Climbing Kilimanjaro

KILIMANJARO IS ONE of the most beautiful mountains in the world. A perfect volcanic cone, it straddles the border between Kenya and Tanzania, rising 5896 metres (19,340 feet) from the African plains. At its feet lies the Amboseli game reserve with its teeming herds of wildebeest, antelope and elephants. Its summit is crowned with icefields of breathtaking beauty. Despite its great height, no mountaineering skills are required to reach the top of Kilimanjaro; it is a walk which takes less than three and a half days from base to summit. Unfortunately, the rapidity of this ascent is fraught with danger for the unwary.

We set off through the rain forest early in the morning. The air was warm, heavy and damp, redolent of the tropics. It smelt like the Palm House at Kew. Our feet made little sound on the soft moist earth of the forest floor. Monkeys swung chattering through the canopy far above us. It was difficult to realize that we were climbing all day as we wound our way though the cool dark shade of the forest. Late in the afternoon we emerged from the trees to find a small triangular hut nestling against the side of the mountain in meadows reminiscent of those of the Alps. The sun winked out and night fell almost instantly, since Kilimanjaro lies on the equator.

Next day we climbed to around 3700 metres, crossing high grasslands and passing through vegetation unique to these altitudes in Africa and South America. Giant Senecio, a relative of the common groundsel, towered above our heads. Immense lobelia flowers, like giant blue candles, stood sentinel beside the path. The thinner air was exhilarating, convincing me that I was immune to mountain sickness.

The following morning it was very cold. As we walked, we left the vegetation behind us and entered a high rock saddle hanging between the twin peaks of Kilimanjaro. To our right stood Mawenzi and to our left the higher Uhuru, our ultimate goal. Despite the flatness of the terrain, I felt tired. It seemed a long way across the saddle and even further to the tin huts sited at the foot of the final climb – a giant ash cone.

We spent a third, cold and uncomfortable night at 4600 metres. Sleep was impossible. My head hurt and the world spun around me when I closed my eyes. Despite a lack of appetite, I had forced down lukewarm food and tepid tea (at this altitude, water boils at 80°C), conscious that I would need energy for the coming climb. Now I felt sick. My companions' breath came in jangling gasps interrupted by such long silences that I wanted to shake them awake for fear they had permanently stopped breathing. I waited, shivering, for time to pass.

We rose at two o'clock in the morning to begin the long trek to the summit, for our guide had persuaded us to see dawn break over Mawenzi peak. I now know his real reason for the early start was far more prosaic: we climbed in the dark, so as not to see the enormity of the task that lay before us. The path wound in a shallow zig-zag up a 1200-metre cone of fine grey ash and small stones to the edge of the crater. Even at sea-level, climbing sand dunes is hard work; at this altitude it was torture. For every hard-won three steps up, I slid two steps back. My boots filled with fine abrasive dust. My legs felt unsteady and out of control, so that I staggered wildly, further compromising my progress on the shifting sands. One of my companions collapsed, unable to go further. It is not easy to tell who will succumb to mountain sickness; he was probably the fittest and strongest of our group but now he sat gasping for air like a stranded fish, his only option to descend. We continued, the guide lighting the way ahead with a hurricane lantern held low by his side. Progress was not easy. I fought for breath and struggled to take a few steps between each ever-longer rest. It was only by sheer effort of will and the (quite foolish) determination not to be beaten that I managed the last few hundred feet. I collapsed at the top of the crater rim, my head feeling as if knives were being driven through it, my vision swimming with black dots.

A medley of images danced across my mind. I sat in a dusty Cambridge lecture theatre, shafts of sunlight falling across the desks, listening to a discourse on mountain sickness. What exactly had the lecturer

said? It seemed important but it slipped away as brilliantly coloured zig-zags marched majestically before my eyes. The air shivered and a snow leopard slunk around the edge of the ice floes which sail within the crater of Kilimanjaro. It glared at me with yellow eyes and twitched its tail. I looked away and the sun rose, flooding the sky with a soft pink and orange glow, tinting with gold the edges of the thin clouds, Mawenzi peak a sharp black silhouette against a Botticelli sky. I sat on the top of Uhuru's crater rim, the cold wind blowing through my hair, and I knew the illusions were a warning. My brain was slowly shutting down through lack of oxygen. It was past time to leave.

I slithered and slipped drunkenly down the steep slope, suddenly afraid of cerebral oedema, yet fearful of falling forwards and tobogganing uncontrollably downwards if I went too fast. With every step I felt more alive, as oxygen flooded through my brain. I ran the scree, skiing down the mountain in great long slides, slaloming around the rocks and boulders. It took only half an hour to cover the distance I had taken over five hours to climb so painfully.

