeliness, and quality of feedback on your team will dictate the pace at which it matures.

If you've been on a great team, you know it. You likely consider your teammates more than just friends. They become an extended family complete with creepy uncles, crazy stepsisters, and punk nephews. If you haven't been on a great team, you should find one or build one. Make it a life goal. The team will sustain you in the darkness and bind the good times with sunshine and lollipops...and beer. The best teams all drink beer together. ▲

The core of teamwork's cooperation requirements:

coordination, adaptability, backup behavior.



Gladstone, CO: Legit team culture.
Photo Chris Englehard

References

- Baker, D. P., Day, R., & Salas, E. (2006). *Teamwork as an essential component of high-reliability organizations. Health services research, 41(4p2), 1576-1598.*
- Klein, G. A. (1999). *Sources of power: How people make decisions.* MIT press.
- Leonard, M., Graham, S., & Bonacum, D. (2004). *The human factor: the critical importance of effective teamwork and communication in providing safe care. Quality and Safety in Health Care, 13(suppl 1), i85-i90.*
- Mudd, P. (2015). *The HEAD Game: High-Efficiency Analytic Decision Making and the Art of Solving Complex Problems Quickly.* WW Norton & Company.
- Salas, E., Dickinson, T. L., Converse, S. A., & Tannenbaum, S. I. (1992). *Toward an understanding of team performance and training.* In R. W. Swezey & E. Salas (Eds.), *Teams: Their training and performance* (pp. 3-29). Norwood, NJ: Ablex.
- Salas, E., Sims, D., Burke, C. (2005). *Is there a "Big Five" in Teamwork? Small Group Research, Vol 36, No. 5. DOI: 10.1177/1046496405277134*
- Salas, E., Shuffler, M. L., Thayer, A. L., Bedwell, W. L., & Lazzara, E. H. (2014). *Understanding and improving teamwork in organizations: a scientifically based practical guide. Human Resource Management.*
- Sexton, J. B., Thomas, E. J., & Helmreich, R. L. (2000). *Error, stress, and teamwork in medicine and aviation: cross sectional surveys. Bmj, 320(7237), 745-749.*
- Stevens, M., & Campion, M. (1994). *The Knowledge Skill, and Ability Requirements for Teamwork: Implications for Human Resource Management. Journal of Management, Vol. 20, No. 2, pp. 503-530.*
- Wilson, K. A., Salas, E., Priest, H. A., & Andrews, D. (2007). *Errors in the heat of battle: Taking a closer look at shared cognition breakdowns through teamwork. Human Factors: The Journal of the Human Factors and Ergonomics Society, 49(2), 243-256.*



Ski

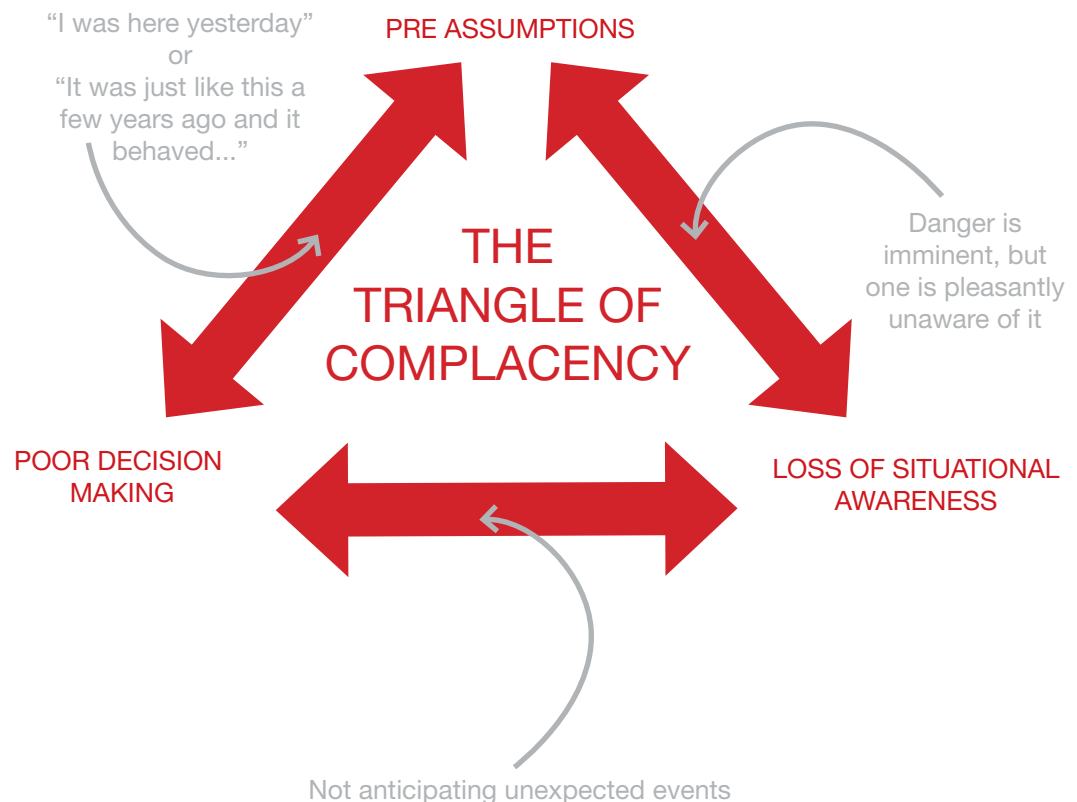
Professional ski patrol veteran Aaron Rains leading his partner, Eric Borke, on a route near the summit of Lone Peak on an early morning at Big Sky Resort in Montana. Photo courtesy of Rob Wood, Big Sky Ski Patrol

