

AVALANCHE DISASTERS IN THE HISTORIC RECORD;
A SURVEY OF CULTURAL ATTITUDES IN WESTERN CIVILIZATION

Adam Brown

Vail Powder Guides, Colorado Mountain College, Prescott College, USFS, Leadville, Colorado

Abstract:

Avalanches have existed for as long as snow has covered mountainsides. As such they are a natural phenomenon of infinite age. Avalanches become natural disasters when people are involved. Injuries, fatalities, damage or destruction to property, loss of natural resources, even the devastation of whole communities from hamlets to cities are losses to humans. Natural phenomena are seen as a natural process or cycle. A natural disaster is a human concern. Avalanches as natural disasters have occurred for as long as humans have lived in, worked near, traveled through, gone to war in, or played among snowy and steep surroundings. The documented record of avalanches affecting people in Western Civilization precedes the Christian Epoch, and extends to the present. This paper will explore the historical record of avalanche disasters and consider common themes and threads that connect the avalanche events as: Military related; Community related, involving transportation, work, and habitation; and finally, Recreation related. At various times throughout history, reactions to such disasters reflected common themes or cultural elements of an era. Considering this Zeitgeist related response to avalanches, historically as well as in the present is the primary focus of this study.

Keywords: Avalanche History

From Military to Science and Practice:

The earliest commonly cited incidents of avalanche disaster are Military related; and refer to Hannibal, the Carthaginian General who campaigned against Rome in the Second Punic War. In this campaign he attacked Rome in northern Italy after crossing the Pyrenees and the Alps. Reports of his losses vary, but are consistent within known facts. (Thinkquest 2005; SciAm 2004; Fraser 1966; Krech et al 2004 107; Herlofsen 1994 248)

Colin Fraser (1966), an English author on avalanches, notes that there is only speculation that avalanches were among the perils that decimated Hannibal's troops (even the specific site of passage is unknown); however he concedes that avalanches were likely:

The two main accounts of the crossing, those of Polybius and Livy, do not mention avalanches specifically but they do describe circumstances which make them a strong possibility... The snow conditions described can easily lead to avalanches and the poet Silius Italicus (25-101AD) describes them...in the epic poem *Punici* a dramatized and perhaps not overly reliable account of the Punic Wars....'Detached snow drags the men into the abyss and snow falling rapidly

from the high summits engulfs the living squadrons.' ...Overall then it would seem that avalanches were almost certainly among the hazards which caused such terrible losses...(pgs 8-9)

Regardless of the accuracy of the avalanche account or the debate over where it may have occurred, it is a widely accepted notion that this was the first such incident. Indeed, the next military accident accounts were recorded some seventeen hundred years later, related to a private war between the Duke of Uri and the Duke of Milan (Fraser 1966 8) or the regent Duchess Bonne of Savoy. (Sismondi 1847 222) Sixty Swiss soldiers were killed on St Gottard's Pass in 1478. Then in 1499 during the Swabian War, between the Swiss Confederacy and the House of Habsburg, there were two military avalanche accidents. The first involved French mercenaries, allied to the Swiss Confederacy, who lost one-hundred soldiers when crossing Great St. Bernard Pass to fight the Milanese for Louis XI. In the second troops of Kaiser Maximilian were climbing Ofen Pass when four hundred men were caught in a snow slide, though none were killed. (Fraser 1966 18)

Later, at the turn of the 19th Century, there are reports of avalanche accidents in the Napoleonic Wars. Cossacks soldiers under the command of a Russian general named Suravov (or Surorov) were retreating from Napoleon's troops over Panix Pass in the Swiss region of Graubunden when hundreds died in avalanches and falls. (Fraser 1966 18; and Vital-Durand (2004) Then in May 1800 Napoleon's General

*Corresponding author's address:

328 W 7th St Leadville, CO 80461

Tel: (719) 293 1566

email: adamarbrown@gmail.com

Marmont lost men "Quite a few men were buried under 50 feet of snow." when crossing the Great Saint Bernard Pass. (Fraser 1966 19) Later in November 1800 Marechal MacDonald was leading the Army of Grisons over Splügen Pass into Italy on the orders of Napoleon. He lost many to avalanches. His own memoirs, quoted by Fraser (1966 19) states: *'I had more natural difficulties to surmount than enemies to conquer. Avalanches had swallowed whole squadrons.'*

Fraser (1966) asserts that: *"Avalanches have probably claimed an even heavier toll of human life from armies who ventured into the mountains in winter than they have from the civilian population."* This was an accurate statement at the time of writing as the Yungay, Peru event of 1970 that killed some 20,000 people (Thinkquest 2005; SciAm 2004; Krech et al 2004 107) had yet to occur.

