

The use of Traditional Aboriginal Knowledge in avalanche forecasting (Canada and Alaska)

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Abstract: Traditional Knowledge is based on, and acquired through, observation and experience within a local or utilised regional environment, as well as instruction and oral tradition. Traditional Knowledge is cumulative and is a shared experience validated by testing its effectiveness in particular circumstances. In reviewing the stories and lessons provided by Elders from across the Canadian Arctic and Alaska the macro-picture emerges of weather and terrain, and above all, human safety. Traditional routes are very well defined and the same routes are followed generation after generation. On the Easter weekend of 1898, at the height of the Klondike Goldrush, an avalanche swept down the Alaskan side of the Chilkoot Goldrush Trail, killing 69 “stampedeers”. Aboriginal packers accustomed to the ways of the traditional routes warned against going past the treeline that day and the days preceding. Scientific Knowledge tells us that the conditions described should have been a warning that went unheeded. Traditional Aboriginal Knowledge also describes why this was a warning. The only difference was that the Traditional Knowledge did not go unheeded and of the hundreds of Aboriginal Packers who were on the trail that day, none were in the pass and none were killed. A question arises as to whether the stampedeers heard and understood the warnings, given the language barriers and the fact that the mountains were a foreign environment to many of them, or whether haste and greed prevailed.

Keywords: Traditional Knowledge, Aboriginal, Elders, avalanche, Chilkoot Pass

“The Father’s Song”

*Great Snowslide,
Stay away from my igloo,
I have my four children and my wife;
They can never enrich you.*

*Strong snowslide,
Roll past my weak home.
There sleep my dear ones in the world.
Snowslide let their night be calm.*

*Sinister snowslide,
I just built an igloo here, sheltered from the wind,
It is my fault if it is put wrong.
Snowslide, hear me from your mountain*

*Greedy snowslide,
There is enough to smash and smother.
Fall down over the ice,
Bury stones and cliffs and rocks.*

*Snowslide, I own so little in the world.
Keep away from my igloo, stop not our travels.
Nothing will you gain by our horror and death,
Mighty snowslide, mighty snowslide.*

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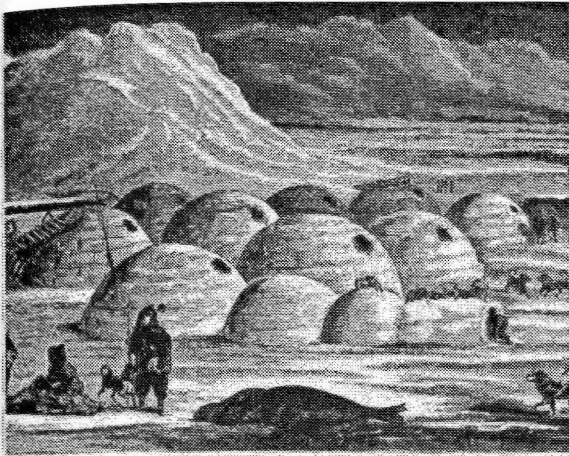
*Little snowslide,
Four children and my wife are my whole world,
All I own, All I can lose, nothing you can gain.
Snowslide, save my house, stay on your summit (1).*

1. Introduction

Traditional Knowledge is a knowledge-practice-belief complex. (Berkes, 1999). Traditional Knowledge is based on observation and experience within a local or utilised regional environment. It is acquired through observation, experience, instruction and oral tradition. Traditional Knowledge is cumulative and is a shared experience validated by testing its effectiveness in particular circumstances (Usher, 2001). Inuit *Qaujimaqatuaqangimut* (Traditional Knowledge) consists of six basic guiding principles, the concept of serving and providing, consensus decision making, collaborative working relationships, environmental stewardship, resourcefulness in problem solving and *Pilimmaksarniq*, the guiding principle of knowledge and skills acquisition (through observation, and practice) (Arnakak, 2000).

An analysis of many Traditional Ecological Knowledge systems shows that there is a component of local observational knowledge of environmental phenomenon, a component of practice in the way people carry out their resource use activities and further, a component of belief regarding how people fit into or relate to their environment (Berkes, 2000).

