Some Expeditionary Aspects of Glaciological Studies in Alaska

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Juneau, Alaska, capital city of our 49th state, has given its name to the fifth largest mass of ice and snow on the North American continent, Juneau Icefield. Occupying about 1,600 square miles and averaging nearly a mile in elevation at its crestal névé, this ice-field is an ideal location for glaciological expeditionary research. Its western periphery is almost directly above Juneau, and a hard climb of 10 or 12 hr will put you on the ice. Its major crestal portions of Taku, Demorest, Vaughn-Lewis, Lewellen, Battle, and Reverse Glaciers can be reached in a half-hour's flight from Juneau, and many of its distributary glaciers reach nearly to sea level.

Any serious attempt to conduct glaciological research in southeast Alaska must be undertaken on an expeditionary scale. Distances involved, conditions of ice and névé surfaces, logistical problems of food, medical supplies, vehicles, gasoline and scientific equipment all present obstacles to be overcome, but the most basic and omnipresent threat to research is the hostility of Alaskan weather. During a nine-week period on Juneau Icefield in July, August, and September of 1966 members of our party saw the sun only seven days.

One of the functions of our study was to collect and record meteorological data at three-hour intervals from a number of camps and stations on the icefield. Wet- and dry-bulb thermometers, recording barographs and thermographs were housed in standard louvered meteorological shelters at all stations. Anemometers and vanes record wind velocity and direction at several stations, and at three locations Belfont total-radiation recorders and Campbell-Stokes duration-of-sunshine recorders provide records of these important weather factors. Measurements are made of precipitation accumulation and of glacier-surface ablation in order that these factors may be related to glacier-budget and motion studies. At our high camp (Camp #8, 7,200 ft), located near the crestal névé of Taku - Lewellen Glaciers, 6.5 ft of new snow accumulated in a seven-week period. Winds in excess of 100 mph were recorded and it was not uncommon to measure rime-ice more than a foot thick on the windward side of vertical surfaces after a severe sleet storm. Temperatures most commonly stayed close to freezing, but a range of 21 to 58 F was recorded in our meteorological shelters.

Nine movement profiles have been set across the main trunk and several tributaries to Taku Glacier. These profiles consist of stakes driven into the surface of the glacier, the stakes having flags attached to their tops. Readings are made on the stakes at desired intervals by theodolites located on bed-rock adjacent to the glacier. Observations during the summer of 1966 showed Taku Glacier to be moving at a rate of 3.5 to 5 ft a day at an elevation of 3,600 ft, below base camp #10. This rate of movement is not unusually high according to Nye (1952) and Sharp (1954), but is of sufficient significance to necessitate all permanent or semipermanent structures being built on bed-rock exposures above the moving ice.

Some of the equipment and supplies can be brought to the campsites by helicopter, and infrequently even loads of plywood and sheet metal for hut construction can be slung beneath a helicopter and brought to the camps. Normally, however, all of these building supplies, foodstuffs, medical, scientific, and personal equipment must be back-packed from landing sites on the glacier to the campsites above. Loads are usually lashed to army packboards and carried up the hill. To reach our high camp, #8, we walked about 2.5 miles and climbed 1000 ft, only the last 100 yards of which was on rock. The remainder was on heavily crevassed snow on a western slope which commonly was quite slushy by afternoon. "Sherpa" duties, necessitated by needs of everyday living and survival, constitute a considerable portion of the time involved in a glaciological expedition.

Despite the fact that short courses in survival techniques and first-aid procedure are given "on the site" by experienced personnel of most expeditions, no prospective participant should plan to make such a trip without first preparing himself to meet emergencies. Self-arrest action with and without ice-ax, prussik and jumar ascents, knowledge of proper belay procedures, middle-man and end-man roping-up techniques should be familiar to anyone planning in-field glaciological research. Physical, physiological, and psychological dangers are never far away on the ice. In Alaska we never go onto the ice alone, and never without basic equipment intended to ensure safety if a fall occurs or a sudden blizzard is encountered. This equipment is usually carried in a back-pack and consists of down parka, rain gear, ice-ax, crampons, 120 ft of nylon climbing-rope, two 10-ft lengths of nylon sling-rope, a pair of jumar ascenders, compass, flashlight, trail food, canteen of water, first-aid kit, goggles, and down sleeping bag. With this equipment one usually is prepared to climb from a crevasse with the help of his partner or to weather the worst blizzard summer has to offer. If the trip is a long one to be made on over-snow vehicles, it becomes necessary, of course, to take along extra gasoline and oil, a tool kit, and shovel to dig out from the almost inevitable slush-down.

In summary, a major glaciological research expedition spends a large measure of its time performing the mundane chores necessary to create the environment in which its research must be conducted. Every member must act as cook, meteorological observer, officer-of-the-day, mechanic, carpenter, and occasional doctor. In spite of these onerous chores, expedition members still find time for their individual research projects and to be stimulated in the exhilarating aura of a world of moving ice.

Literature Cited

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Sharp, Robert P. 1954. Glacier flow. Geol. Soc. Amer. Bull. 65:821-838.