Moving forward to the early twentieth century, World War One and the battles between Austria and Italy in Tyrol saw the gravest of losses to avalanches. Estimates vary widely: as low as 10,000 (SciAm 2004) and as high as 80,000. (Fraser 1966 20) Details from the era, press and military accounts are few and most researchers admit that information on these battles is sparse. (Fraser 1966 and Galli 2000)

Another belief tied to these battles is that troops used artillery to set off avalanches above the opposition as an intentional tactic. This notion is asserted commonly. Most sources mention the practice, and it has become part of the collective understanding of most who study avalanche phenomenon or The Great War. (Fraser 1966 s 20, 47, 201 & 202; Thinkquest 2005; SciAm 2004; Herlofsen 1994 249) One historian in particular, Richard Galli (2000) of Bozeman, Montana disputes this notion:

It has been said that opposing forces deliberately set off bombs, or fired artillery over columns of troops and transport to cause avalanches during WWI. This author finds these accounts unbelievable fiction or modern exaggerations for several reasons. The Alpini I knew said they had never heard these tales. "This sounds like Hollywood....perhaps in some other war, but we could never do such a thing," I was told....planned avalanche ambushes seem improbable.

Galli presents a compelling point of view. However, stories of Alpini intentionally releasing avalanches with explosives are so widespread

the idea that this did happen, and was the precursor to modern avalanche mitigation, is ingrained the minds of most.

In the aftermath of WWI, two former soldiers from the Tyrolean front became some of the first modern avalanche safety and rescue experts. Matthias Zdarsky and Col. Georg Bilgeri were both avid mountaineers and skiers before the war. After the war, they used the expertise they had gained during warfare avalanches and rescue experiences to train other soldiers, guides, patrollers, climbers, and skiers. (Fraser 1966 46-47)

Whether or not it was an off-shoot of the battlefields of WWI, the first use of explosives to protect human life occurred in 1933. (Fraser 1966 201) I. Zimmerman, director of the Bernina Railway in Switzerland, experimented with using mortars and rockets to set off avalanches on purpose to protect the rail corridor from unexpected releases. (Fraser 1966 202) This practice was soon picked up and applied to ski runs at Parsenn ski area near Davos Switzerland by the Parsennendienst, precursors to today's ski patrollers.

The Parsennendienst started using small tins of dynamite tossed by hand, in addition to airborne ordinance, in the mid to late 1930's. They tossed charges into the slopes, and then ski cut them afterwards. (Fraser 1966 202-203) This remains the most common delivery method of explosives for ski patrollers even today. Ski cutting, or the intentional release of avalanches by quickly skiing across sensitive starting zones, is also a practice still widely used today.

With the pre-WW II saber rattling in Europe, the Swiss Army took an interest in the marriage of explosives to avalanches. (Fraser 1966 202) Also during the inter-war period in the Alps, more scientific and academic research into avalanches took place, especially in Austria and Switzerland.

Where Zdarsky and Bilgeri represented practitioners, a group of researchers comprised of engineers and physicists got involved in the subject. Prof. W. Paulcke of Innsbruck, G. Seligman, engineer R. Haefeli, crystallographer P. Niggli, and H. Bader

were seminal researchers of the period. Bader produced Snow and Its Metamorphosis (Schnee und Seine Metamorphosen) in 1939 and Seligman wrote Snow Structures and Ski Fields in 1936. (Fraser 1966 46-50) There exists still today a unique dynamic between the practitioner and theoretician sides in the avalanche world.

The early research efforts, especially in Davos, eventually became the Swiss Federal Institute for Avalanche Research. The leading snow and avalanche research center in the world today, it started in a single igloo in the 1935/36 season. (SLF 2007; Fraser 1966 48) In the shadow of WW I and in anticipation of WW II, military influences must have been omnipresent in this era, and affected the interest in new research.

By the end of WW II practitioners and researchers alike were active in the U.S. (USDA 1964.) Many were veterans of the 10th Mountain Division who returned stateside to work in the U.S. ski industry. Ski Patrol and U.S. Forest Service personnel worked to secure ski area safety, often veterans using military surplus ordinance. (Abromeit 2004; Atkins 2006; Atwater 1964 & 1968; Hall 2007) Montgomery Atwater was an early U.S. experimenter with explosive mitigations who worked first at Alta, later Squaw Valley –for the 1960 Olympics, and eventually at Berthod Pass Colorado. (Abromeit 2004; Atwater 1964 & 1968)

