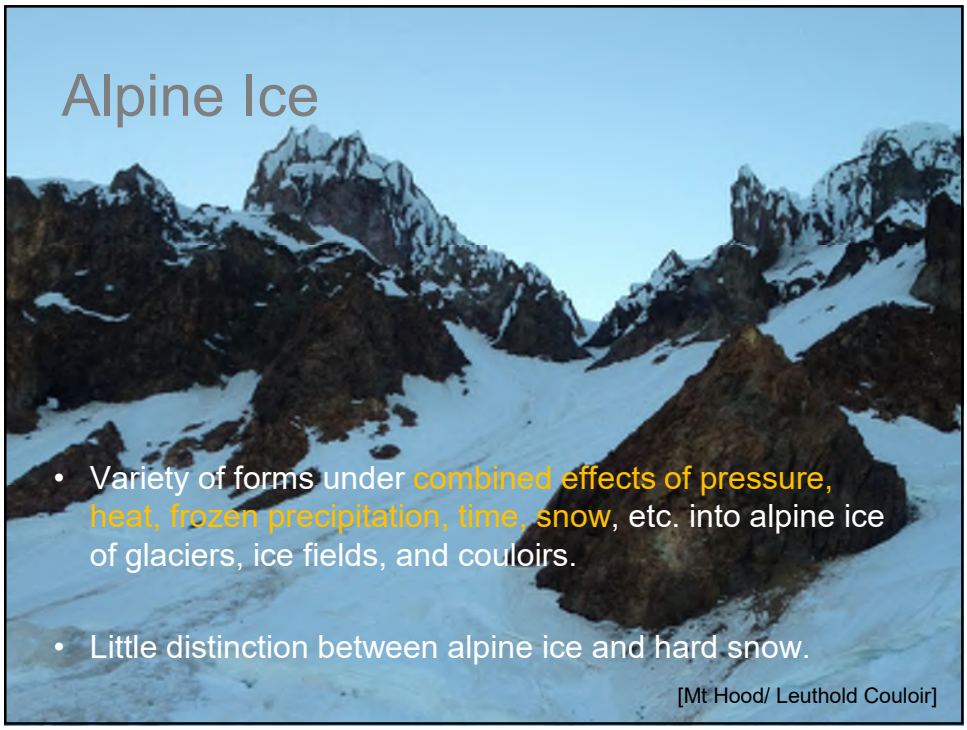
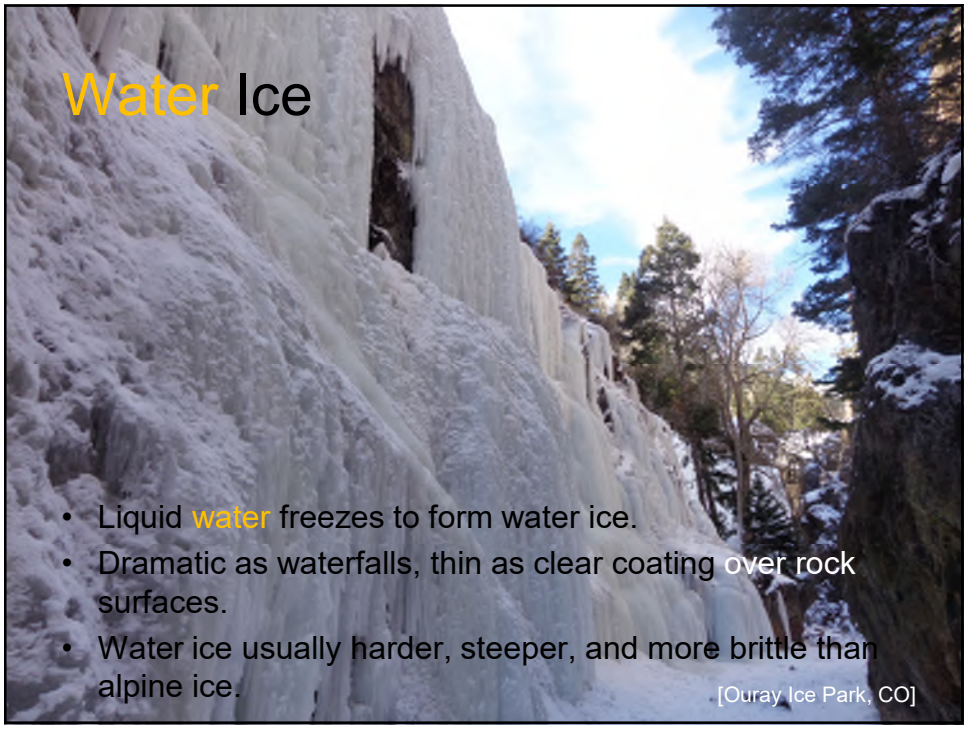

