

# The mystery of Mallory and Irvine

Few subjects in the literature of exploration have so consistently commanded the attention of the public as the history of attempts to climb Mt. Everest. Publication of its record height in 1865 caused a growing interest among explorers which reached a climax in 1953, when the British, mounting the ninth full-scale expedition, finally succeeded in placing Edmund Hillary and Sherpa Tenzing Norgay on the summit of the highest mountain in the world.

The mountain had been climbed – for certain. What was not certain was whether Hillary and Norgay were the first men to reach that barren, inhospitable peak. This uncertainty went to the summit with Hillary, who made a brief reconnaissance there for signs of possible predecessors. And it is an uncertainty that remains today. For at fifty minutes past noon on June 8th, 1924, George Leigh Mallory and Andrew Irvine were sighted less than 800 vertical feet from the summit, before swirling clouds hid them from view. They were never seen or heard of again, and they left behind the unsolved mystery of whether they succeeded in reaching the summit before they died on the mountain's desolate slopes.

## The First Attempt

Everest is situated on the borders of Nepal and Tibet, and early efforts to gain access to the mountain were discouraged by a strict

policy forbidding Europeans entrance to either country. It was not until 1920 that a British political envoy entered Lhasa and obtained permission from the Dalai Lama to explore this secret mountain.<sup>7</sup>

The Reconnaissance Expedition of 1921 was unprepared for the magnitude of the task of climbing Mt. Everest. Nevertheless, George Mallory succeeded in reaching the West Ridge and the North Col, at 23,000ft.

From the West Ridge Mallory could see only the terrifyingly dangerous Khumbu Ice Fall, which appeared to block all access to the Western Cwm, whose end he could not see. The great blocks and treacherous slabs of broken ice seemed reason enough to discontinue exploration in that direction.

Then, on September 23rd, 1921, Mallory and two other climbers fought their way through gale-force winds to the saddle of the North Col. From there they could see a possible route to the summit via the North East Ridge. Mallory was satisfied: the mountain would 'go'.

Returning to England after their six-month reconnaissance, they drew up plans for an attempt on Everest in the following Spring. The plans contained some formidable innovations. Because the base of Mt. Everest lies one mile higher than the top of any mountain in the Alps, the proposed ascent presented challenges hardly considered in the

*Could Mallory and Irvine have reached the summit of Everest in 1924? Expert opinion has so far concluded that they failed well short of their objective. In this new study, American Tom Holzel suggests that Mallory might have come far closer to success than was previously supposed.*

annals of mountaineering. To cope with this the 1922 Expedition proposed to employ oxygen breathing equipment – for the first time in mountaineering history.

In a sense, the equipment proved its worth. One exceptionally able team, comprising T. Howard Somervell, F. E. Norton, H. T. Morshead and Mallory, fought its way nearly to the crest of the North East Ridge at 27,000ft., but, without the aid of oxygen, could proceed no further. Another team, consisting of G. I. Finch and J. G. Bruce, managed – with breathing equipment – to exceed this height by 300ft. Although denounced as 'artificial' by many members of the Alpine Club and the Royal Geographic Society, sponsors of the expedition, the success of the oxygen equipment was not lost on Mallory.

## Norton and Somervell's Attempt

The next attempt on the mountain was made in 1924 by an expedition which again included Mallory. A camp was established on the North Col on May 22nd, but severe cold and storm forced a retreat. The Expedition was unable to re-establish the camp until the precariously late date of June 1st. On June 4th, racing against the approaching monsoon, whose driving snows would prevent both ascent and descent, Norton, Somervell and three sherpas successfully placed their summit assault tent (Camp VI) at 26,800ft.

The following day, a perfect one for climbing, the two Englishmen set out for the summit. Near midday, at a height of some 28,000ft., the membranes of Somervell's throat, which were painfully cracked due to the dehydrating effect of the dry, frigid air, caused him such difficulty in breathing that he could go no further. Ensnoring himself comfortably in a little nook, he took out his folding Kodak camera and photographed Col. Norton who continued the climb across the vast North Face of Everest alone.