2. Inuit eloquence



From Hall, *Life with the Esquimaux*, 1864, pg. 239

The lyrics of the traditional “Fathers Song” are very instructional both in description and in the knowledge it contains of the environment in which the singer finds himself, the awareness of what has come before him, and the poignancy in which he acknowledges his position of danger – public words – private interpretations. The words are both the inflections of a single singer and a representation of a mingling of traditional values and individual expression. Inuit eloquence. Inuit are sceptical but not agnostic as we tend to be, but neither are they fatalistic.... there are spirits and significance in everything and that information is what keeps them alive. The belief in “*tornarssuit*”, spirits hostile to men, is no longer universal but you still hear in the spring when an avalanche is heard, the old people say a spirit is among the hills (Rasmussen, 1908). In the song the singer expresses that he understands the power he has put himself under the control of and acknowledges that it is his responsibility ... “I just built an igloo here, sheltered from the wind, it is my fault if it is put wrong”. “Greedy snowslide” expresses the fact that by placing the igloo on the lee side of the mountain he understands the risks and understands that avalanches have happened before in this same location.

Historically, death by avalanche in Inuit society was not uncommon. Elder Inuki Kunuk, of Igloolik, Nunavut, remembers that “in the past, before our time, death was more frequent”(2). Historical tales from the likes of Hall, Rasmussen, and Freuchen in the 1800s and early 1900s make mention of many events involving avalanche fatalities. “He was out sealing near the base of a high land when an avalanche of snow came suddenly upon him, not only overwhelming him, but a large extent of ice, carrying

it and him down, far down into the sea” (Hall, 1864). Of one unfortunate man who lost all five of his wives, the first is described as “having gone astray on a snow-covered glacier and froze to death and his second wife, was buried in an avalanche” (Rasmussen, 1908).

Freuchen describes a most remarkable story as follows:

“Ivaloo was remarkable to look at with her clothes off, for on her shoulder, and extending along the upper side of her right arm to the hand, lay a huge red birthmark. I was told that there was a very special reason for this - Ivaloo was one and the same person as her grandmother! The old women had been living in an igloo with the family near Parker Snow Bay when a snowslide crushed the dwelling. By a miracle everyone but the grandmother escaped.

The body of the grandmother was not discovered until the following spring when hunters found her right arm and shoulder protruding from a snowdrift. The gulls had eaten the flesh away to the bone. Shortly after this event Ivaloo was born – and on her right arm and shoulder was a mark in precisely the same position as the scar left by carrion birds upon the old women. Consequently it was quite evident that Ivaloo was the old woman reborn” (Freuchen, 1935).

What is even more remarkable about this story is that I recently had occasion to have supper with a young family from Arctic Bay, Nunavut and I asked the young mother of three small children what she knew about avalanches in her community. She said to me “oh yes, a ptarmigan hunter in Arctic Bay was killed a few years ago. He stood on top of a snowdrift (cornice) above a creek bed and was buried when the drift collapsed”. She then went on to tell me of a family that was struck by an avalanche. “They built their igloo too close to the side of the mountain. The grandmother was killed and”... she proceeded to tell me of the tale recounted in about 1920 by Peter Freuchen in his book, *Arctic Adventure* (Freuchen, 1935). It seemed to me, and obviously to her by the way the story was told, that the story was as contemporary as the one about the ptarmigan hunter. I think that is an apt interpretation of the value of Traditional Knowledge; oral information is passed down, but it is contemporary in its use and value.

3. Igloolik Oral History Project

Interviews with Inuit Elders archived with the Igloolik Oral History Project, at the Igloolik Research Centre in Canada’s Central Arctic in the Nunavut Territory, identify this awareness. “One must always be careful where they build their shelter, one must never build a shelter under a cliff or on a lee way of high hills as these usually have *aluiqqaniq* (an over-hanging snowdrift)” says Elder Emile

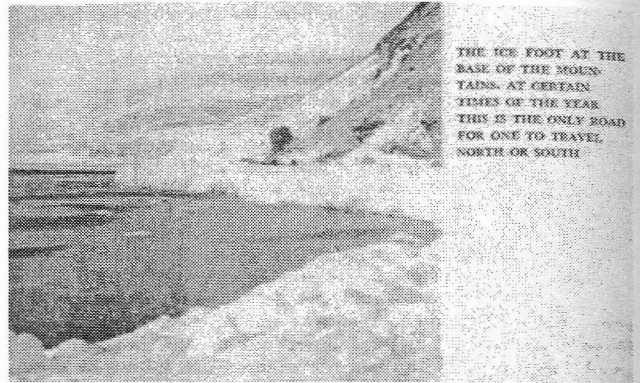
Imaruittuq. "In a blizzard these "over-hangs" (cornices) will continue to build up making it heavier so the danger of avalanche is always imminent. That people have been killed by avalanches is well known, so care must always be taken and one must not build shelter even for the night under these conditions. One can be buried with no chance of getting out" (3).