ICE
Alpine Ice Climbing Lecture 2019
[Mt Hood/ Sandy Headwall]


Alpine Ice
• Variety of forms under combined effects of pressure, heat, frozen precipitation, time, snow, etc. into alpine ice of glaciers, ice fields, and couloirs.
• Little distinction between alpine ice and hard snow.
[Mt Hood/ Leuthold Couloir]


Water Ice
• Liquid water freezes to form water ice.
• Dramatic as waterfalls, thin as clear coating over rock surfaces.
• Water ice usually harder, steeper, and more brittle than alpine ice.
[Ouray Ice Park, CO]


Characteristics of Ice
[Mt Rainier/ Kautz Glacier]

Characteristics of Ice

Ice Quality = Weather

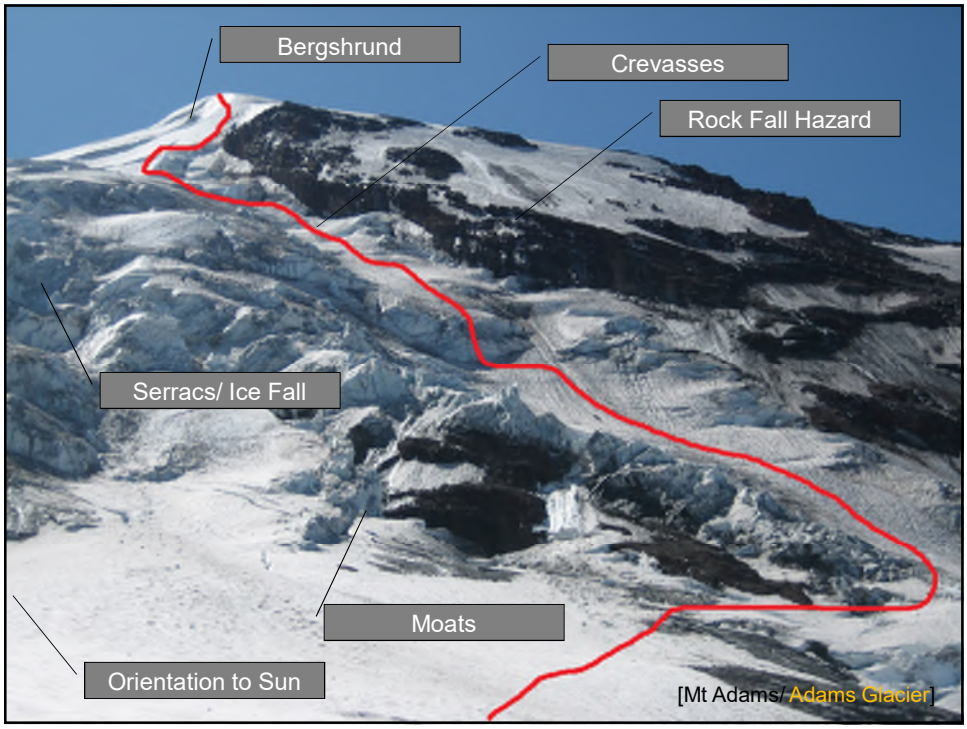
- Ice formed directly from water freezing; or indirectly through metamorphosis of neve (permanent snow).
  - *Ice is distinguished from hard snow when its mass is air tight.*
- OPAQUENESS denotes softness.
  - *Soft, plastic snow can lead to good tool placements; too soft and weak can lead to weak protection.*
- COLOR indicate hardness.
  - *Blue ice (ice relatively pure) vs black ice (old, hard ice mixed with dirt, pebbles, debris)*
- CLARITY equals brittleness.
  - *Can require extra time to plant a tool without ice shatter.*
- Cracks and fractures can mean weakness
- "Dinner plates" mean temperatures are changing (tends to happen later in day as air warms), surface of ice becomes softer and more aerated, breaks away in plates

Objective Hazards

- Loose rock, hidden ice, crevasses on approach
- Falling ice and rock
- Avalanche/ weather conditions
- Ice quality

Hazards You Control

- Loose clothing
- Inappropriately racked gear
- Sharpness of tools and crampons
- Poor crampon & travel technique
- Fatigue
- Slips/ falls
- Timing of attempt


Bergshrund
Crevasses
Rock Fall Hazard
Serracs/ Ice Fall
Moats
Orientation to Sun
[Mt Adams/ Adams Glacier]


Condition Factors
Cold/ warm temps
Cloud cover
Aspect; when the sun lights up a slope
Storm cycles
Avalanche conditions
Timing of the trip
[Mt Buckner/ North Face]