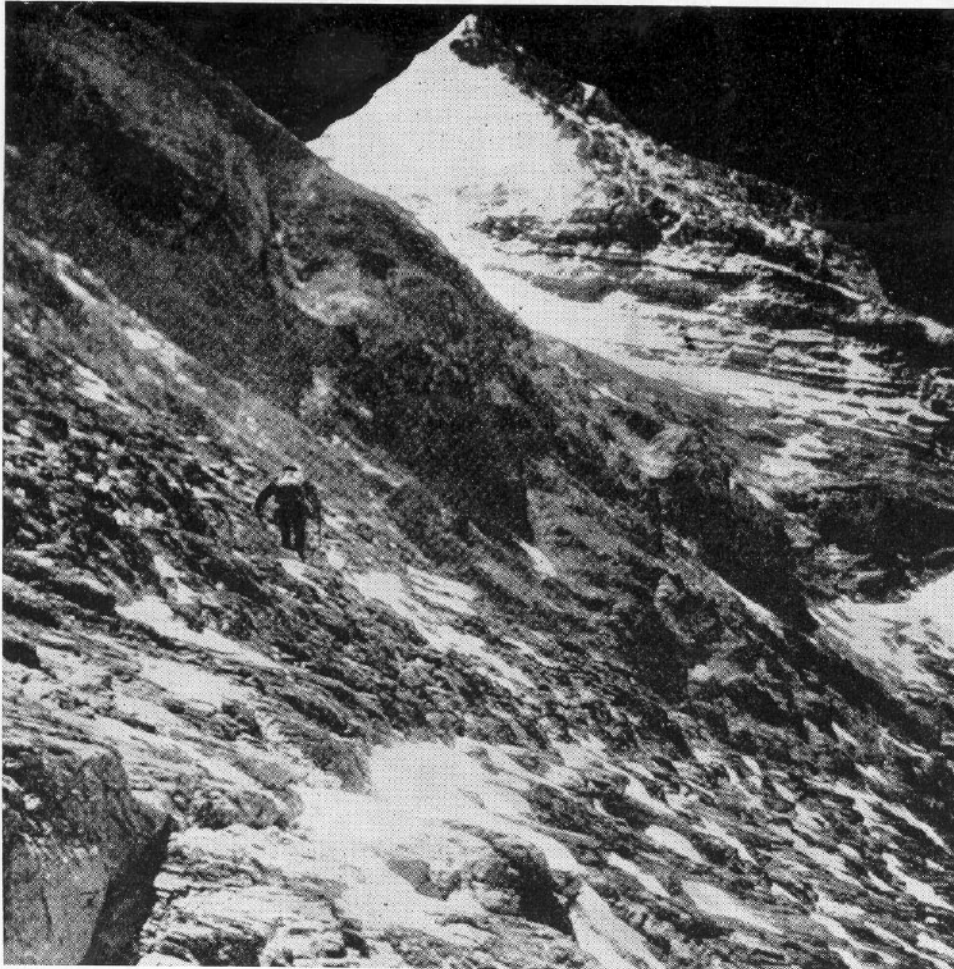
But soon Norton, too, reached the limits of his endurance. Gasping for air at seven breaths per step, he was only able to continue his gradual climb for another hour. At that point, at 28,126ft., the mountain presented terrain which required more energy to climb than will power alone could supply. Exhausted from his magnificent effort, Norton gazed briefly at the summit, 900 vertical feet away, and turned back – grateful only to be going down.

## Mallory and Irvine's Attempt

With the return of Norton and Somervell, Mallory gleaned vital new information that confirmed suspicions first aroused by Finch's and Bruce's climb in 1921. Col. Norton had been defeated by simple 'exhaustion' rather than the more commonly encountered external barriers of severe weather or impossible terrain; and it was exhaustion brought on during the final hour of his ascent – a climb of only 80 vertical feet over truly 'easy' ground. Certainly, this feeble rate on such an easy grade with a respiration rate of seven to ten breaths per minute could not be attributed to fatigue alone.

Mallory therefore made two decisions. The first was to use oxygen in his final attempt, despite his original lack of enthusiasm for it.

**Below:** Norton pressing on alone during the final stages of his attempt in 1924. The summit and the Great Couloir, both greatly foreshortened by perspective, are in the background.



The second was to select 22-year-old Andrew Irvine as his climbing companion, instead of the more obvious candidate, N. E. Odell.