BY ALEX BERGERON, PROFESSIONAL SKI PATROLMAN AND GRADUATE STUDENT, AND
 JERRY JOHNSON, PROFESSOR, DEPARTMENT OF POLITICAL SCIENCE, MONTANA STATE UNIVERSITY

Pa

In a previous study, we set out to learn about the causes of avalanche related accidents and near misses experienced on the job among professional ski patrol (Bergeron and Johnson 2015). We reported over 80% of survey respondents (n= 151) stated they had experienced an avalanche-related accident or near miss on the job. The three most frequent contributing factors in accidents were: “poor personal decision-making”; “pre assumptions” (decisions based on past data or experience); and “loss of situational awareness.” All three can be traced back to failure by the individual rather than operational pressures or other causes outside of one’s control. Based on the co-linearity of the three variables/causes, we suggested that they may be connected, and that any one of these contributors can easily lead into another in a cyclical, multi-directional fashion. In order to conceptualize this cycle, we created “The Triangle of Complacency.” Our representation suggests that ski patrollers conducting avalanche mitigation can get caught in this dangerous cycle without even realizing it (see figure 1).

Figure 1: The “Triangle of Complacency” shows the process of getting caught in the cyclical process of poor decision-making identified as contributing to avalanche related accidents and near misses on the job by ski patrollers. Not anticipating unexpected events leads to poor decision-making. Decisions being made while relying heavily on past data or experience leads to decisions made based on pre assumptions. Loss of situational awareness occurs when danger is imminent but the decision maker is pleasantly unaware of it. (Bergeron and Johnson 2015)



Complacency is a feeling of uncritical satisfaction, especially when unaware of upcoming trouble. The question is – why do highly trained individuals in potentially high-risk terrain and consequences get complacent? One possible explanation is that the individual's stress level is either very high to the point of inaction, or very low so as to lose the mental acuity required to operate safely in risky environments. In between, there may be levels where our decision-making capacity is diminished.

The literature on stress and decision-making behavior has received a good deal of attention in recent years and a consensus is emerging. Stress results from a decision space where the demands of making a decision exceed personal resources, resulting in undesirable physiological, emotional, cognitive and social changes (Salas et al. 1996). In emergencies, such personal resources (knowledge, skills, and abilities) are the key management factors. Some observe stress-induced deficits in spatial reference (where am I?), working-memory (what should I be doing?), and behavioral flexibility (heuristics) (Sousa, et al. 2008; Liston, et al. 2009).

A recent study (Soares, et al. 2012) indicates that chronic stress biases decisions. Rather than continually moving toward problem solving, we revert to decisions made on habit and so constrain our choices and consideration of new data. This has obvious implications in the continually changing environment of avalanche mitigation. They point out that automatization (i.e. “autopilot”) of recurring decision processes can sometimes be considered advantageous because it increases efficiency as we move cognitive resources to more demanding tasks. However, they state that the ability:

to adapt to ever-changing life conditions, the ability to select the appropriate actions to obtain specific outcomes based on their consequences is of utmost importance. The capacity to shift between habit-based and goal-directed actions is a condition for appropriate decision-making. (Soares, et al. 2012)

Viewed in this way, complacency may be better understood as the result stress has on individual decision making as indicated by the three causes identified by survey respondents. The cycle of complacency is the result of an inability to shift from habit-based actions toward situational or goal oriented decisions.

