SPQ – Module 10 – Crevasses!

"Crevasses. God they give me the creeps!"

Richard Weber was sitting in an apartment in Punta Arenas, Chili, with Ray & Kevin and they were chatting about what they expect to find in Antarctica. They were a week away from flying over to Antarctica for the start of their expedition. Richard is not naïve to the threat of crevasses having spent over twenty years exploring the far reaches of the north.

Crevasses are likely the biggest danger the South Pole Quest team face and are abundant across the Antarctic continent, which is 98% covered by glaciers.

Standard crevasses can be up to 30 meters or more in depth. They vary in width from a few centimeters to tens of meters wide when they are considered very dangerous. What makes them particularly dangerous is that they can be concealed beneath a thin carpet of snow effectively hiding them from those travelling over the glacier above. Snow bridges can create the illusion of an unbroken glacier surface when in truth they may consist of only a few centimeters of snow hiding a deep chasm below.

Figure 1: A man marks a snowbridge above a crevasse. This crevasse measured 32 feet wide; 82 feet deep with a snow bridge 25 foot deep (Source: United States Antarctic Program)

Both Amundsen and Scott encountered problems with crevasses. On the fourth day of their expedition to the Pole, Amundsen's team had a dog team fall into a crevasse when a snow bridge that had been obscuring it collapsed under the weight of the sledge. Thirteen dogs attached to the sledge were being pulled into the crevasse where they hung suspended until the team members managed to lash a rope around the sledge and halt its downward progress. The sledge and dogs were ultimately pulled to safety.

Early in the preparatory phase of his expedition Scott had a dog team of 13 fall into a crevasse. Most of the dogs remained in their harnesses and were suspended in mid air. Two of the dogs fell 65 feet and landed on a ledge of ice. After rescuing the dogs that were suspended in their traces Scott was lowered 65 feet into the crevasse and retrieved the two dogs that had fallen to the ledge. The rescue effort took two and a half hours.

What are crevasses and how do they occur?

Crevasses are cracks in the surface of glaciers, and are a product of the movement of glaciers which flow like very slow rivers. At first glance it would not seem obvious that ice can flow like a river. If you place a block of ice from your freezer outside on a sloped surface the block of ice will not flow down the slope. Rather it will sit there until spring comes and it melts. So why is it that if block of ice from your freezer does not flow downhill, that a glacier does? The reason is that ice requires a massive amount of weight pressing down on it in order to begin to flow. The ice toward the bottom of a glacier flows or is pushed downhill by the weight of the ice above it. As the ice toward the bottom of the glacier passes over irregular surfaces cracks can form in the more solid ice on its surface. These cracks are called crevasses.

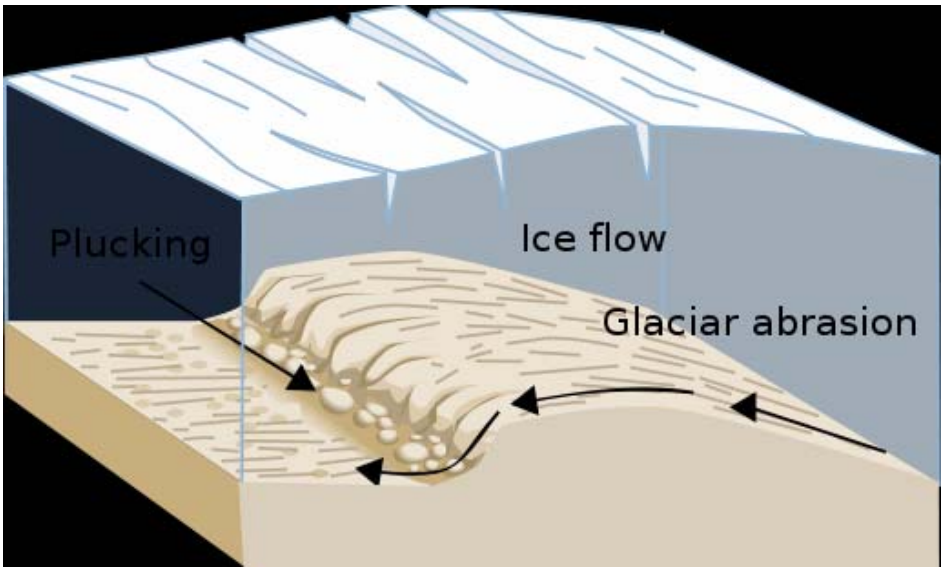

Figure 2: Diagram of glacial plucking and abrasion (Source: originally from es.wikipedia)

There are three types of crevasses, marginal, transverse and longitudinal crevasses. Recalling that crevasses are a product of the differential flow of ice, helps to understand how these different types of crevasses form.

- **Marginal Crevasses: These are cracks that occur at the edges, or margins of a glacier due to the strain built up when the center moves faster than the sides.**

- **Transverse Crevasses: These are cracks that run across the surface of a glacier that is running down a slope. These crevasses run perpendicular to the direction of flow of the glacier and are the most common type of crevasse.**

- **Longitudinal Crevasses: these are cracks formed when a glacier spreads over a wide plain. These crevasses run parallel to the principle direction of flow of the glacier.**

Crevasses can be either wet or dry, depending on the climactic conditions in the area of the crevasse. Wet crevasses can be much deeper than dry crevasses, and can even penetrate the entire depth of the glacier. Most of the crevasses in Antarctica are dry, and occur in greater frequently where the ice flows from the Polar Ice sheet to the lower levels around the periphery of the continent.

Most of the crevasse incidents in Antarctica involve individuals travelling by snowmobile or other motorized vehicles. The weight of these vehicles often breaks a snow-bridge where the weight on ski or foot would not. To address this problem an apparatus has been invented that allows heavy vehicles to carry a radar device on a long boom in front of the vehicle to 'read' the terrain ahead and find crevasses before the vehicle falls into them.

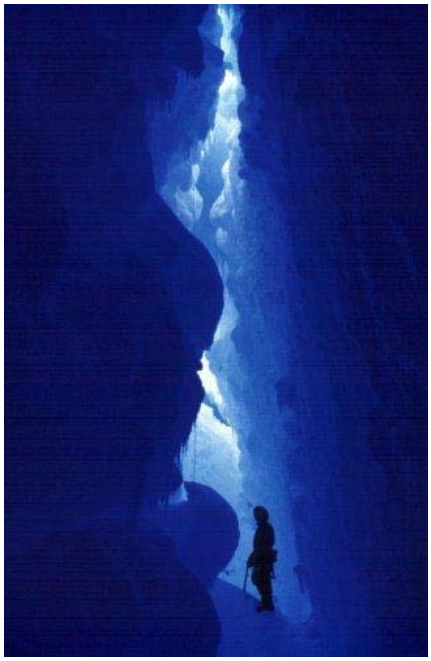

Figure 3: The bottom of an Antarctic crevasse (source: This work is licensed under the Creative Commons Attribution 2.5)

The South Pole Quest team has elected to travel without ropes. Richard and Kevin are traveling on skis, whereas Ray is running on foot or snowshoe. Skis help distribute weight over a greater area when crossing a snow bridge. As a consequence, Ray must be particularly careful, ensuring the integrity of the surface over which he travels. Falling into a crevasse with no ropes on hand would not be a good thing. Mind you he has a contingency plan, he has suggested that he take the team tent on his sledge so that if he falls into a crevasse he can camp out while waiting to be rescued.