Certainly, Odell would have been the logical choice. He was more experienced, and was by now so superbly acclimatized that he was to perform effortlessly, without oxygen, an amazing series of high-altitude climbs in support of Mallory and Irvine. But Odell had little confidence in the use of 'English air' (as the sherpas first called oxygen), and indeed his performance without its aid was so exceptional that it was subsequently cited as evidence that oxygen was neither necessary nor helpful in climbing Mt. Everest. But Irvine, though a less experienced climber, had demonstrated a genius for nursing the delicate oxygen apparatus on which Mallory now decided to stake his effort.

On the morning of June 6th, 1924, at Camp IV on the North Col, Mallory and Irvine strapped on their breathing equipment and started up the first leg of their final attempt. Eight sherpas accompanied them with additional oxygen bottles and food, but four had to turn back short of Camp V (at 25,000ft.) because of altitude sickness. When they returned to Camp IV, they reported to Odell that Mallory and Irvine were "going strong".<sup>2</sup>

The following day, as Mallory and Irvine continued on to Camp VI, Odell moved up to Camp V in support, carrying an additional oxygen set. It was then that he received Mallory's last message, brought down by the four remaining porters. Requesting Odell to fetch a compass he had left behind at Camp V, Mallory closed his note by saying: "... we'll probably go on two (oxygen) cylinders - but it's a bloody load for climbing. Perfect weather for the job!"<sup>3</sup>

On June 8th, the day on which Mallory and Irvine were to make the final assault, Odell worked his way up to Camp VI, as scheduled, to deliver the oxygen set and the compass.

Picking his way up the vast expanse of Everest's North Face, Odell halted momentarily and, at a distance of 2,700ft., witnessed an incident that has fired the imagination and curiosity of mountaineers the world over:

"At about 26,000ft. I climbed a little crag which could possibly have been circumvented, but which I decided to tackle direct, more perhaps as a test of my condition than for any other reason. There was scarcely 100ft. of it, and as I reached the top there was a sudden clearing of the atmosphere above me and I saw the whole summit ridge and final peak of Everest unveiled. I noticed far away on a snow-slope leading up to what seemed to me to be the last step but one from the base of the final pyramid, a tiny object moving and approaching the rock step. A second object followed, and then the first climbed to the top of the step. As I stood intently watching this dramatic appearance, the scene became enveloped in cloud once more, and I could not actually be certain that I saw the second figure join the first. It was of course none other than Mallory and Irvine, and I was surprised above all to see them so late as this, namely 12.50 (p.m.), at a point which, if the 'second rock step', they should have reached, according to Mallory's schedule, by 8.00 a.m. at latest, and if the 'first rock step', proportionately earlier."<sup>4</sup>

The sighting of the two climbers at a record altitude of 28,230ft. would ordinarily have sufficed to capture for them the credit for having attained it. But things didn't work out that way. Although Odell's view was the last ever of Mallory and Irvine, the climbers' mysterious fate has been the subject of continuous controversy ever since.

Since the Mallory and Irvine climb, three other expeditions have attempted the

mountain from the northern approach through Tibet. On one of these, the 1933 Expedition, Wyn Harris discovered an ice axe lying directly on Mallory's and Irvine's route to the summit. Expedition Leader Hugh Ruttledge describes the find:

"... the moment the sun appeared, nearly an hour after they had left Camp VI, Wager sat down to remove his boots and rub his feet. Soon after this, about 60ft. below the crest of the ridge and 250 yards east of the first step, Wyn Harris, who was leading, found the ice axe about which there has been so much controversy. It was lying free on smooth, brown, 'boiler-plate' slabs, inclined at an easy angle but steepening considerably just below. It was in perfect condition, looking quite new. On the polished steel head was stamped the name of the maker - Willisch of Täsch, in the Zermatt valley."<sup>5</sup>

Ruttledge commented that a fall at the point where the axe was found was likely to have ended only after a long slide. He felt that it may have marked the point of an accident - one that probably occurred during descent.

The ice axe was the last trace to be found of the ill-fated climbers.

All climbing ceased during World War II and was not resumed until the expedition of 1951. This and all subsequent attempts were undertaken from the southern approach through Nepal. No Westerners have been permitted to climb Mt. Everest from the north since the expedition of 1938, and the question remains: did Mallory and Irvine reach the summit of Everest before they perished on her slopes?