In order to test the above assumption, we first need to determine the amount of stress (if any) patrollers experience on the job. At this point, we are not making claims about the role of stress, rather, we are looking for the presence or absence of stress as a factor in our future studies of complacency.

Measuring stress is problematic; should we aim to measure some magnitude of the stressor, or the accompanying stress response? When respondents self-report stress levels, we often find individuals are unstressed by conditions that severely stress others and so are actually measuring a psychological response. Some may not recognize stress and so may underreport stress levels. In any case, it is a highly subjective notion. However, stress is associated with a chemical response in the brain.

We determined the most feasible way to measure the level of on the job stress in ski patrollers



How much cortisol would you be secreting on a day like this? Big Sky pro patrol.
Photo Chelan Babineau-Z

Patrollers

and Complacency

Stress Levels in Ski Patrollers

was to measure cortisol concentrations in their saliva. Cortisol, the primary stress hormone, is secreted by the adrenal glands in response to perceived stress. It is a product of the sympathetic nervous system's “fight or flight” response, and acts physiologically to increase blood glucose levels to be utilized by the body's muscles. Measuring cortisol concentration in the saliva is a commonly used technique to quantitatively assess stress levels in humans. This technique is often favored due to its non-invasive, non-stress inducing collection process, therefore effectively minimizing procedural bias in the sample collection phase of the analysis.

Procedure

Cortisol levels follow a daily cyclical fluctuation. This change in cortisol level is unique for each individual so sampling for condition-induced stress must take into account these normal shifts. Generally speaking, we experience a peak in cortisol levels mid morning (i.e. @ 8 a.m.). As the day wears on, it falls gradually, reaching its lowest levels in mid afternoon (i.e. @ 3-4 p.m.). To account for this cycle, we adopted a time series sampling procedure that allows us to compare changes in cortisol levels throughout the workday. In order

to understand the role of work-related functions, we sampled an off day (Day Off), a workday with no avalanche mitigation duties (Day On), and a workday with avalanche mitigation duties (Avy Day). Day On and Day Off saliva samples provided baseline cortisol levels for comparison to the Avy Day cortisol levels in that individual.

The cortisol concentrations were collected from nine study subjects conducting avalanche mitigation work in approximately the same location of Lone Peak, Big Sky, MT. To the degree practicable, all routes on the south face experience the same weather, wind, elevation, and avalanche conditions. Given the advanced nature of the routes, all the respondents were experienced patrollers. All samples that were used for analysis in this study were collected on the same Avy Day. After the saliva samples were collected, study subjects completed a survey aimed at identifying potential stressors in their personal and work lives.

On sample days, subjects were given six Salivette® tubes in a collection kit and were instructed how and when to collect their saliva while actively engaging in avalanche mitigation work. Each tube included a cotton swab that was chewed for approximately one minute until the swab was saturated with the subject's saliva. The