Efficiency

- Desire to move faster
- Stay fit
- Know the weather
- Memorize ascent/ descent routes
- Early starts absorb contingencies
- Adopt a steady pace
- Let the strongest lead all the way through, or block lead
- “Draft” by hooking leader’s pick holes, to save time & energy
- Eat & drink frequently to save energy- carry warm drinks instead of brewing up
- Carry light packs and be strict about contents
- Don’t place screws too high to interfere with your next tool placement
- The best way to deal with getting pumped, is <u>not to get pumped</u>

Efficiency

- Arrange packs with most useful stuff on top
- Use longer ropes
- Avoid complicated gear
- Use chocks and natural protection; use bollards instead of deadmen and ice pitons
- Use longer axe- axe/ second tool combo is good for alpine ice
- Cut steps instead of putting on crampons in short sections
- Learn to put on crampons on fast
- Keep tools SHARP
- Crampon quickly across dangerous areas- crab across with both tools deployed in *piolet panne*
- Your ice tool is also a nut tool
- Carry the hex key you need to tighten your pick
- Use ice features for foot placements when possible

Efficiency

- If really pressed for time, follow on tension using nothing but hands, or use the rope as handline
- Don't drive in axe for self belay when following in steps; use balance instead
- Avoid cutting long ladders of steps
- Don't use piolet traction if axe only will do; use hands instead of tools where possible
- Swing the second tool with the lead; swing the belay jacket with the belayer
- Stop and belay only if necessary; avoid rope of three
- Know the snow conditions and travel on stable wind pack
- Down climb when possible; rappel only when necessary
- "Chicken clip" to place a screw if you are in an unsettled position
- Face outward when descending whenever possible. Face inward as last resort

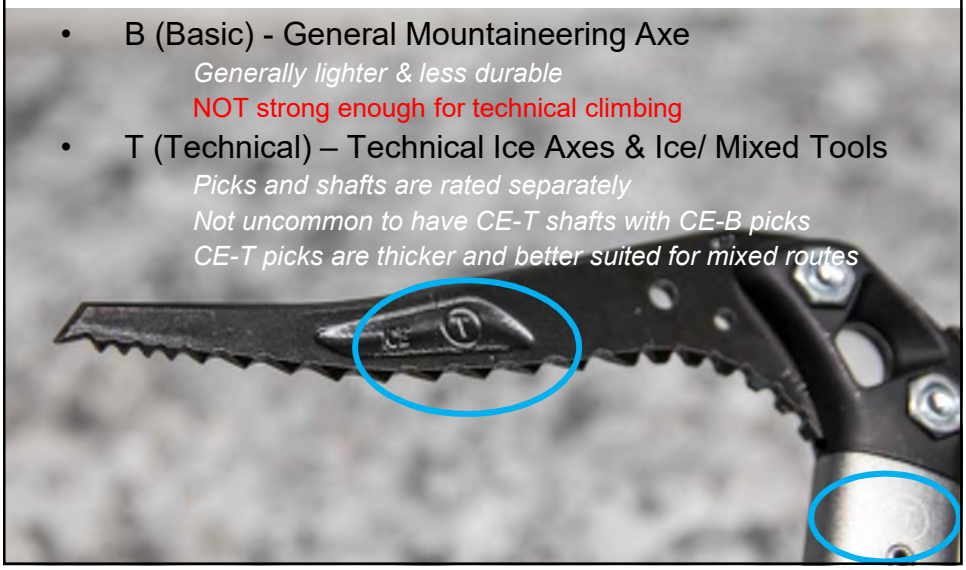
Gear

Necessary Clothing + Gear

- Warm, fitted clothing
- Sunscreen, Sun glasses
- Climbing helmet
- Stiff mountaineering boots (leather, plastic, hybrid)
  Advantages/ disadvantages to each
- Gators
- Climbing harness
- Single & double runners with carabiners
- Cordelette
- Standard glacier travel gear
- 10 essentials

CE Safety Certifications

Comité Européen de Normalisation



- B (Basic) - General Mountaineering Axe
  - *Generally lighter & less durable*
  - NOT strong enough for technical climbing
- T (Technical) – Technical Ice Axes & Ice/ Mixed Tools
  - *Picks and shafts are rated separately*
  - *Not uncommon to have CE-T shafts with CE-B picks*
  - *CE-T picks are thicker and better suited for mixed routes*

Ice Climbing Hardware

- SHARP 12-point crampons w/ front points- compatible with your boots
  - NO ALUMINUM
  - *Preferably with anti-bot plates*
- Ice axe (60+cm)
  - *Verify pick will stick in the ice*
- Second ice tool with hammer (55cm)
- Leashes (spinner, hand, runner)
- Tool protection (*keep things sharp*)
- Ice screws, variety of lengths (eg- 19, 22 cm and smaller)
- Pickets
- V thread tool

Ice Climbing Hardware

Optional (but nice to have)

- Tool holster
- Load limiting protection
- Helmet visor or goggles
- Waterproof gloves, or multiple pairs of gloves
- Quick draw
- Trekking poles
- Rap ring & extra perlon
- Pitons and/ or Rock Pro (*for mixed climbs*)

Tool & Crampon Maintenance

[Mt Rainier/ Mowich Face]

Sharpening Tools and Crampons

Better kicks and sticks!