#### The Early Evidence

The principal early arguments to the contrary were somewhat marred by the natural bias of their proponents, who were mainly fellow Everest climbers and expedition members. It is well known that veteran climber Mallory and expedition leader Norton differed publicly as to which route should be followed to the summit. One can imagine the mixed feelings of Col. Norton, who was simultaneously carried to a world climbing altitude record and yet blocked from the summit by the route he had chosen. That he was more than a little proud of this record (which would immediately have been eclipsed had the Mallory and Irvine attempts been admitted) is evident from his undisguised chagrin when he learnt that subsequent theodolite measurements placed his highest point some 24ft. below the summit of Kanchenjunga, the third highest mountain.<sup>6</sup>

Norton continued to argue that Mallory's route was unfeasible, and added that had Mallory reached the summit he would have shone a light or put up a flare to signal his success. Norton persisted in this view, despite Odell's comment that he had noticed flares in the Camp VI tent on the day Mallory and Irvine made their final ascent, and had assumed that both flares and signal lamps were left behind to save weight.<sup>7</sup> (Some signal equipment was found in the tattered remains of Camp VI by the climbers of 1933.<sup>8</sup>)

Hugh Ruttledge, too, may have felt disinclined to interpret the Mallory and Irvine attempt favourably. He was, after all, the leader of two subsequent Everest expeditions, both of which were unsuccessful. Ruttledge did achieve a Camp VI that was 700 ft. higher than Mallory's, but exhaustion forced his oxygenless parties to turn back at a point 100ft. below the 'second step' reached by Mallory and Irvine.

There is, however, additional, rather more objective, evidence against the 1924 team. Climbers who have reconnoitred the only apparent obstacle on the Mallory route - the 'second step' - have been very sceptical about whether it can be climbed. F. S.

Smythe, a three-times Everest, explains the problems of the Mallory versus the Norton route:

"The clear issue was that, whereas Norton's route was practicable, it was obviously difficult and exacting and of a nature such as the mountaineer instinctively avoids. The ridge (Mallory's route), although a better route if it were practicable, was an unknown quantity. True, the first step did not look difficult, but between it and the second step the telescope had revealed a narrow and broken rock edge. The second step was a sheer cliff some 80ft. high and appeared impregnable to direct assault, taking into account the fact that strenuous rock climbing is impossible at 28,000ft. If it could be climbed there was no doubt that the difficulties would be shorter and the route less dangerous than Norton's traverse."<sup>9</sup>

Harris and Wager, and Smythe and Shipton, all of whom tried the Mallory route and were thwarted at the second step, contributed to the growing opinion that Mallory and Irvine could not have succeeded. In his book *Everest 1933*, Ruttledge states:

