Lightning and the Mountain

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THE URGE to know more concerning the effects of lightning becomes stronger when one is on a peak with the static charge beginning to make its power felt. When every projection in the vicinity, and finally the climber himself, begins to spark and the air is filled with ominous hissing, the desire to be in camp becomes overwhelming. Since this desire cannot always be satisfied, it is well to know what to do at this time.

The reasons behind the classical warning to be off the summit and ridges in a lightning storm can be seen when the mechanics of the lightning discharge are studied. Owing to rising currents of air and various other disturbances in the atmosphere, the clouds in cold-front and linesquall weather obtain high charges of static electricity. When these charges build up to such magnitude that they can overcome the resistance of the air, they tend to join their counterparts on the ground. This is similar to the action of a spark plug in the automobile engine, magnified millions of times. The discharge between cloud and ground is accompanied by currents which dissipate themselves over the ground surface.

A study of static electricity reveals that the cloud charge prefers to discharge to a sharp pointed object rather than to other shapes. This, coupled with the relative closeness of the summit of a mountain to the cloud, is the reason for the danger at the top of the mountain. However, where there are low clouds and a ridge, discharge is likely to occur to points on the ridge rather than to the summit. Once discharge has occurred, the current flows over the surface of the rock toward the base of the mountain. It flows perpendicular to the lines of equal potential. The closer the potential lines are together, the greater is the current cow. Near the summit the lines are very close together, while near the base, they are relatively far apart; the ground currents are strong near the top and weak near the base. Also, the lines are close together on vertical walls, while on the horizontal ledge they are far apart. Similarly, it is found that the current flow is greater on the face of a mountain than on its ridges.

The two types of danger from lightning consist in a direct strike and in a subsidiary danger from the ground currents. Anywhere but on the summit or very near to it the chance of being the victim of a direct bolt is small and the probability of being killed is almost certain. In contrast, the chance of meeting ground currents is almost certain, while with a few precautions the probability of being injured by the currents is small.

The precautions to be taken against a direct strike consist in getting away from the summit or ridges, and, if this is impossible, to get as close to the rock as possible without Iying down. A squatting position with head low is ideal. Any pinnacle in the vicinity that is five to ten times the height of the squatting position will give lightning-rod protection.

From a study of potential distribution on an idealized mountain several important theoretical conclusions may be reached.

Since the potential lines are farther apart near the base, it is apparent that it is safer near the base. The long ledge is safer than the sloping ridge near it. The vertical portion of the ridge conducts large currents; Thus, one may conclude that the steeper the rock, at any given height above the base, the more dangerous its ground current.

The protection from ground-current injury should consist of getting on rock with the least slope available. The climber should be sure that he stays as far from the wall as possible to minimize the danger of a discharge

from the wall to the body. One point of contact with the rock should be the maximum. The danger of rappelling is immediately apparent, as it automatically gives the climber two points of contact with a very great potential difference.

Combining the precautions against both ground currents and a direct strike, we find that the best position would consist of squatting with the head down and feet together in the middle of a wide ledge or as gentle a slope as is available. Ice ax, crampons, pitons, and other sharply pointed objects should be some distance away. Possibly the ice axes could be placed ferrule up to form crude lightning rods (especially if the handle is wet or its conductivity is otherwise improved, e.g., by wire).

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