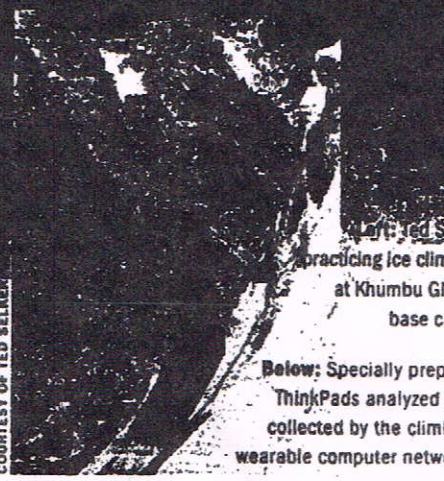
LabNotes

High Computing

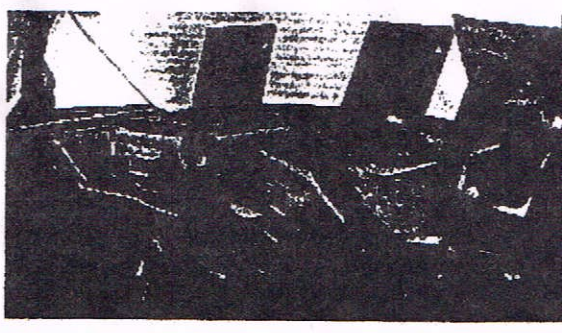
THINKPADS ON EVEREST



COURTESY OF TED SELKER

practicing ice clim
at Khumbu Gl
base c

Below: Specially prep
ThinkPads analyzed
collected by the clim
wearable computer netw



Mt. Everest photo/John Montgomery, Adventure Photo & Film

Many people have been put for [illegible] risking life and limb in the attempt to climb Mt. Everest, beginning with the unassailable, if unenlightening, "Because it's there." Accompanying a bevy of IBM ThinkPads might rank as one of the more unusual motives. Yet, nominally, that is why Ted Selker, an IBM Fellow at the Almaden Research Center, found himself in May enduring oxygen deprivation and frigid temperatures as he made his way up the flank of the world's tallest mountain.

How the body responds to such physiological hardships is, of course, a scientifically interesting problem in itself, although not one likely to command the attention of someone actually engaged in a dangerous ascent. At Yale University, therefore, a scientific expedition to Everest was planned to study telemedicine in extreme conditions, and a group led by Mike Hanley at MIT's Media Lab developed a special "wearable computer network" to automatically monitor a climber's condition. The network, which Selker helped debug, came with a global positioning system and instruments to measure temperature, pulse rate, blood oxygen and other vital signs.

In March, Hanley's group decided to accompany the expedition, and they invited Selker, who had given a talk at the Media Lab in October on wearable computers for climbers. An experienced mountain climber — he had scaled Ecuador's 20,500-foot Mt. Chimboazu — Selker was tempted [illegible] Selker agreed to contribute and help program several ThinkPad notebook computers for the expedition to record and analyze the information collected by the wearable computer networks. But first, Selker and his Almaden colleagues Bill Kozlovsky and Kim May had to prepare the ThinkPad 560 computers for the ordeal. They installed special membranes to protect against glacial dust and taped over connections and bearings for added protection. They even provided tiny heaters.

Then there was the matter of the hard disks. Because the head is kept floating above the spinning disk by a thin layer of air, a typical drive wouldn't function properly in the rarefied atmosphere of Everest, with a density less than half that of sea level. Selker and Kozlovsky enlisted the help of a group at the Fujisawa facility in Japan, where the drives are manufactured.

Using a low-pressure chamber, the group screened production line disk drives to find ones whose heads rode slightly higher than normal and therefore would require less air pressure to retain the required distance above the disks. The drives were tested and qualified for operation at altitudes up to 20,000 feet, short of the summit but well beyond the 17,500-foot base camp where the computers were to remain and receive data from transmitters on the climbers.

When, after a six-day trek, Selker reached base camp — the farthest he was to go — all the ThinkPads functioned fine, except one that had a problem with its back light. And Selker, despite the hardships, took a scientist's interest in his own bodily changes, which were duly monitored. Among other effects, his blood turned black owing to lack of oxygen, and his carotid artery was enlarged 50 percent.

"One of the effects of the oxygen shortage," says Selker, "is that everything and everyone seemed immensely silly, making it difficult to concentrate on even simple tasks. The lack of oxygen also made it difficult to solder connections as I fixed people's equipment. And the temperature fluctuations — which could go from sweltering to freezing in the span of a few minutes — made it hard to erase the eproms [electrically programmable read only memory], let alone dress sensibly for the afternoon." ■ — RLD