- Sharp equipment and tight bolts — picks, head weights, etc. — should be part of your pre-flight check.
  - Always carry the necessary hex key(s) to tighten your tools.
- Sharp points moving fast enter the ice more easily and disturb it less, saving you energy and preserving the medium.
  - *Swan dive versus belly flop.*
  - *More important for water ice than for glacial ice.*
- Everything that touches the ice should be sharp, i.e., at least tool picks, primary front points, and secondary front points.

Sharpening Tools and Crampons

Shaping by subtracting material.

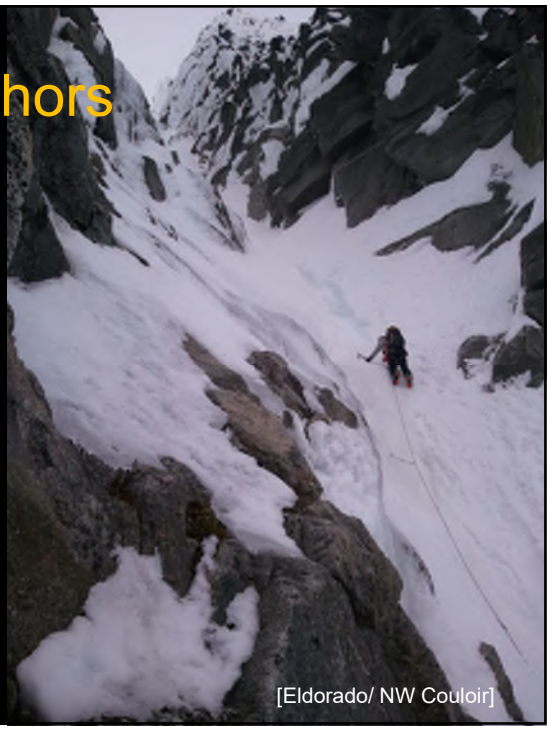
- For tools and crampons, use a “mill bastard file”. Readily available from Amazon.
- The goal is to make the pick and front points into the shape you want.
  - **Do not** use a bench grinder. It will heat up the metal.
  - Gently clamp the pick in a vice or brace the tool against your leg. *Be careful of furniture and flesh.*
  - First, shape the cross-section of the tip to match the shape when it was new. (E.g., if it gets “beaked” from hitting rock…)
  - Next, shape the edge with smooth, even strokes in the same direction on each side.
- Sharpening removes metal, so think about that as you work.
  - E.g., don’t sharpen the front side of your secondary front points, as that will alter the profile of your crampons.

Sharpening Tools and Crampons

Be gentle with your screws.

- Sharpening screws is an involved process that requires skill, care, and additional kinds of files.
- The best way to keep your screws sharp is to not dull them. Keep your screws capped when not in use and be careful around rock.
- Video about sharpening tools and crampons: https://www.youtube.com/watch?v=TelFz1cSdQU
- Video about sharpening ice screws: https://www.youtube.com/watch?v=L-CQbOM35oY

Common Anchors



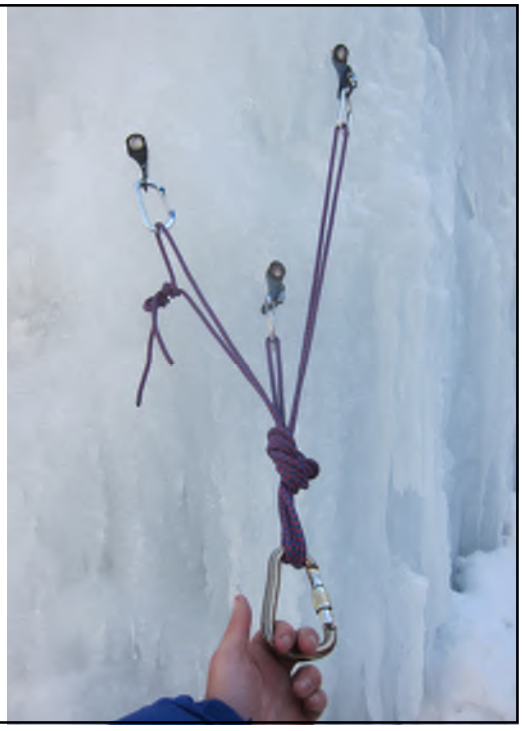
[Eldorado/ NW Couloir]

