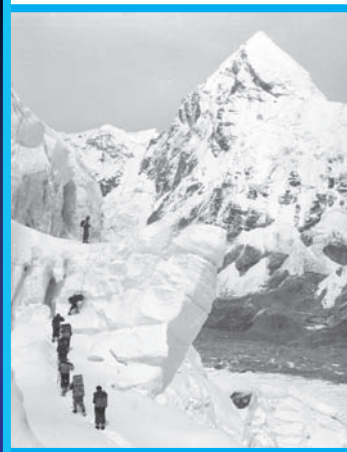


GOING UP: LIFE IN THE DEATH ZONE



The New Zealander struggled up the final snowy ridge. His companion soon joined him on the mountaintop, gasping for breath. Edmund Hillary offered his hand to Tenzing Norgay, but Norgay gave him a bear hug instead.

Fifty years ago, Hillary and Norgay became the first to reach the summit of Mt. Everest. Since 1953, the mountain has been climbed many times. The death toll is 175 for those who didn't make it to the top. Many were killed not by falls or avalanches, but by the effects of low pressure at extreme altitudes.

Going Up into Thinner Air

The weight of the atmosphere creates air pressure. At higher altitudes, there is less air above you. This means that the density and pressure of air *decreases* as altitude *increases*. Each intake of air on Mt. Everest has only one-third of the gas molecules—including oxygen—that would be present at sea level.

Mt. Everest is in Nepal, a small country sandwiched between India and China. Nepal's capital, Kathmandu, is at 1,340 meters (4,400 feet)—not much higher than Salt Lake City, UT. Unless exercising hard, a person in Kathmandu probably wouldn't notice the slightly thinner air.

Less Oxygen Equals More Work

However, as you move higher, the body reacts to the decreasing pressure. On their way to Everest, Hillary and Norgay stayed at Namche Bazaar, a trading town at 3,440 meters (11,300 feet). With each breath at Namche Bazaar, the body takes in only 70 percent of the oxygen it would get at sea level.

In response, the body makes more red blood cells that carry oxygen throughout the body. More red blood cells mean that more oxygen can be pulled from the thin atmosphere. Breathing automatically

speeds up, and the heart beats faster as the body tries to get the oxygen it needs.

It takes many days for the body to make the extra red blood cells. Allowing the body to adjust slowly to the lower air pressure at high altitudes is called *acclimatization*. Hillary and Norgay spent many weeks acclimatizing to higher altitudes. Rushing up and down Mt. Everest isn't an option. A person taken directly from sea level to the summit would die of oxygen starvation within minutes due to a lack of enough red blood cells to pull oxygen from the thin atmosphere.

Reaching Base Camp

From Namche Bazaar, Hillary, Norgay, and their team trekked to the Mt. Everest base camp at 5,364 meters (17,600 feet), where most of their supplies were kept. At this altitude, air pressure is half that of sea level. Even with acclimatization, some people show signs of mountain sickness, caused by too little oxygen, which can result in headaches, dizziness, and fatigue.

Fluid buildup in the lungs and brain is also a threat. For reasons not well understood, lower air pressure causes fluid to leak from tiny blood vessels, called *capillaries*, in



An oxygen supply is crucial to climbing Everest. Early equipment was cumbersome.



Modern-day ascenders of Mt. Everest have sophisticated clothing and equipment to help them make it in and out of the Death Zone.

the body. Fluid in the lungs, known as *pulmonary edema*, keeps desperately needed oxygen from getting to the muscles and brain, causing weakness and confusion. Fluid leaking into the brain, *cerebral edema*, causes dangerous swelling, hallucinations, and irrational behavior. Both pulmonary and cerebral edema can kill. The only cure is retreating to a lower altitude.

Bottled Oxygen: A Climber's Life Line

Hillary and Norgay helped move loads of supplies from the base camp to camps higher on the mountain, breathing bottled oxygen to help offset the thin air. "As the oxygen flowed into my lungs, my load seemed to lose half its weight," wrote Hillary. After 44 days of acclimatizing on Everest's slopes, Hillary and Norgay climbed above 8,000 meters (26,250 feet) into the Death Zone.

Above 8,000 meters, the human body "hits the wall." Bottled oxygen can hold off acute mountain sickness, pulmonary edema, and cerebral edema, but only temporarily. If a climber stays above 8,000 meters too long, death is inevitable. It's a brutal race against time. Can the climber get to the top and back before the body falls apart?

When Hillary was in the Death Zone, it took "three hours to do what I could have done in half an hour at sea level . . . every step became . . . [a] major task that was going to require a maximum of effort." On the last climb to the summit, "I seemed clumsy and unstable, and my breath was hurried and uneven."

A Triumphant Ascent

Hillary and Norgay reached the top and took off their oxygen masks for a few moments. They were too tired to do more than hug and take photographs. When Hillary tried to put the camera away, he realized that a lack of oxygen to his brain was causing his slow, fumbling movements. Hillary and Norgay strapped on their oxygen masks and started their journey down.

As Hillary and Norgay descended the mountain, they were joined along the way by expedition members who had stayed at lower camps. As they neared one camp, they could see the question on the members' faces: Had they reached the top?

A companion walking down with Hillary and Norgay joyfully pointed toward the summit. Their faces "lighting up with unbelieving joy," the men in camp rushed toward Hillary and Norgay.

It was a long, tiring, triumphant walk home.

Adapted from an article by Pamela S. Turner



The Greatest Ups and Downs

- **Highest spot on Earth:**
Mt. Everest

Elevation: 8,850 meters (29,035 feet) above sea level

Pressure at the summit: $\frac{1}{3}$ of an atmosphere

Number of people who've been there:
1,200 (and climbing)

- **Lowest spot on Earth:**

Challenger Deep (off the Mariana Islands)

Elevation: 10,091 meters (33,100 feet) below sea level

Pressure at the bottom: 1,010 atmospheres

Number of people who've been there: 2

P.S.T.