2 pitches without problem. I felt that by moving slowly and carefully we could successfully negotiate the route I chose.

Second was the decision to continue the route when we encountered climbing of close to Class 3 difficulty near the mountain's base. All the members of the party seemed to be climbing well on the descent, and we had already descended one pitch of Class 3 difficulty when we reached the Class 3 slab on which the accident occurred. Once over this slab there only remained a brief Class 2 traverse to the snowfield at the mountain's base. I felt that since we had come this far without difficulty, and since it was then 6:00 p.m., we would be better advised to continue rather than turn back and choose a new route, which would have necessitated returning nearly to the summit.

We did not have a rope with us for two reasons: 1) We intended to attempt only routes that the party could negotiate without a rope, and 2) only one of the party besides myself was trained or experienced in the proper use of a rope.

California, Mt. Whitney area. On 29 May Jeff Genest and Larry Hamilton (20), started from Whitney Portals (8,360 feet) at 0600 with the intention of climbing the buttress of Mt. Whitney. They had started from home at sea level and driven all night and then started hiking. They carried 50 pound packs. They arrived at a point south of East Face Lake (12,500 feet) at about 1400 and were too ill to continue. While hiking Genest developed altitude sickness consisting of headache, nausea, tiredness, and weakness so Hamilton led the way. By the following morning (30 May), Genest had recovered but Hamilton awakened very short of breath and weak. In retrospect Genest believes Hamilton could have hiked out unassisted that morning if he had recognized the symptoms and the risk involved. He remained at that altitude expecting to recover momentarily. On the 31st, however, Larry was worse and was having difficulty breathing. Jeff decided to carry the equipment down in stages and to walk Larry down. When he returned from lower Boy Scout Lake, Larry was worse and could not walk. Jeff then descended for assistance. Evacuation was finally accomplished by helicopter on 1 June.

At the time the Mountain Rescue Association Team ground party reached Hamilton on 1 June he was lying on top of his sleeping bag comatose, cyanotic, and coughing up frothy sputum some of which was pink. His pulse was 170 per minute and went to 190 when he moved. His respirations were 60 per minute and very noisy with harsh crackling rales. He was placed in his sleeping bag in a seated position, to give the greatest lung capacity, and his head was fully extended for the best airway. No supplemental oxygen was available, even on the helicopter, which fortunately arrived 20 minutes later. During this brief period of observation he visibly deteriorated. He made a complete recovery by the fifth of June using oxygen in the Lone Pine Hospital at 4,000 feet altitude.

Hamilton was very experienced in hiking and had climbed many times above 14,000 feet in Colorado and had gone to 15,700 feet in the Alps. He never had trouble with acclimatization nor with fitness. In December, six months before this incident, he had snow-shoed, hiked and climbed on snow for five days at close to 14,000 feet. Between that and this ven-

ture he was a student at U.C. Santa Barbara at sea level. On weekends he would rock climb below 8,000 feet in Yosemite or on Tahquitz Rock. For a week before this Whitney hike he lived at 5,600 feet. He thought that physically he was in good but not excellent shape for the hike. Subsequent to this illness he had two thorough cardiac studies that showed no evidence of any heart disease.

Source: A. Green, Norman H. Mellor, M.D.

Analysis: (Green) Both had over-extended their physical capabilities. As noted they had started out tired from home (sea level) had driven all night and then had started hiking. The altitude change, coupled with fatigue, surely caused this near tragedy. Symptoms at the time of rescue indicated that this was a case of pulmonary edema. Pulse was 160/min, he was having difficulty breathing, and had foam in his mouth, and was cyanotic (blue).

A more leisurely trip with a night spent at Whitney Portals, and a more gradual ascent would in all probability have prevented the trouble. If they had decided to descend on the 30th, it is also likely that the trouble could have been avoided.

Analysis: (Mellor) The symptoms of undue fatigue, shortness of breath on slight exertion, rapid pulse, hacking non-productive cough and later chest pain, frothy sputum, and fever must immediately be recognized as high altitude pulmonary edema—a potentially fatal emergency. In the U.S. it can occur above 9,000 feet. Absolute rest, supplying supplemental oxygen, and prompt evacuation to lower altitude must be achieved.

Although there is a difference between acclimatization to altitude and physical fitness, they are both involved in high altitude pulmonary edema. They can each be gained or lost independently. Those who are best acclimated to the highest altitude can lose their acclimation from a few weeks stay at sea level. Cardiopulmonary fitness requires a minimum of four months training and it is maintained or lost depending upon the amount of stress the system continues to meet. Hamilton had lost both acclimatization to high altitude and cardiopulmonary fitness to hiking with a heavy pack.

Analysis: (Herbert N. Hultgren, M.D.) Both climbers should have recognized the possibility of high altitude pulmonary edema on May 30. Descent to Whitney Portal, 4,000 feet lower would probably have resulted in rapid improvement. A few more hours of delay in this rescue probably would have resulted in death since Hamilton's condition was critical when the rescue party and helicopter arrived. Unfortunately, neither had oxygen available.

Once a suitably strong rescue party reaches a victim of altitude edema, prompt descent using a stretcher is necessary rather than waiting for an uncertain period of time for arrival of a helicopter. Analysis of a previously reported fatal instance of high altitude pulmonary edema (*Accidents in North American Mountaineering* 1967, p. 17) indicates that prompt descent would have been preferable rather than waiting for helicopter rescue which was considerably delayed.

Utah, Wasatch Range, Mt. Timpanogos. On 16 June Richard Smith