The history of the physiology of extreme altitude is one of the most colorful in the whole area of physiology. Man seems to have a fundamental urge to climb higher and higher, and reaching the summit of Mt. Everest is still often referred to as one of the basic human aspirations. An interesting feature of the history is that physiologists through the years have repeatedly been astonished by some new altitude record but in spite of this have confidently predicted on each occasion that man can go no higher!

In this brief survey, I shall touch on some of the most important events in the gradual improvement of our understanding of the physiology of extreme altitude. Space limitations preclude me from covering many important topics and I hope readers will excuse the personal nature of the selection.

One of the first descriptions of the debilitating effects of high altitude on the human body was given by the Jesuit missionary, Jose de Acosta who accompanied the early Spanish conquistadors to Peru in the 16th century. He described how as he traveled over a high mountain, he "was suddenly surprised with so mortall and strange a pang, that I was ready to fall from the top to the ground." He went on to add "I was surprised with such pangs of straining and casting, as I thought to cast up my heart too; for having cast up meate, fleugme, and choller, both yellow and greene; in the end I cast up blood, with the straining of my stomacke." And finally "I therefore perswade myselfe, that the element of the aire is there so subtile and delicate, as it is not proportional with the breathing of man, which requires a more grosse and temperate aire" (Acosta, 1590). The reference to the thinness of the air was an inspired guess because it was not until 1648 that Blaise Pascal arranged to have a mercury barometer taken to the top of the Puy de Dome in central France and showed that the pressure fell (Pascal, 1648). Incidentally, Acosta's dramatic description of vomiting at high altitude is not typical of acute mountain sickness.

Acosta's book which also contains much valuable information about the Inca civilization, was widely read in both Spanish and English versions and influenced Robert Boyle and others who took part in the great surge of scientific learning in the 17th century. However, it seems that Chinese
travelers were aware of mountain sickness at least 1600 years before Acosta gave his historic description. In the classical Chinese history of the period preceding the Han dynasty, the Qian Han Shu written about 30 B.C., we read that the route from the Western regions of China to the Hindu Kush (now in Afghanistan) crosses "the Great Headache Mountain, the Little Headache Mountain" and that "men's bodies become feverish, they lose colour, and are attacked with headache and vomiting; the asses and cattle being all in like condition" (Wylie, 1881).

In the 18th century, climbers in the European Alps reported a variety of disagreeable sensations at high altitude which now seem to us greatly exaggerated. An important event was the first ascent of Mont Blanc (4807 m, 15,782 ft.) in 1786. Twenty-six years earlier, Professor De Sassure, a physicist in Geneva, had offered a generous reward to anyone who could find a way to the summit in the hope that he could first use it himself. To his chagrin, the first ascent was made by Dr. Michel-Gabriel Paccard with the guide Jacques Balmat in 1786. Paccard took a mercury barometer and scratched the glass with a diamond in the village of Chamonix where they began, and at various stages of the climb. They had great difficulties circumventing the Jonction, a meeting point of two glaciers where there were many crevasses, and they apparently only saved themselves on four occasions by falling flat on their faces when they felt the snow giving way beneath them. These desperate measures apparently introduced a bubble of air into the barometer because heights above 3350 m registered about 150 m too high. The two men suffered frostbite and snow blindness but gave little account of the physiological problems of the great altitude. Subsequent accounts of the climb disagreed considerably about the state of the two men near the summit.

De Sassure made the ascent the following year (Fig. 1) and he was eloquent on the physiological problems. "When I began this ascent" he reported "I was quite out of breath from the rarity of the air.... The kind of fatigue which results from the rarity of the air is absolutely uncon-