Common Anchors

- Ice Screws
- Pickets
- Pitons

Belay Anchor

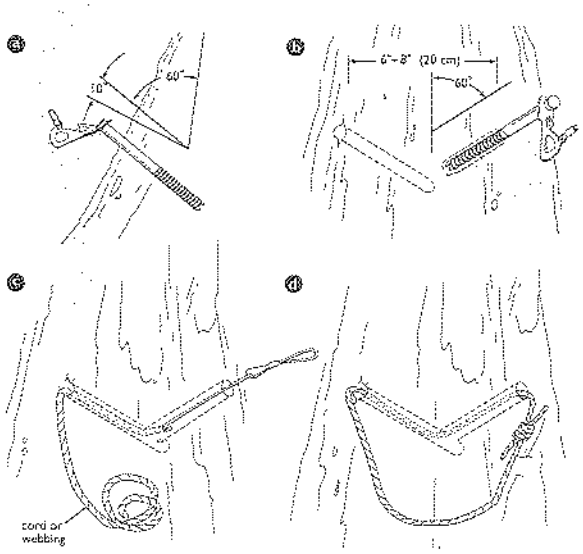
- Three Ice Screws
  Placed staggard
- Equalized Cordellette
- Belay Follower off Anchor



Common Anchors

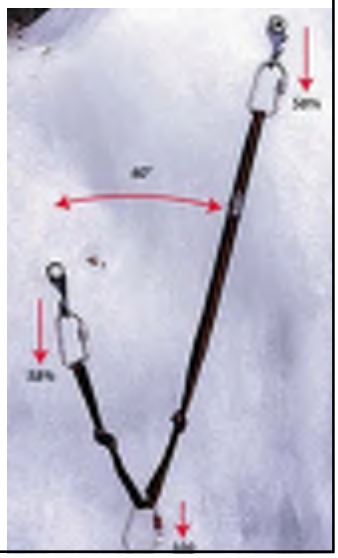
- Abakalov / V-threads
- Ice bollards

Making a V-Thread Anchor



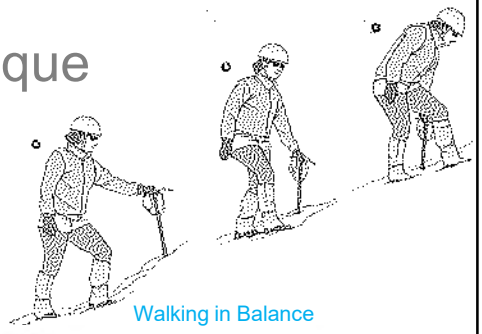
Ice Screw Top-Rope Anchor

- Two Ice Screws
  Placed staggard
- Equalized Runner
  Extend as necessary
- Use Locking Carabiners
- Place Snow atop Ice Screws
  To mitigate screw melt-out over time, not shown for clarity



Climbing Technique

Low Angle Technique



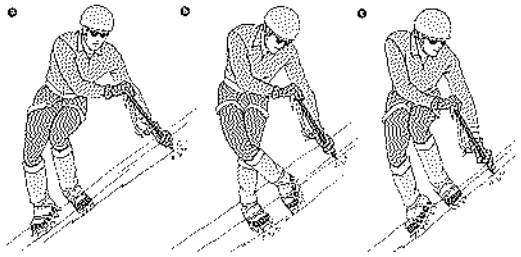
Walking in Balance

Ascent- cane position

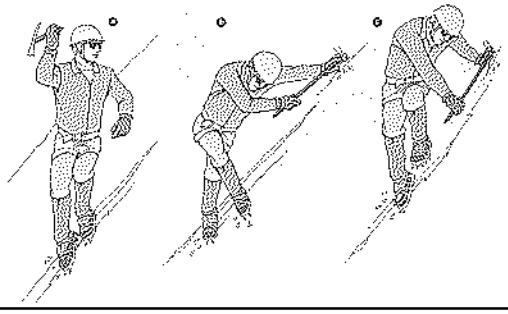
Ascent- stake position

Ascent- Ax in horizontal position

Moderate/ Steep Angle Technique



French Technique/ Ax in Cross- Body Position



French Technique/ Ax in Anchor Position

Front-pointing

NOT CORRECT

Correct

Ax Position- High/ Low Dagger

Front-pointing/ Ax in low dagger position

Front-pointing/ Ax in high dagger position

Ax Position- Traction

Front-pointing/ Ax in overhead traction

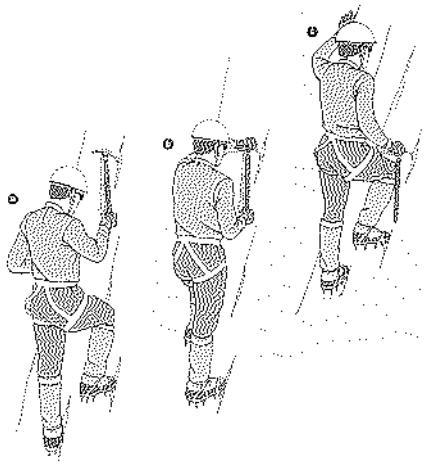
Three-O'Clock position/ Ax in overhead traction