Elder Abraham Ulaajuruluk explains that "if you (are) next to an overhanging of snow on a cliff or mountain you should not take refuge on the lee side, or below the "overhang". If the weather gets worse, there is a possibility that the "overhang" will (build) up and soon cause an avalanche in which one can get buried. Even the "overhangs" can break off while I am sleeping and bury me. No one should build an igloo next to an *aluiqqaniq*"(4).

Elder Inuki Kunuk shared that "there is something else that I always show other people, this does not have anything to do with making an igloo. This is because I want people to stay alive. In the past, before our time death was more frequent. If there is a snow cliff or *aluiqqaniq* (cornice), it is said that the *imikkalaaq* (snow that holds your weight momentarily then gives way) is usually deep especially at the bottom. If the cliff appears that it might fall and create (an) avalanche, then one must not travel close by it, though you can stay some distance away from it. If the cliff has a lot of *imikkalaaq* a jolt could cause an avalanche and one may get caught in it".

"If you are situated on (the) lee side of a windbreak with an "overhang", this too can be dangerous if the "overhang" is getting heavier with the wind, then that can also kill. One must always be cautious about these things, if there is no "overhang" then that is all right to find a shelter. But also, one must observe the immediate area and be familiar with it so that you are not situated below something that might fall, you can find a shelter that way"(2).

Elder Herve Paniaq explains, "there are some places that are dangerous for a person to travel by or camp near. For instance, you should never make camp too close to anything big, like mountains, high hills and huge rocks, otherwise if you're snowed in you'll never get out. If you are going to travel near high hills and mountains, always have a lookout for any heavy snow sitting on top of hills that might trigger an avalanche. Those were the main things that we were told to always watch and those are the things that people used to worry about most"(5).



THE ICE FOOT AT THE BASE OF THE MOUNTAINS. AT CERTAIN TIMES OF THE YEAR THIS IS THE ONLY ROAD FOR ONE TO TRAVEL NORTH OR SOUTH

The photo caption from Rasmussen's People of the Frozen North "The ice foot at the base of the mountains. At certain times of the year this is the only road for one to travel north or south"

4. A merging of Traditional Knowledge across the circumpolar regions of North America

In reviewing the stories and lessons provided by Elders from across the Canadian Arctic and Alaska the macro-picture emerges of terrain and weather, and above all, human safety. Traditional routes are very well defined and the same routes are followed generation after generation, be it through the fiords on the sea ice in the Canadian High Arctic or through the mountain passes between the interior and the coast of Alaska. Certainly this is to avoid avalanche terrain, but it is also to avoid white out weather, deep snowdrifts, and dangerous cliffs and gullies. Safety is always paramount.

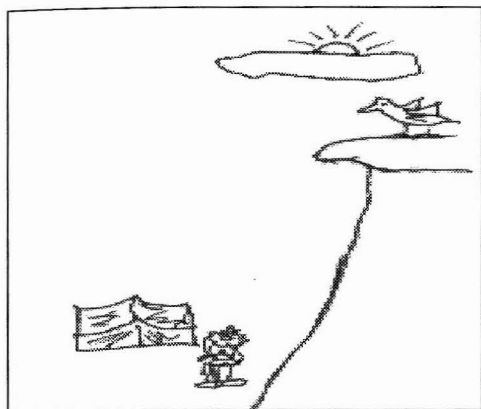
What is unique about the pattern of movement in Northwest Alaska is that, in the past, it often involved entire families, communities, or even whole societies. The travel difficulties were complex and there was considerable variation among them in regard to the problems they posed for human travel. Key mountain travel routes within the Brooks Range of Alaska for example are identified as having steep gradients, making for unsatisfactory sled travel and considerable danger of avalanche due to the narrow and steep-walled valleys (Burch). This knowledge influenced route selection and timing of movement.