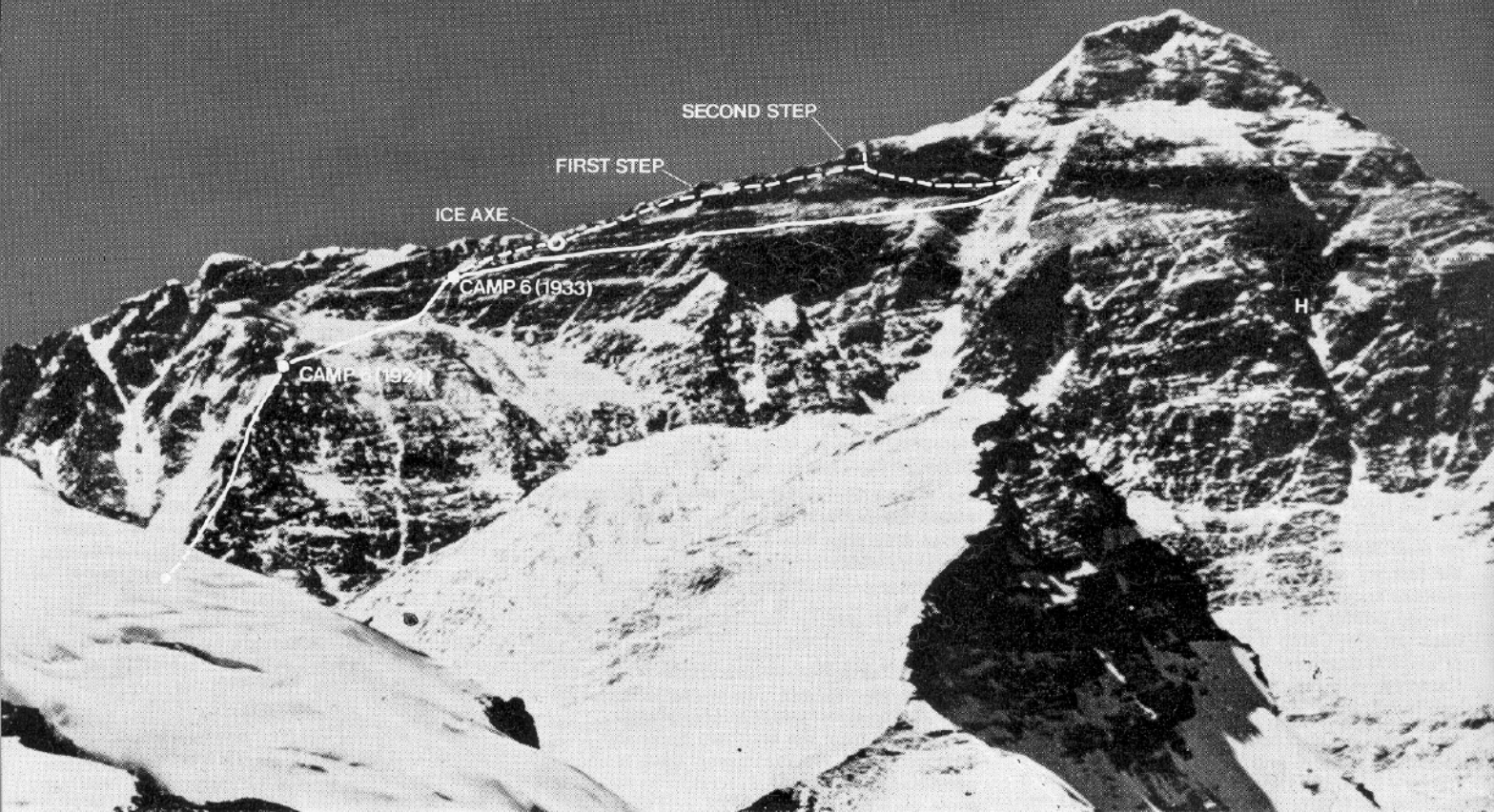
"The reconnaissance made by Wyn Harris and Wager afforded evidence, which to my mind is conclusive, regarding the comparative merits of the routes favoured by Mallory and Norton respectively. The conditions on May 30th were sufficiently good to permit accurate judgement of the practicability of the second step. One cannot go so far as to say that a rock-climbing expert might not climb, or turn, this step in good conditions at Alpine levels; but I am satisfied that if Wyn Harris and Wager, both of them first-rate mountaineers, turned away from it, future parties will be advised to leave it out of their calculations. If, after arrival at Camp VI, they should find the slabs rendered temporarily impassable by a sudden fall of snow, they might make a further examination of the second step. But this should not, I think, be included in the plan of assault.

"I would strongly recommend single-minded adherence to Norton's route, which offers a practical certainty of success in good conditions. Provided that you can synchronize the arrival of two parties at the top of their form with the absence of snow and three, or preferably four, days of consecutive fine weather, I believe that the summit will be reached by Norton's route."<sup>11</sup>

This consensus of climbing opinion has contributed much to the theory that Mallory and Irvine could not have succeeded in climbing the second step and were thus probably unsuccessful in attaining the final pyramid of Mt. Everest. However, careful reading of the reports of these frustrated climbers indicates that all avenues of approach to the second step had not been examined.

Not only were Harris and Wager exhausted by the altitude (they were not using oxygen) but, because of their weakened condition, they chose not to climb the first step up to the crest of the ridge as Mallory and Irvine planned to do. Instead, they took an easy traverse below the first step, which continued parallel to and below the crest of the ridge, ending some 100ft. below the base of the difficult second step. From this position it was impossible to attain a point from which the difficulties of the second step could be accurately assessed. Yet it was on this distant 'reconnaissance' that Ruttledge based his crucial argument against the Mallory route.