Ax Position- High/ Low Dagger

Front-pointing/ Ax in low dagger position

Front-pointing/ left Ax using traction with right Ax in high dagger position

Ax Position- High/ Low Dagger



Front-pointing/ Moving with Ax in High and Low Dagger Position

Descending

Plunge stepping

Flatfoot/ Ax in cane position

Flatfoot/ Ax in cross-body position

Prior to the Ice Climb

- Know your route, what to expect for the desired climbing day
- Know the recent weather history & forecast, including avalanche forecast if applicable
- Review team composition, party size
- Perform tool maintenance & sharpening as necessary
- Establish a Climbing Plan

While Ice Climbing…

- Assess route & weather when you arrive
  Is it what you expected?
- Go/ No-Go Decision prior to starting
- Use proper footwork
- Climb in balance, move efficiently
- Use proper tool work
  Relaxed swing, when to employ techniques for efficiency, avoid overdriving tools
- Properly carry and stow tools as conditions permit
- Use safe travel technique across ice falls, moats, bergshrunds, crevasses
- Running belays/ simul-climbing vs Swinging Leads
- MAKE INFORMED DECISIONS

Questions
(thus far)

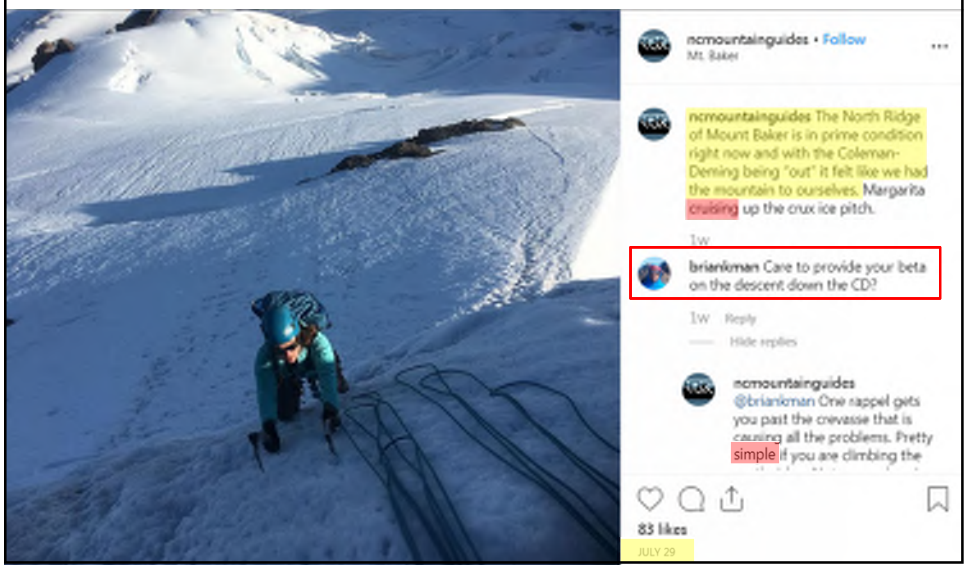
[Mt Rainier/ Liberty Ridge]

Selecting the Right Objective

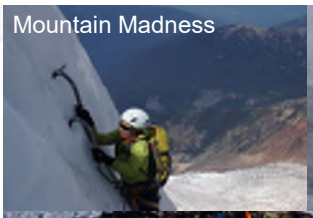
"And he thought about why they had chosen Capitol Peak, about the hype surrounding it. They were so focused on the descriptions — the thrill of the Knife Edge, the endorphin rush at the summit, and the desire to see themselves among all the others they knew had stood on the top of that mountain. A few weeks after the accident, Doro was scrolling through Facebook and came across a post about Capitol Peak that tagged a news article about Lord's accident. 'Hardest peak ever,' the post read. 'So many people have died, but I crushed this mountain.'"

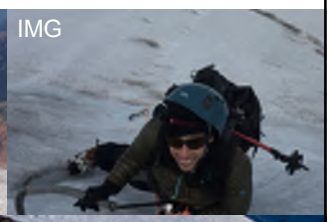
– From Tory, Sarah, and Katie Botwin. "Death in the Alpine." *Death in the Alpine* , 14 May 2018, www.hcn.org/issues/50.8/recreation-death-in-the-alpine.