...the Forest Service continued experimenting with explosives for avalanche control, albeit with limited success, until 1946 when they hired Monty Atwater as the Alta Snow Ranger. Atwater had served with the US Army Tenth Mountain Division in Europe during World War II and he had seen explosives including military artillery used to trigger avalanches. (Abromeit 2004)

The military related avalanche activity of the 20th century had close ties to modern avalanche research, but so too did community related events. As we shall see the first connection to natural cause and effect events, and the first ever forest management practices were tied to avalanches:

Community Settings, Communal Responses:

The earliest documented avalanche occurrence, noted by Strabo, was transportation related Fraser (1966) states:

The first mention of avalanches was by Strabo, a wealthy man of Greek upbringing who lived from 64-36 BC. He devoted his life to travel and wrote a massive work called Strabo's Geography...When writing of the Alpine passes he describes the horrors [of]...layers of ice that slide down from above...numerous layers resting one upon another...congelations upon congelations...and the congelations that are on the surface are from time to time released from those beneath...' (pg 8)

Little information exists in the record concerning avalanches in the Early Middle Ages, perhaps due to a combination of low literacy, language differences, and a climactic warming period. It seems, however, that there must have been encounters with avalanches for the Visigoths in the Pyrenees and for travelers, pilgrims, and settlers in the high country of the Alps during this period of migration.

Community avalanche disasters include domestic, vocational, and transportation. Compared with recreational or military settings, they most embody the concept of avalanches as natural disasters. The victims in community set avalanches are most blameless; they are going about their daily lives, working on the farm or in the mines, travelling through a mountainous passage, or at home, inside, perhaps asleep. Avalanches of this sort, like floods, tornados, volcanoes, or earthquakes are truly natural disasters.

Early records of the Alps reveal considerable avalanche destruction. In the Davos Valley, Switzerland, avalanches became a problem between the sixteenth and eighteenth centuries when increased population and widespread cutting of the mountain forests coincided with the increasing snowfall and glacial advance associated with the Little Ice Age. A chronicler described one such avalanche in 1602:

"On 16 January, on a Saturday night, at 2400 hours, after it had been snowing for 3 weeks and the snow had reached a depth of over 12 shoes [*sic*], all at once powerful snow avalanches broke loose in Davos in several locations so that mountains and valleys trembled and roared. Entire larch and pine trees with their roots, much earth, and stone were tom away, the Lady Chapel with 70 houses and farm buildings were demolished or carried away and buried with all the inhabitants in the snow" (Cited in Frutiger 1975).

Avalanches causing the death of 50 to 100 people were commonplace in early records from the Alps... (Dexter 2002)

There are scores of reports of avalanches striking alpine villages between the 15th and 18th centuries killing livestock and people; a few to hundreds per incident. Consider these examples:

Davos, Switzerland (1440)

2 houses were destroyed by an avalanche. One villager was found alive after being buried for 24 hours. The death toll was 11.

Disentis, Switzerland (1459)

An avalanche destroys the 655-year-old *Church of Saint Placidus* and 16 people perished.

Leukerbad, Switzerland (1518)

An avalanche destroys an entire village and took 61 lives.

Graubunden, Switzerland (1598)

An avalanche in the Eastern Canton took 100 lives.

Davos-Frauenkirch, Switzerland (1606 January 16)

An avalanche occurred after three weeks of snow, destroying 70 buildings and taking 100 lives. Five villagers were found after a 36-hour search.

Davos-Dorf, Switzerland (1609 March 13)

This avalanche hit on *Ash Wednesday* while many villagers were eating breakfast. The death toll was 26.

Plurs, Switzerland (1618, September 4)

This event, known as the Rodi avalanche, buried the town of Plurs and all of its 1,500 residents, except for four people who happened to be away from the village. The total death count was 2,427.

Stura Valley, Italy (1775, March 19)

Three people in the Stura Valley of the Piedmont break a record for surviving after being buried for thirty-seven days. Maria Anna Rocha (45), her sister-in-law, her daughter (13), and her son (6) were trapped with the livestock in stables behind their home when 50 feet of snow buried the entire farm. Because the men of the family were not home at the time and assumed everyone had perished, no rescue attempts were made. Meanwhile, the stable roof caved in under the snow's weight, trapped the four people further in a space 12 feet long, 8 feet wide, an 5 feet high. All the livestock died except for two goats. The little boy died after twelve

days. The women were driven nearly insane by the smell of dead bodies and constantly dripping water. On April 24 the spring thaw helped uncover the top of the shed. The men returned at this time to bury the assumed dead bodies, only to find the women still alive. The young girl did not seem injured, but the sister-in-law could no longer speak and Maria Anna Rocha had gone completely bald.