Chelan Babineau-Z hard at work on Alto Ridge at Big Sky.
Photo Rob Wood

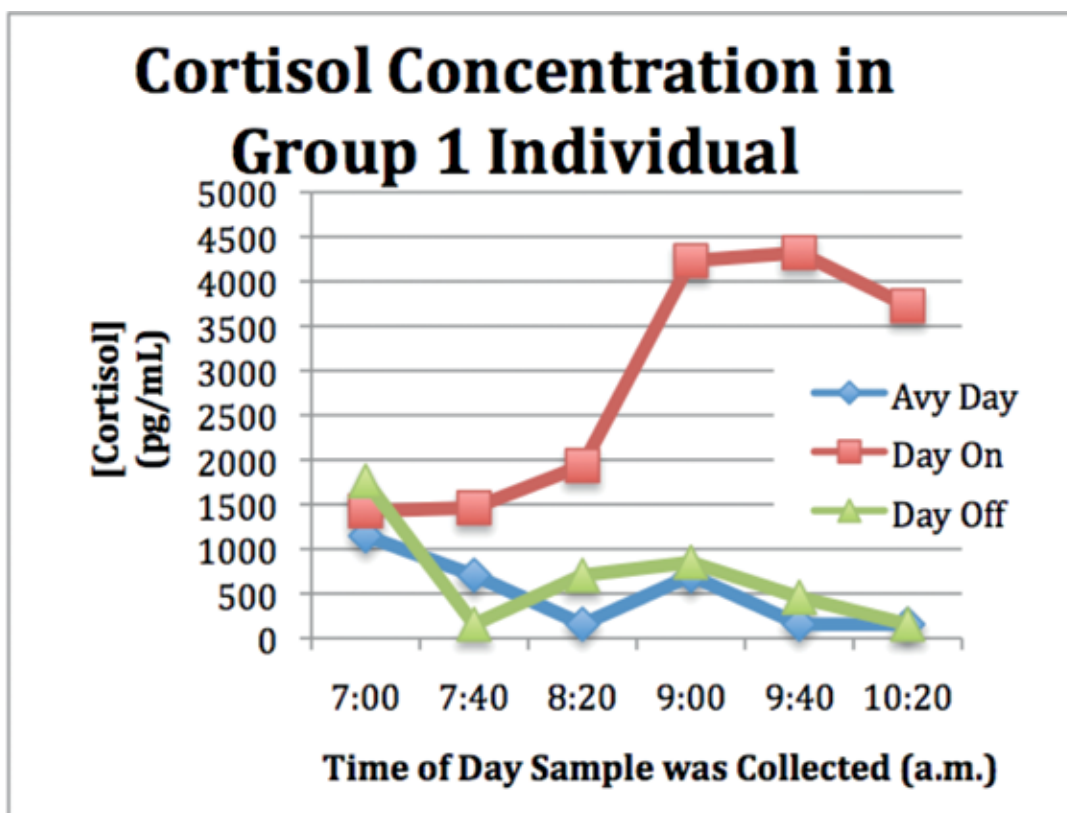


Figure 2: Example of a group 1 individual (someone without supervisory or management responsibilities pertaining to avalanche mitigation). The cortisol concentrations are compared for an avalanche mitigation day (Avy Day), a workday that did not include any avalanche mitigation work (Day On), and a non-workday (Day Off)

swab was then placed back in its sterile tube. The study subjects collected their saliva in this fashion at six times during the collection process at forty-minute intervals starting at 7 a.m. on a collection morning. The study subjects were then given two more collection kits to collect saliva in the same fashion just described on their next workday that did not involve avalanche mitigation work (Day On), and on their next day away from work (Day Off). The saliva samples were analyzed using enzyme-linked immunosorbent assay (ELISA) cortisol concentration measurement techniques (Dressendörfer, et al. 1992).

Results

During initial analysis of the results, the study subjects were placed into one of two groups. A group 1 individual conducts avalanche mitigation as a “line patroller” and therefore does not fill any supervisory or management roles pertaining to avalanche mitigation. A group 2 individual is one who does fulfill at least some supervisory or management role pertaining to the avalanche mitigation work conducted by the ski patrol (i.e. forecasters, managers, and directors who supervise line patrollers).

Group 1 individuals did not experience elevated stress levels during avalanche mitigation as measured by their salival cortisol concentrations

when compared to their baseline levels. Interestingly, stress hormone elevations were seen in four out of six of these Group 1 individuals on either a Day On or Day Off when compared to their Avy Day stress hormone levels. In other words, these individuals exhibited higher levels of stress while not conducting avalanche mitigation than they did while conducting such work. Over all, this group exhibited little to no elevated stress on Avy Days. Additionally, it was implied by these individuals’ questionnaire data that any elevated stress levels experienced were mainly the result of stressors associated with family/home life and other non-avalanche and/or non-work related stressors (see Figure 2).

Unlike Group 1, Group 2 displayed elevated cortisol levels above their baselines during the avalanche workday (Avy Day). Again, these are individuals who fill major avalanche mitigation management roles, including overseeing avalanche mitigation efforts and their associated results for the ski patrol and the ski resort as a whole. Not surprisingly, the questionnaire data provided by these individuals imply the additional duties and responsibilities associated with their management roles were the primary causal factors related to elevated stress levels while avalanche mitigation work was being conducted.

Based on the preliminary results of this pilot study, avalanche mitigation work alone does not seem to increase stress levels in our group of line patrollers. Instead, other non-avalanche work related stressors or non-work related stressors are the cause for elevated stress as measured by cortisol concentrations in the saliva and the survey answers provided by these individuals. Although cortisol levels were higher on avalanche mitigation days for those with broader responsibilities, based on the results from Group 1, it is possible that responsibility for others and operational requirements are the ultimate stressors for these Group 2 individuals.