Influence of Social Media



Perception

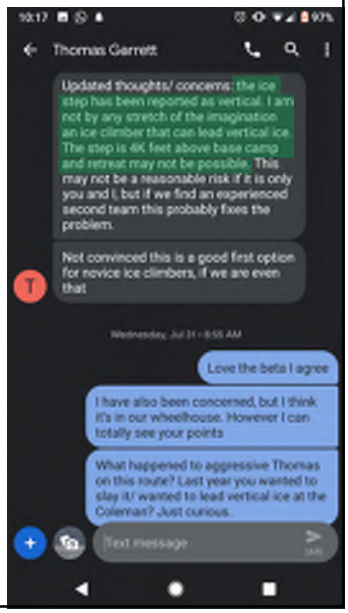




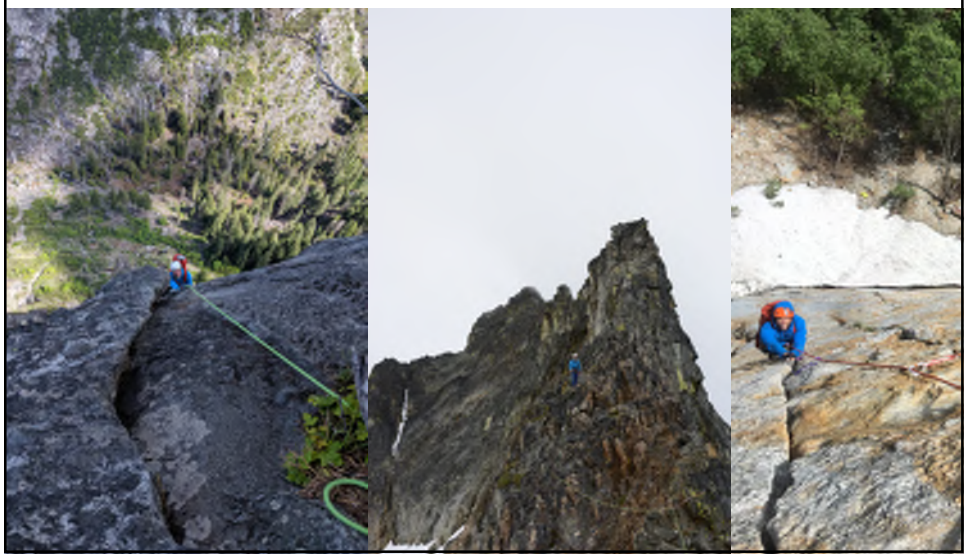
Evaluation

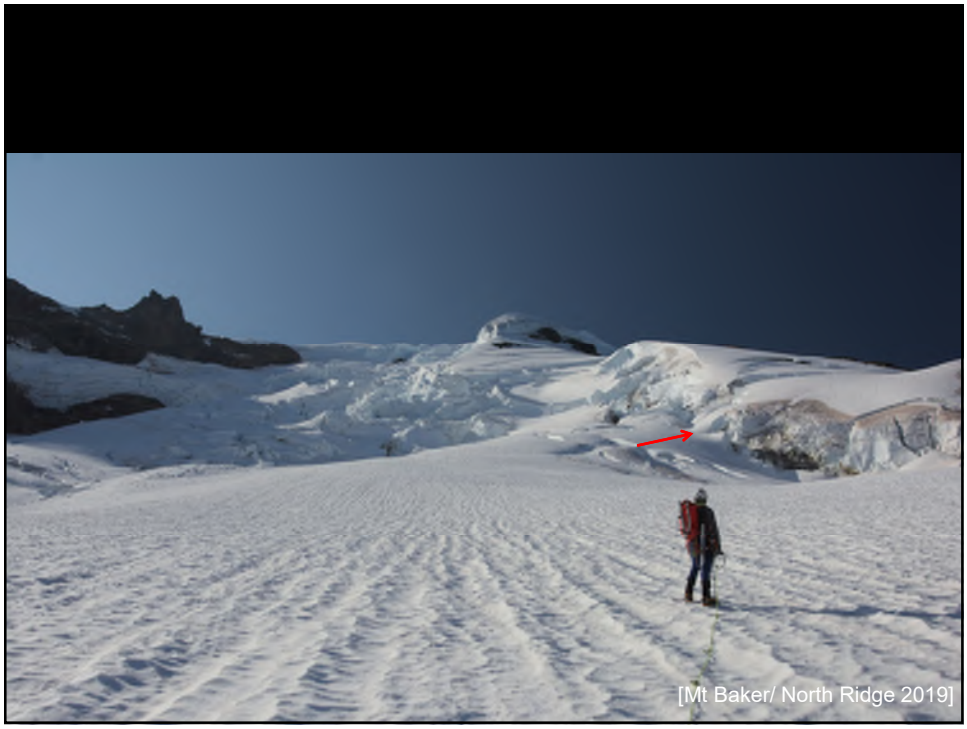
"Where the angle increased above 45 deg Ralph chopped a large stance in the ice, and when he had his belay ready I began chopping a line up the steep ridge, adjusting each blow carefully, shaping each step almost like a work of art. We had soft steel, barbed ice pitons to protect leads and to anchor belays. For two arduous hours I chopped and maintained a delicate, strained balance on chipped-out handholds… Above the wall the slope angle decreased, but hopes for fast non-belayed progress were premature. The crest became blue ice covered with loose snow and filmy crusts so variable in depth we could not trust ice-ax belays…[as] The covering on the ice became thicker; it was a ***relief*** *to reach a wall of compact neve."*