Montafon Valley, Austria (1689, Winter)

More than 300 are buried beneath a series of avalanches in the Alps this winter. The worst hit was the town of Saas in the Pratigau valley, a popular resort still today. Two snow slides on Calmut Peak on the same day killed 73 people and destroyed 155 buildings. The town remains beneath the area's wide, steep, and open slopes, and remains vulnerable to avalanches.

Ftan, Switzerland (1720)

Thirty-two children at choir practice in the house of the local schoolmaster perish in an avalanche.

(From SciAm 2004 and Thinkquest 2005 with *emphasis added*)

One can only try to imagine the effect of such natural disasters on the communities that were struck. In this period in European history, the Late Middle Ages, religion and the church dominated politics and culture. The period was also marked by frequent witch-hunts. (Pfister 2007) Climactic changes that were associated with the period of the Little Ice Age were often interpreted as having supernatural associations. These misunderstood causations were either attributed to almighty God, or to conjuring witches:

In medieval times, peoples speaking French, Italian, German, and Slavic languages felt that avalanches stemmed from supernatural powers. God and God's wrath were responsible for sending avalanches to wreak destruction on low-lying villages. Yet alpine villagers were not innocent sufferers; rather, in the most common view, avalanche victims engendered their own misfortunes through immoral or unrighteous behavior. God, acting through tumbling snow masses, was merely teaching a lesson to sinners who had brought their troubles upon themselves. Ex-votos (votive offerings to a divine figure) and other religious symbols still displayed in mountain churches attest to the gratitude given by

survivors of such encounters with The Almighty, who occasionally showed mercy. (Hall 2007)

Fraser (1966) cites numerous references to both religion and witchcraft. He asserts that the capricious nature of slides, sometimes smashing houses while leaving china cupboards or clocks unharmed, for example, added to the mystique.

In Kalanka Valley of the Grisons...a whole forest was brought down...flying tree trunks shot over a village with out doing harm, but a single tree was pitched upright on the roof of the pastor's house as if growing there. (pg 41)...in the Montafon Valley in 1689...while a priest was taking the sacrament to the dying he was buried by one avalanche and promptly unburied by another (pg 41)...In the past it was easy to explain such occurrences by saying that evil spirits controlled avalanches. ... It was believed, too, that these spirits dislodged avalanches in vengeance or spite and then stood on them as they thundered down, steering them with a tree held like a rudder. (pg 42)

There is a legend that at Erstfeld, in the Canton of Uri, [where an old woman was suspected of being a witch]...one day an avalanche stormed down the Wyler valley and, by all that is holy, the old hag was sitting on the first wave of snow, quietly turning her spinning wheel! That was the last straw-the evil witch had overreached herself. Just as she was thanking providence for sparing her life, four men grabbed her...and summarily burnt her alive. (pg 42)

...there was a famous witch trial at Avers in the Hinterrhein Valley in 1652 at which it was stated quite categorically that 'witches are the cause of avalanches.' (pg 43)

Pfister (2007) states that there was a thirteen year cycle of extreme cold in the late 16th and early 17th centuries associated with the Little Ice Age. He relates the high incidence of witch hunts to subsistence crises and environmental disasters, especially glacial-advancement-related flooding. He further makes a case for considering the relationships between climate and culture, and that attention should be paid to how people of past eras perceived environmental forces.

Certainly some were observant enough of their natural environment to see connections and cause and effect relationships of avalanches in nature. The first decree to limit timber harvests on the slopes above the Swiss village of Andermatt for reducing avalanche

exposure was mad law in 1397 by the commune. (Fraser 1974) This law was called a "banning letter" or "Bannbriefe" and represented some of the earliest public forest lands management. (Commarmot 2004) Today in Canada and the U.S. (except in Colorado) there are strong links between state forestry programs and avalanche programs.

Other communal reactions included the construction of stone terraces, deflectors, and diversion walls. Villagers were working together to avert disaster. The earliest efforts, deflection mounds and walls such as built in 1518 in Valais, were meant to slow or divert moving snow. (Fraser 1974)

Starting in the 1860's under the design and direction of Joan Croaz, a Swiss forester, passive defense structures, meant to stabilize slopes by holding the snow in place, were constructed. Croaz represented another strong link between forestry and avalanche science. (Fraser 1966 and 1974)

The hand-building of rocks walls, terraces, and fences represents a strong group reaction and a communal response. So too do community ordinances, zoning regulations, and legal decrees. These are strong group reactions that even today are drawn by natural disasters. Calls of civic responsibility are elicited still today following a community set incident. Witch trials are also a group reaction to the disasters. They too have their modern counterparts in civil litigation.