Discussion

The sample of professional ski patrollers presented here is clearly not representative of the industry as a whole, but it does provide a small insight into the sources of stress experienced on the job. We do not know to what degree stress is a factor in the workplace or what role it may play in job related accidents, but we find some indication when we begin to think of complacency being related to stress. It may be that the triangle of complacency is a form of heuristic thinking where the individual falls back on known solutions to a high stress situation. Such a strategy is successful in most cases. However, due to the occurrence of accidents, it is possibly a very dangerous strategy as well.

Most literature on stress and the workplace is focused on controlling the work environment so as to reduce stressors. Coping mechanisms most often cited include: reducing noise; finding time to be alone; creating a time management plan; or balancing schedule, responsibilities, and daily tasks. Most are unrealistic for professional ski patrollers. Stressors are simply part of the job.

In our survey results we found that home, family, and non-work issues act as stressors for the first group of study participants. Managing this related set of stressors is again, unrealistic for most human resources (HR) departments at ski resorts as they are simply not equipped to offer family counseling and/or other non-work related support. Stressor

relief in these cases is largely the responsibility of the individual and family just as they are in other professions. Future research could focus on what patrol employers provide in the way of these services and how individuals cope with non-work related stressors.

For the second group, stressors are directly related to their job description where operational responsibility lies, in part, with decisions made by the individual. We posit that it may be these broader job responsibilities that act as the job stressor. On mitigation days these stressors may be more acute than during non-mitigation days. In these cases an argument can be made that the employer should be proactive in reducing stress. In addition to making calls on snow conditions, coordinating the use of explosives, and making the decision whether to open certain ski runs, these Group 2 ski patrollers also administer first aid and accommodate the skiing public in various other ways. While some may cope with the stressors associated with these occupational duties successfully, others may suffer from the effects of stress buildup.

Finally, if avalanche mitigation work is not as stressful as one might expect, this may point to the effectiveness of focused high quality training and tenure on the job. If so, it highlights the efficacy of continued and ongoing training as a way to manage and minimize the affects of stress while making high consequence decisions.

Conclusion

In this small exploratory study of experienced professional ski patrollers, we find evidence of varying levels of stress during avalanche mitigation. For some, mitigation efforts are not stressors, for others with broader responsibilities, mitigation is associated with high stress levels. However, we leave open the possibility that the job duties on mitigation days are the ultimate stressor.

This winter we plan to continue monitoring cortisol levels in a wider sample of ski patrollers and will continue to identify sources of stress. Eventually we hope to understand more about the causes of AVPRO accidents and what patrol organizations can do to minimize them. ▲

Literature Cited

Bergeron, A. and Johnson, J. 2015. *The Avalanche Review*. Vol. 33:3.
 Dressendorfer, R.A., Kirschbaum, C., Rohde, W., Stahl, F., Strasburger, C.J. 1992. *Synthesis of a cortisol-biotin conjugate and evaluation as a tracer in an immunoassay for salivary cortisol measurement. The Journal of Steroid Biochemistry and Molecular Biology*. Vol. 43:7:683-692.
 Liston C, McEwen BS, Casey BJ. 2009. *Psychosocial stress reversibly disrupts prefrontal processing and attentional control. Proceeding of the National Academy of Science*. 106: 912-917.
 Salas, E., Driskell, E., and Hughes, S. 1996. *The study of stress and human performance*. In: Driskell, J.E. and Salas, E. Editors, 1996 *Stress and Human Performance* Lawrence Erlbaum Associates, New Jersey, pp. 1- 45.
 Soares, J. M., Sampaio, A., Ferreira, L. M., Santos, N. C., Marques, F., Palha, J. A., Cerqueira, J. J. and Sousa, N. 2012. *Stress-induced changes in human decision-making are reversible. Translational Psychiatry*. 2, e131.
 Sousa, N, Cerqueira, J.J., Almeida, O.F. 2008. *Corticosteroid receptors and neuroplasticity. Brain Research Review* Vol. 57: 561-570.