I was lucky; the previous week two people had died of mountain sickness on the same trek. My own brush with mountain sickness had no permanent effects, but I had been foolish. We had climbed too high too fast: 5896 metres in three and a half days. The high peaks may not be reserved for the gods, but they must be treated with respect.

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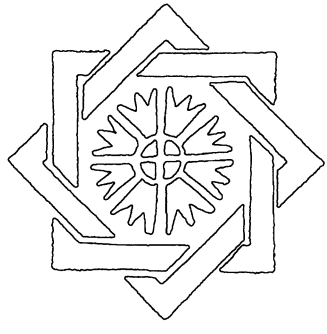
LIFE AT THE TOP



'Great things are done when men and mountains meet;'

WILLIAM BLAKE, *Gnomic Verses*, I

Mount Everest

AT 8848 METRES (29,029 FEET), Mount Everest is the highest mountain on Earth. If it were possible to be transported instantaneously from sea-level to the summit of Everest, you would lose consciousness and lapse into a coma within seconds because of lack of oxygen. Yet in 1978, the Austrian climbers Peter Habeler and Reinhold Messner reached the top of Everest without the aid of supplementary oxygen; and ten years later, more than twenty-five others had also done so. What is the explanation for their apparently impossible feat? The scientific detective story of how the answer to this question was unravelled, the twists and turns along the way, the excitements, extraordinary feats of endurance and colourful characters involved are the subject of this chapter.

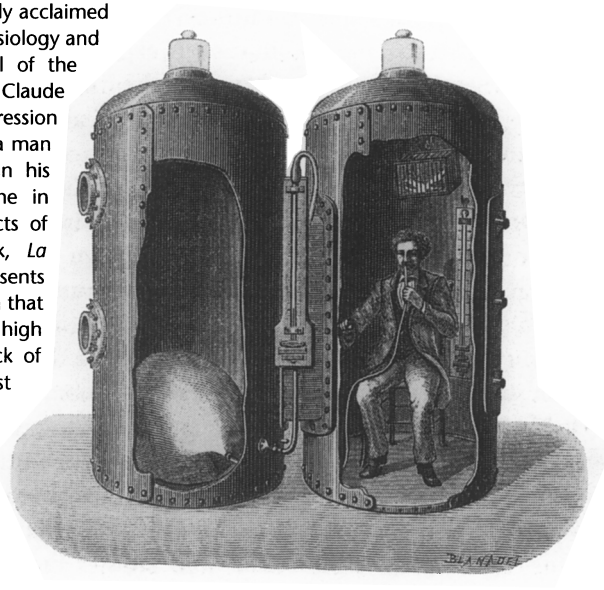
Mountains have fascinated and challenged people for centuries. Beautiful but forbidding, they were initially believed to be the home of the gods. The Greek Pantheon lived on the summit of Mount Olympus, the highest mountain in Greece; the Indians considered the Himalayas the abode of the gods; and evidence of ancient human sacrifice, probably to mountain gods, has been found in the Andes. Even today, many cultures hold sacred mountains in reverence – Tenzing Norgay buried chocolate and biscuits on the summit of Everest during the first successful ascent, as a gift to the gods that live there. Mountains lie shrouded in myth and legends, their peaks and crags imaginatively populated not only with gods, but also by mysterious monsters like the Himalayan Yeti and the trauco of southern Chile (that feeds on human

blood). Even their names cause enchantment: 'Chimborazo, Cotopaxi, They had stolen my soul away!'[1] Yet despite, or perhaps because of, these stories, people have always been attracted to mountains, whether for spiritual refreshment, the promise of hidden treasure, a means of escaping oppressive regimes, the thrill of exploring new terrain or, more mundanely, to find a way through to the other side: or simply, in George Mallory's memorable phrase, 'Because it's there'.[2]

As a consequence, mountain sickness has been known for centuries. Its cause remained a mystery to the ancients who considered it due to the presence of the gods (which drove men mad), or the result of poisonous emanations from plants, and led to the early European view of mountains as dangerous and mysterious. Some time around the latter half of the nineteenth century, however, mountain climbing emerged as a sport and men vied with the elements and with each other to be the first to reach the highest peaks. Physiologists became increasingly interested in the effects of altitude on the body, and increasingly knowledgeable about their causes, and their studies contributed greatly to the success of the first expedition to reach the summit of Everest. Yet they have been repeatedly astonished by the ability of mountaineers to ascend higher than their predictions.