Recreation: Relieving Ennui by Cheating Death; Individuals Emboldened by Science:

In the modern and post modern eras the vast majority of avalanche incidents have involved recreationists. Over the past three or four decades, in an average season, North America sees about forty to fifty people die in recreational avalanches. (Avalanche.org 2008) World wide the fatality rate for the same period is about one hundred fifty to two hundred persons. (UAC 2008) The trends have been towards increasing fatality rates each year. (CAIC 2008)

These accidents reflect a number of significant aspects of our modern and post modern zeitgeist.

In and since the Age of Enlightenment reason was given greater authority and Nature was seen as a system that could be classified and understood as a series of cause and effect relationships through empirical observations.

Resource extraction and a sense of dominion over nature rose as well.

Interestingly, travel in the mountains solely for the pursuit of pleasure, or what we would consider mountaineering as a modern sport, commenced in the Age of Enlightenment. Naturally, avalanche accidents soon followed.

The first man to climb for no other reason than his own pleasure was Father Placidus à Spescha, a Benedictine monk from Disentis. He made the first ascent of several peaks in Graubünden (Grisons) in the late 18th century and has attracted the title of 'the father of mountaineering'.

(Fraser 1966 pg 23)

Most mountaineering in this era was centered in Chamonix, France and the Mont Blanc massif, though all of the Alps were well explored. Many of these early expeditions had some element of scientific pursuit linked to the adventure. H. B. de Saussure of the college Geneva typified the era. Geology, meteorology, cartography, geographic land-survey, and Natural History were subjects of great interest to the intelligentsia of the period.

In many ways de Saussure embodied ideals that exist today in mountaineering and avalanche culture. He placed a great emphasis in empiric science, observation, and experience. He was bolstered by his own accomplishments, and sought ever increasing challenges. He wanted to summit Mt Blanc, and to be the first scientist to make observations from its summit.

No self respecting mountaineer of the 18th century would have ventured into the Alps without a scientific pretense. Most early ascents on Mont Blanc included a prototype barometer and other instruments.

Mountain climbing for personal gratification and scientific edification soon became quite popular with the gentry of Europe, especially with upper class Brits. (Fraser 1966 23 and George 2006) By 1800 Chamonix had become an important destination for holiday travelers. The word *tourism* was coined by English Sporting Magazine in 1811 and a new industry had a moniker. (George 2004 and Harper 2001) Skiing arrived about another 100 years later, at the turn of the century. (George 2006)

Chamonix is the epicenter of mountain sports in the world still today. Contemporary mountaineering writer John Krakauer, described Chamonix as 'the death sport capital of the world' (1997 pg 87) in his collection of essays *Eiger Dreams*.

From de Saussure to Krakauer the history and the contemporary culture of Chamonix symbolize the modern era of avalanche accidents and our attitudes towards them. The rise of the ski industry in Europe and the U.S. after WWII was emboldened by the war related research in the 20th century and the use of explosives.

This post war era of economic boom has been due largely to cheap energy, readily available from natural resource extraction. Mankind's sense of dominion over nature has come to full fruition in the 20th century.

There is an ideal of escaping the modern boredom of our easy lifestyles by passing through risky situations unharmed. Many post modern commentaries speak of man's disconnect from Nature. Much of the outdoor-recreation-industry seeks to replace that disconnect with activity oriented adventure. Mountaineering and backcountry skiing are good examples. There is a culture in the avalanche of believing that experience, judgment, and judiciously applied empiric observation can safeguard dangerous activities.

There has also been a shift toward the individual, and away from the community in this paradigm. While the rewards of accomplishment are geared toward the individual ego, so too is the blame when things go wrong.

In 90 percent of avalanche incidents, the VICTIM or someone in the victim's party triggers the avalanche. (UAC 2008)

Many practitioners, avalanche (control) technicians, recreationists, and even many theoreticians who work and play in avalanche terrain believe that with a balance of appropriate prudent judgment and objective risk assessment the powers of observation can allow one to safely tease the White Dragon. (Hall 2007)

Succeeding at these dangerous games not only relieves the idleness, but also boosts the ego. This makes for a feedback loop of empowering the individual's sense of superiority over nature even more. The opposite result certainly occurs, with alarmingly increasing frequency. Recreational avalanche fatalities still continue to rise, in spite of constant scientific advances. Educational efforts directed specifically at recreationists as well as professionals become more popular with each passing year. Avalanche hazard bulletins are more available now than fifteen years ago. Rescue technologies, especially locator

beacons, have gotten radically more advanced in recent years, yet the death tolls increase.

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