Alaskan Iñupiaq Elder, Jonas Ramoth says, "in the winter in Selawik, Alaska, if it's clear and cold, -20° or -30°F (-29° or 35°C), maybe there are a few clouds but it's nice and calm. The wind isn't supposed to blow now. If the wind starts to blow when its not supposed to, people gathered will say "ooo, cold". In Iñupiaq they say *qimaurauqtuq*, which means, "he's beckoning the storm". You know it will be stormy - blowing, drifting snow. It

makes you decide to stay home. Animals will stay home too. This is very reliable”.

“Weather is never the first thing taught to children because until they start hunting, at age twelve, they don't really need to know. They are just travelling from home to school and only need to know the danger of the weather that is already there. Direct instruction about weather signs and prediction would not occur until there was the need to know associated with independent travel on the land” (6).

5. A story of Raven and the avalanche - a Yupik or Iñupiaq tale



An Iñupiaq child's drawing depicts the "Story of Raven".

"It is said a very long time ago Raven used to eat people because they were so easy to trick.

One day, while flying over the arctic coastline, Raven saw a small village. He was very hungry so he made a plan to get food to eat. He flew low over the village screaming, "Your enemies are coming! Your enemies are coming!"

All of the men ran out of their igloos with their spears in hand and asked the great bird what they should do.

Raven landed on top of a cache and addressed the men; "You must surprise them before they reach your village. Go and make camp at the foot of the cliff and wait for them in the morning."

The unsuspecting men thanked Raven and set out for the cliff's base to ambush the attackers in the morning as he had said to do.

When they arrived that night they built shelter at the foot of the steep cliff where Raven had told them to go to. Later that night, after the men had discussed

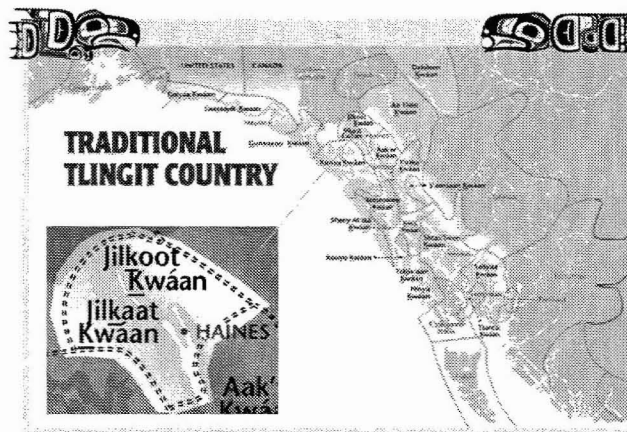
their plans and strategies, their seal oil lamps were extinguished and they all went to sleep.

When it was dark and the men were asleep, Raven flew to the top of the cliff high above the small camp and landed on an enormous overhang of heavy snow. Raven knew that the great load of snow was ready to fall with only the slightest encouragement, and so he proceeded to jump up and down on it.

After a few jumps, the overhang collapsed and avalanched down upon the sleeping men. They were completely buried alive by the heavy snow load!

The snow was very deep, and because Raven was lazy and didn't want to work to dig the dead men out so he could eat them, he waited until spring when the snow melted. Then he returned to eat them all (7)".

6. The Chilkoot Pass Palm Sunday slide of 1898



Prior to the arrival of European and North American traders, the Chilkoot Pass on the Alaska/British Columbia border served as a trade route to the interior of the Yukon Territory for the coastal Tlingit People. Native control of the trail by the Chilkoot tribe of the Tlingit weakened as the entire Tlingit trading system came under pressure from the Hudson's Bay Company and American traders in the 1800s. By the 1880s, the Tlingit People were allowing prospectors and exploration groups to make limited use of the Chilkoot route and by 1898 it was a stampede (Neufeld, 1996).

On the Easter weekend of 1898, at the height of the Klondike Goldrush, a series of avalanches swept down both the Alaskan and British Columbia sides of the Chilkoot Goldrush Trail, killing sixty-nine stampedeers.



Scene near the Chilkoot Pass, digging out from the avalanche.

There is a variety of information available on the Palm Sunday avalanche. It seems unlikely that it was a human trigger given the rapid changes in weather, but without a doubt the terrain into which a considerable number of the stampedeers fled was the contributing factor in the number of fatalities.

Of interest to those of us that spend time in the mountains are the weather and snow conditions at the time. A typically northern snow pack for that part of the world; depth of snow affected by the close proximity to the moisture of the ocean, the incredible elevation changes noted by historical photos of stampedeers climbing the "Golden Stairs" of the Chilkoot Trail, and the butting up against that of extreme arctic temperatures coming in from the north.