High altitude is defined, somewhat arbitrarily, as more than 3000 metres (10,000 feet) above sea level. Many people, probably around 15 million, live above this height in the mountainous areas of the world, with the greatest numbers in the Andes, the Himalayas and the Ethiopian Highlands. Many more people visit altitudes of over 3000 metres each year for skiing, backpacking and tourism. The highest permanent human habitations are mining settlements on Mount Aucanquilcha in the Andes, at an altitude of 5340 metres. Although the sulphur mines are located at 5800 metres, the miners prefer to climb the additional 460 metres to work each day rather than sleep higher up. The Indian army is also reputed to have kept troops at 5490 metres for many months, to guard their border with China, but this is probably the limit at which it is possible for humans to live for an extended period, for life at such altitudes is fraught with difficulties. Chief among these is the reduction in the oxygen concentration of the air, but cold, dehydration and the intense solar radiation are also significant problems.

The decrease in the density of the air at altitude means that it contains less oxygen, which poses a considerable problem for most organisms,



Paul Bert (1833–86) is widely acclaimed as the father of altitude physiology and aviation medicine. A pupil of the famous French physiologist Claude Bernard, he built a decompression chamber large enough for a man to sit comfortably inside in his laboratory at the Sorbonne in Paris, to simulate the effects of altitude. His famous work, *La Pression Barométrique*, presents evidence to support his idea that the deleterious effects of high altitude are due to the lack of oxygen. He was also the first to show that decompression sickness (the bends) is due to the formation of bubbles in the blood (see Chapter Two).

including humans, who need to supply oxygen constantly to all their cells. Within each cell, oxygen is burned, together with foods such as carbohydrates, to produce energy. Cells that do large amounts of work, such as muscle cells, need proportionately more oxygen, and exercise further increases their demands. Oxygen was 'discovered' in 1775, as recounted in Chapter Seven, and its beneficial effects were immediately understood. But it was almost another hundred years before it was recognized, by the Frenchman Paul Bert, that it was a lack of oxygen (hypoxia) that was the main cause of mountain sickness. It took even longer for his idea to become widely accepted.

Early Accounts of Mountain Sickness

The Chinese were the first to document the effects of altitude, in a classic text, the *Ch'ien Han Shu*, that describes the route between China and what is probably Afghanistan around 37–32 BC: 'Again on passing the Great Headache Mountain, the Little Headache Mountain, the Red Land and the Fever Slope, men's bodies become feverish, they lose colour and are attacked with headache and vomiting; the asses and the

cattle all being in like condition.' The eminent Chinese scholar Joseph Needham has suggested that such experiences convinced the Chinese that they were meant to stay within the natural borders of their country. Likewise, the Greeks, who found they became breathless on the top of Mount Olympus (around 2900 metres), assumed that the summit was reserved for the gods and was out of bounds to mere mortals.

One of the first clear descriptions of the effect of acute mountain sickness was published in 1590 by Father Jose de Acosta, a Spanish Jesuit missionary who crossed the Andes and spent some time on the high plateau known as the Altiplano. Many of his party became sick when crossing the high pass at Pariacaca (4800 metres). He himself was 'suddenly surprized with so mortall and strange a pang, that I was ready to fall' and considered that 'the aire is there so subtle and delicate, as it is not proportionable with the breathing of man.' He also wrote that at this pass and all along the ridge of the mountains were to be found 'strange intemperatures, yet more in some partes than in others and rather to those which mount from the sea, than from the plaines.' This passage has been taken to indicate that Father Acosta was aware that people who had become acclimatized to high altitude by spending time on the high plains, such as the Altiplano plateau, succumbed less readily to mountain sickness than those who ascended directly from sea-level. Scholars now suggest that this is probably not the case, as the original Spanish text appears to have been incorrectly translated.

The local Inca population, however, were very well aware of the effects of altitude and of how acclimatization took time. They knew that lowlanders died in great numbers if transported to high altitudes to work in the mines and they maintained two armies, one that was kept permanently at high altitude to ensure they were acclimatized, and a second which was used for fighting on the coastal plains. To escape the ravages of the Conquistadores, the Incas retreated higher and higher into the mountains, where the Spanish invaders found it difficult to follow. Although the Spanish eventually established a city at Potosí (4000 metres), it was very much a frontier town and both women and livestock had to return to sea-level to give birth and bring up their offspring for the first year. The fertility and fecundity of the native women was unaffected but Spanish children born at altitude died at birth or within the first two weeks of life. The first child of Spanish descent to survive was not born until fifty-three years after the city was founded, on Christmas Eve 1598, an event that was hailed as the miracle of St