From Beckey, Fred . "The Challenge of the North Cascades." *The North Wall of Baker*

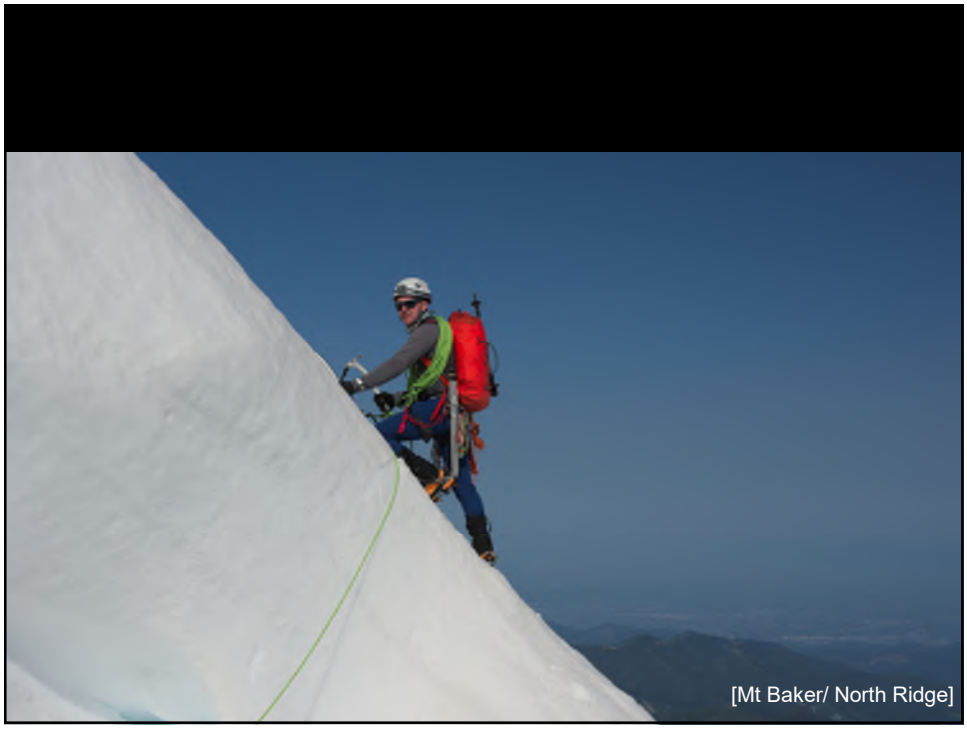


Prerequisites




[Mt Baker/ North Ridge 2019]


[Mt Baker/ North Ridge]



[Mt Baker/ North Ridge]

[Mt Baker/ North Ridge]

The Rest of the Climb

- The ice was steeper than we thought.
  Likely 20-30 feet of vertical
- Bailing was out of the question.
- I took on each screw.
  Placing screws is not like popping in a cam
- I was too pumped to finish the pitch.
  Thomas finished the pitch for me
  I put my partner's safety and my safety at risk
- Climbing transitioned to negative thoughts.
  "Get me off of this thing."
  "I hope there are no more pitches like this."
  "What if we get benighted?"
  "I'm never alpine ice climbing again."

Thoughts

- Grade III+ is serious.
  Take that rating seriously---especially on a big mountain. Bailing off this route was not an option. I did not respect it. Which leads to:
- I was climbing out of my paygrade on this one with the AI3.
  Maybe I should be focused on having more fun in the mountains, rather than doing classic routes or climbing something because it would make me feel like a climber. I need to stop comparing myself to other climbers.
- I should have had a lot more experience on ice before tackling this.

Thoughts

- Having a good partner that you can trust.

  When you just need to move and can't place pickets everywhere is a huge bonus. Sometimes snow doesn't lend itself to either pickets or screws. Sometimes you have to MOVE so you can get off the mountain. Thomas was my dude.

- Maybe we climbed this a bit too late season.

Advice

- Recognize you are transitioning into a climber with skill and ambition.
- You are in this course because you want to experience the alpine and want to challenge yourself.
- The issue is you have yet to develop experience.

  You are walking a fine line

- Make decisions that would make your parents/significant others/the Mountaineers proud.
- I am half ashamed/ half immensely proud of my climb of the North Ridge.
- Reactions to your pictures on social media will validate any of your decisions as long as you made it home safe.

Demonstrations