Chilkoot Pass and Petersen Pass.

The snowpack as usual was characterized by a thick ground layer of depth hoar generated by early season cold temperatures and a shallow snowpack. Heavy snow had fallen during the months of February and March from the south and cold winds blowing across the great expanse of the glaciers from the north and

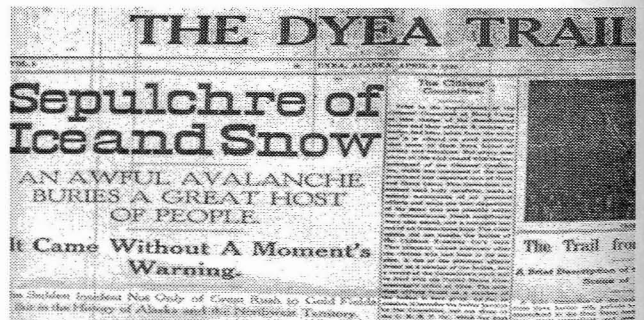
east had added a firm wind layer. Warm south winds from the ocean and new snow on the days preceding the avalanche were certainly contributing factors. Finally, on that Easter weekend, the slopes were loaded by fresh fallen snow and heated by the abrupt warming that happens in the North when winter turns almost to summer overnight.

It seems that at about three in the morning on the Palm Sunday, the first of a series of avalanches started and people camped up high started fleeing down the pass. A construction crew that entered a narrow gorge off the main path of the Chilkoot were all killed in one of the avalanches. A portion of a party of 200 stampedeers following the footprints of the construction crew were struck by a second avalanche and buried to depths of 20 to 50 feet (6 to 15.5 metres). Within 15 to 20 minutes it is said that 1500 men were digging trenches in an effort to locate people in the debris that covered about 10 acres (4.1 hectares).



Looking for bodies after the Palm Sunday avalanche.

In terms of numbers it is difficult to say how many were killed, as the information of the time is inaccurate. Contributing to the natural disorganization and physical difficulty in accounting for the victims that comes with a situation like this, was the fact that many of the stampedeers were transient and without family ties.



The Dyea Trail carried a sensational article on the avalanche in its April 9, 1898 edition.

Newspaper hounds were prone to sensationalising the disaster beyond what it already was. Initial reports were of

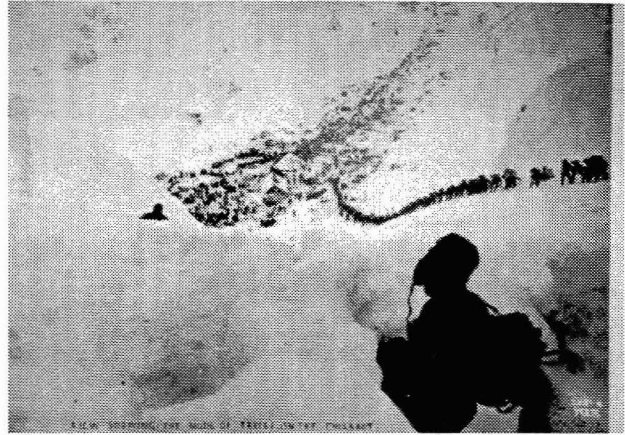
200 or 300 deaths as well as a ghoulish report of up to 5000 deaths (Dyea Trail, 1898). Lastly, a gangster-like criminal of the time, Mr. Soapy Smith, was seen to have men looting the bodies and removing all valuables, including the identification in their wallets (Berton, 1962).

Of interest from the perspective of the knowledge used is that the conditions of the time, while poor, were not unusually so, and the same kinds of human factors were at play 100 years ago as there are today. Likely many of the fatalities can be attributed to ignorance, not just of the local conditions, but also of the mountains themselves. Many of the Stampeders were fleeing the depression from parts of Canada and the United States and so had no idea of the potential danger. Even the dress of the day suggests the extreme level of ignorance of the conditions to be faced. In this case it may very well have also been haste and greed and a lack of respect for the intuitive understanding of the Aboriginal packers of the day.

Both Aboriginal and experienced white packers accustomed to the ways of the traditional routes warned against going past the treeline both that day and the days preceding. Whether the Tlingit speaking packers were able to communicate their knowledge and fears of the conditions is a good question.