Dave Brown on route on High Traverse.
 Photo Rob Wood

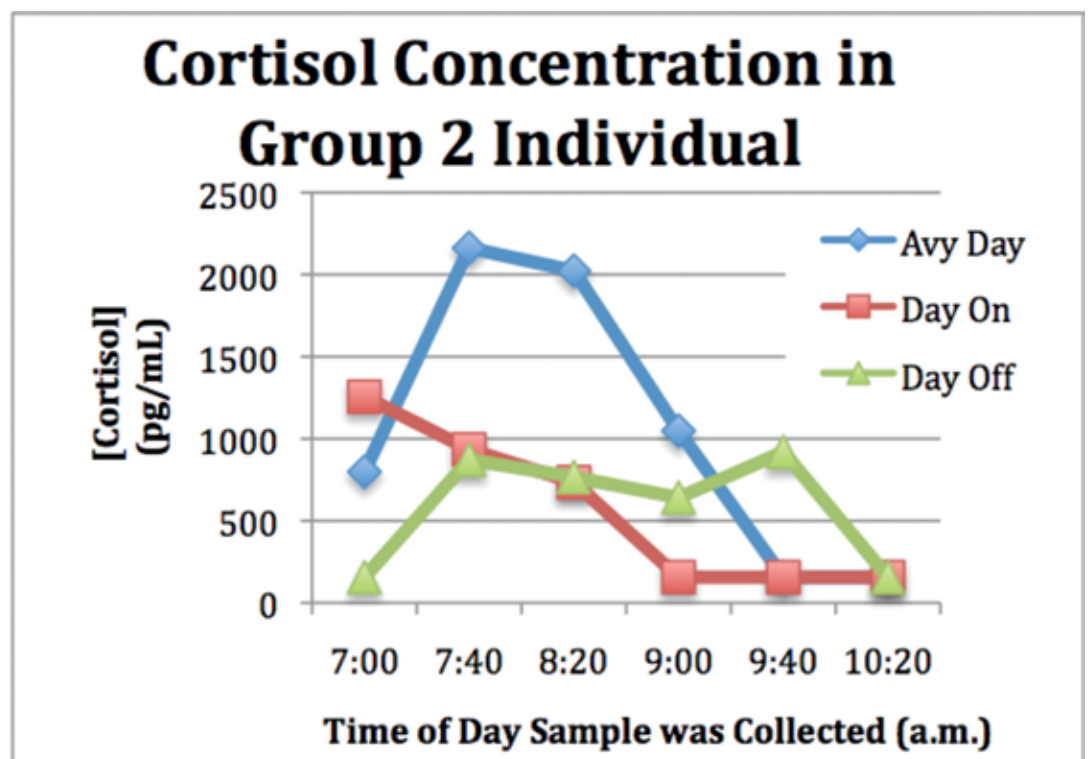


Figure 3: This figure shows an example of a group 2 individual (someone with supervisory or management responsibilities pertaining to avalanche mitigation). The cortisol concentrations are compared for an avalanche mitigation day (Avy Day), a workday that did not include any avalanche mitigation work (Day On), and a non-workday (Day Off).

Acknowledgements:

Thank you to: Big Sky Professional Ski Patrol; Scott Creel and the members of his lab; and the Montana INBRE Research Grant Fund.

Snowpro Plus+
 Create High Quality Snow Profile Graphs
 Annual Subscription C\$199 for 2 Computers
 Order: www.snowproplus.com

- * New Photo Attachments
- * New Improved Latitude/Longitude entry with Maps
- * Conforms to CAA OGRS and AAA SWAG Standards, IACS 2008 Symbols
- * Snow and Shear Layer Nicknames
- * 9 Categories of Grain Shape Classifications Symbols with detailed Grain Shape Sub-classes
- * Implements Flags/Lemons Analysis
- * Computes Snow Pack Average Density, Cumulative Shear Stress, Ramsonde, Snow Loads and more ...
- * Automatic updates and telephone support

Gasman Industries Ltd.
 Telephone: +1-250-999-1490 Email: info@gasman.com
 Amount in Canadian Dollars – PAYPAL (MC/VISA/AMEX)
 Delivered by Web Download – Free Trial Download
 Contact us for our Educational Program and Volume Discounts

Safety Thanks to
Avalanche Guard



Div: EVANinc

Explosives
EXPERTS
Explosif

Stay a Step Ahead with Custom
Avalanche-Control Explosives

The North American
Snow Control Industry
has Spoken.
C-I-L has Listened!

CIL In-House Tail Fins for all ballistic products.

RECCO Microchips are installed inside the
boosters, where they provide the most reliable tracking.

When you request C-I-L Explosives products,
you are supporting your industry!

3% OF ALL PURCHASES go to the
American Avalanche Association
for training purposes.

David Sly 250.744.8765
davidgsly@mapleleafpowder.com
www.mapleleafpowder.com



Presort Standard
US Postage Paid
Permit #592
Pontiac, IL

A Publication of the
American Avalanche Association



AMERICAN
AVALANCHE
ASSOCIATION



▲ The DeltaLancer System.
Under License from Kevin Powell at
Delta K Explosive Engineering Systems Ltd.



▲ The New Redesigned
CIL Classic Snowlauncher.