Newspaper accounts of the time stated that "warning of impending disaster was given by the native Indian packers, who are said to have deserted the trail when the heavy snow of Saturday and Sunday night set in"(Chicago Tribune, 1898). Further accounts declared "there is not enough gold in the Yukon to induce those Indians to venture above Stonehouse today. They declare that the menace will continue until another freezing spell locks the snow on the slopes"(Portland Morning Oregonian, 1898).

Scientific Knowledge tells us that the conditions described should have been a warning that went unheeded. Traditional Aboriginal Knowledge also describes why this was a warning. The only difference was that the Traditional Knowledge did not go unheeded. Of the hundreds of Aboriginal Packers, primarily Tlingit People, who were on the southern and northern portions of the trail that day, none were in the pass and none were killed. In fact, the Aboriginal Packers refused to travel this mountain route, not just that day, but also that entire week.



View showing the mode of travel on the Chilkoot

7. Traditional Knowledge - contemporary use

It is important to recognise that Traditional Knowledge in the context of avalanche forecasting is not expressed as a warning of danger alone. *Pilimmaksarniq*, the guiding principle of knowledge and skills acquisition also uses humour to illustrate concepts as seen in the Raven and avalanche story. And, as seen in the opening poem, the use of Traditional Knowledge is expressed also in song. Peter Freuchen, in his book *Arctic Power* describes that ... "Songs are thoughts, sung out with the breath when people are mobbed by great forces and ordinary speech no longer suffices".

Traditional Knowledge is cumulative and is a shared experience validated by testing its effectiveness in particular circumstances. What is so moving and telling about the poem, the "Father's Song" is how aware the singer is about his location; he desperately does not want to test the effectiveness of his knowledge and he sings out because, as Freuchen says, ordinary speech no longer suffices.

In cultures across the circumpolar world, there remains a relationship between the people and the land. Spirits still remain amongst the hills, not so much to explain away environmental phenomenon, for phenomena such as avalanches are very well understood by northern people, but to help maintain the link between man and the world we live in... a link lost in the more competitive relationship many seem to have with the mountains and travel routes in the south.

How information is shared, in story, poem and song is important only in its ability to pass on information. Traditional Knowledge; oral information passed down over time... contemporary in its use and value.

Notes

- (1) "The Father's song" - Traditional Inuit Song
- (2) Excerpt from Tape: IE-351. Interview with: Inuki Kunuk. Interviewed by: Maurice Arnattiaq. Translated by: Louis Tapardjuk. Interview date: January 4, 1996*
- (3) Excerpt from Tape: IE-101. Interview with: Emile Imaruittuq. Interviewed by: Susan Avingaq. Translated by: Louis Tapardjuk. Date: February 19, 1990*
- (4) Excerpt from Tape: IE-331. Interview with: Abraham Ulaajuruluk. Interviewed by: Maurice Arnattiaq. Translated by: Louis Tapardjuk. Interview date: March 17, 1995. *
- (5) Computer File: IE-464. Tape Number: IE-464. Interview with: Herve Paniaq. Interviewed by: Claudio Aporta and Thoretta Iyerak. Date: December 12, 2000*
- (6) Interview between Sidney Stephens and Jonas Ramoth. Jonas Ramoth is an Iñupiaq Elder originally from Selawik but now living in Kotzebue, Alaska. From the "Handbook for Culturally Sensitive Curriculum", Winds and Weather Teaching Unit, Alaska Native Knowledge Network.
- (7) Alaska Native Knowledge Network. Marshall Cultural Atlas. Raven Yupik and Iñupiaq Tales

* Excerpts referring to avalanches taken from the interviews archived with the Igloolik Oral History Project, Igloolik Research Centre, Nunavut. Courtesy John McDonald.

Photo/Illustration Credits

- Hall, C.F. Arctic researches and life among the Esquimaux: being the narrative of an expedition in search of Sir John Franklin in the years 1860, 1861, and 1862. New York: Harper and Bro's 1864. Pg. 239
- Rasmussen, Knud. 1908. The People of the Polar North – a record compiled from the Danish originals and edited by G. Herring. L.B. Lippincott Company Philadelphia, Kegan Paul, Trench, Trubners and Co. Ltd. London.
- An Iñupiaq child's drawing depicts the Story of Raven. Alaska Native Knowledge Network. Marshall Cultural Atlas. Raven Yupik and Iñupiaq Tales
- Murdoch's, Whitehorse, Yukon
- Child, U of W Coll. Parks Canada Collection, Whitehorse, Yukon
- Vancouver Public Library Collection Print 2001. Credit: Yukon Archives
- Dyea Trails, April 9, 1898. Front Page
- E.A. Hogg, Parks Canada Collection, Whitehorse, Yukon
- Kirstie Simpson, Whitehorse, Yukon
- Kirstie Simpson, Whitehorse, Yukon



Looking north from the Chilkoot summit



Looking south from the Chilkoot summit

Bibliography

- Arnakak, Jaypetee "What is Inuit Qaujimajatuqangit: Using Inuit Family and Kinship Relationships to Apply Qaujimajatuqangit." Nunatsiaq News, August 25, 2000
- Baird, Morgan. "The Role of Natural Disasters in Human Migration. An examination of the Palm Sunday Avalanche of 1898". Alaska Historical Society Annual Meeting. September 1998.
- Berkes, F. "Sacred Ecology". Traditional Ecological Knowledge and Resources Management. Taylor and Francis, Philadelphia and London, U.K. 1999
- Berkes, F, Colding, J, Forke, C, 2000. "Rediscovery of Traditional Ecological Knowledge as adaptive management". Ecological Applications Vol 10, No. 5
- Berton, Pierre. Klondike. Toronto. McClelland and Stewart. 1962. Pg 264
- Black, Martha Louise. My Ninety Years. Edited and updated by Flo Whyard. Alaska and Northwest Books, Anchorage Alaska. The Northern Library Series. 1976. Pg 26.
- Burch, Ernest S. Jr. Overland Travel Routes in Northwest Alaska. Anthropological Papers of the University of Alaska 18 (1): 1-10
- Chicago Tribune April 11, 1898. Pg. 5
- Colombo, John Robert. Poems of the Inuit. Ottawa, Oberon 1981
- Dyea Trails, April 9, 1898.
- Freuchen, The Arctic Power (unknown publisher and date).
- Freuchen, P. Arctic Adventure. My life in the Frozen North. Toronto. Farrar and Rinehart Incorporated. 1935
- Greer, Sheila. Skookum Stories on the Chilkoot/Dyea Trail. Carcross - Tagish First Nation. 1995. Pg 60
- Hall, C.F Arctic researches and life among the Esquimaux: being the narrative of an expedition in search of Sir John Franklin in the years 1860, 1861, and 1862. New York: Harper and Bro's 1864.
- Los Angeles Daily Times. April 11, 1898. Pg 2 (?)
- Lung/Martinson. Black Gold and Sand. Pg 376 to 380.
- Neufeld, David and Frank Norris, Chilkoot Trail: Heritage Route to the Klondike. Whitehorse, 1996
- Norris, Frank, "Slide Cemetery, and Site of the Palm Sunday Avalanche", 1986.
- Personal Correspondence with: John McDonald, Igloolik Research Centre, Igloolik, Nunavut; David Neufeld, Yukon and Western Arctic Historian, Parks Canada, Whitehorse, Yukon; Frank Norris, Historian, Alaska Support Office, National Park Service, Skagway, Alaska; Karl Gurcke, Cultural Resource Specialist, Klondike Gold Rush National Historical Park, National Park Service, Skagway, Alaska; Allen Niptanatiak, Wildlife Officer, Department of Sustainable Development, Government of Nunavut, Kugluktuk, Nunavut; Jane Vincent, Whitehorse, Yukon; Heather Jones, Yukon Archives, Whitehorse, Yukon.
- Portland Morning Oregonian April 11, 1898, Pg. 1.
- Rasmussen, Knud. 1908. The People of the Polar North – a record compiled from the Danish originals and edited by G. Herring. L.B. Lippincott Company Philadelphia, Kegan Paul, Trench, Trubners and Co. Ltd. London. Pg. 34,134.
- Usher, P.J. "Traditional Ecological Knowledge in Environmental Assessment". Northern Impact Assessment Seminar, Yellowknife, NWT. October 2001.

WORLD YUKIGATA 2002

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ABSTRACT

Yukigata has been introduced in ISSW'96 and 98. Yukigata is a Japanese which means the shapes created by snow patches surrounded by bare ground (positive yukigata) or by open ground surrounded by snow (negative yukigata). In this paper the newest information on both of the Japanese yukigata and the world yukigata will be reported. Moreover, we would like to get the new other information on world yukigata from the participants of the workshop through this presentation.