Given that they were at 28,000ft., and had no oxygen, one can hardly blame Harris and Wager for preferring a further traverse towards the Great Couloir (i.e. Norton's route) to a struggle up to the second step of the Mallory route.



**Above:** A telephoto shot of the top section of the North Face. The line marked ————— indicates the line taken by Norton, Somervell and Smythe, and that marked - - - - - the route taken by Wyn Harris and Wager in 1933. Mallory and Irvine are thought to have followed the crest of the ridge itself, from the first step onwards. X marks the highest point reached by the face routes. H marks the Hornbein Couloir climbed in 1963. This and other photographs in this article loaned by The Mount Everest Foundation.

In his record of Norton's attempt, Somervell describes the difficulties of climbing at high altitudes without oxygen:

"... the altitude was beginning to tell severely on us. About 27,500ft. there was almost sudden change. A little lower down we could walk comfortably, taking three or four breaths for each step, but now seven, eight or ten complete respirations were necessary for every single step forward. Even at this slow rate of progress we had to indulge in a rest for a minute or two every 20 or 30 yards. In fact, we were getting to the limit of endurance. At a level of somewhere about 28,000ft., I told Norton I could only hinder him and his chances of reaching the summit if I tried to go any further, as an intensely sore throat added greatly to the misery of the fight. I suggested that he should climb the mountain, if he could, by himself, and settled down on a sunny ledge to watch him do it. But Norton himself was not far from the end of his tether. From my seat I watched him slowly rise, but how slowly, and after an hour I doubt whether he had risen 80ft. above my level. He realized that a successful issue to the fight was impossible, and after a little returned. We agreed reluctantly that the game was up. On the way to the summit was a patch of loose rock where it was desirable that two fit men should be roped together, but two men more or less 'done to the world' were unable to hope to reach the top within a good many hours, and it was now 2.30 in the afternoon.

"So with heavy hearts, beating over 180 to the minute, we returned and retraced our steps; but slowly, for even downhill movement at this level is rather hard and breathless work, and both of us required frequent rests for regaining our breath and resummoning our energy."<sup>12</sup>

Thus Harris and Wager were undoubtedly correct in surmising that Mallory's route should not be included in *their* plan of assault. What they failed to realize was that the use of oxygen is essential to the success of any upward effort above 28,000ft.

One possibility that is rarely mentioned is that of turning the second step to the east, just as the first step is turned to the west. G. O. Dyhrenfurth, in his definitive book on climbing in the Himalayas, not only dispenses with the possibility of climbing the second step, by more than doubling its supposed height, but goes on to claim unequivocally that it "bars the whole width of the North East Ridge and cannot be turned on either side."<sup>13</sup>

On the other hand, Frank Smythe, who has climbed the North Face of Everest several times, is far less certain of the impossibility of this obstacle. In recounting Wager's view of the South East Face, Smythe comments that "... it is interesting to note that ice is plastered to the south side of the second step, and it is just possible that the step can be avoided by an upward traverse on this side, though whether a climber can cut steps in an ice slope of 60°, or more, as the angle would appear to be, at 28,000ft. is another unsolved problem of Everest".<sup>14</sup>

#### **Odell's sighting of Mallory and Irvine**

Another argument against Mallory's and Irvine's success is based on an attempt to discredit Odell's report of their position, and, indeed, to discredit the fact that he ever viewed them at all. Odell himself cast some doubts on his having seen Mallory and Irvine on the second step: "The 'second rock step' is seen prominently in photographs of the North Face from the Base Camp, where it appears a short distance from the base of the final pyramid down the snowy first part of the crest of the North East Arête. The lower 'first rock step' is about an equivalent distance again to the left. Owing to the small portion of the summit ridge uncovered I could not be precisely certain at which of these two 'steps' they were, as in profile and from below they are very similar, but at the time I took it for the upper 'second step'.

However, I am a little doubtful now whether the latter would not be hidden by the projecting nearer ground from my position below on the face. I could see that they were

moving expeditiously as if endeavouring to make up for lost time."<sup>15</sup>

This afterthought of Odell's is fortunately not based on fact. Ruttledge explains:

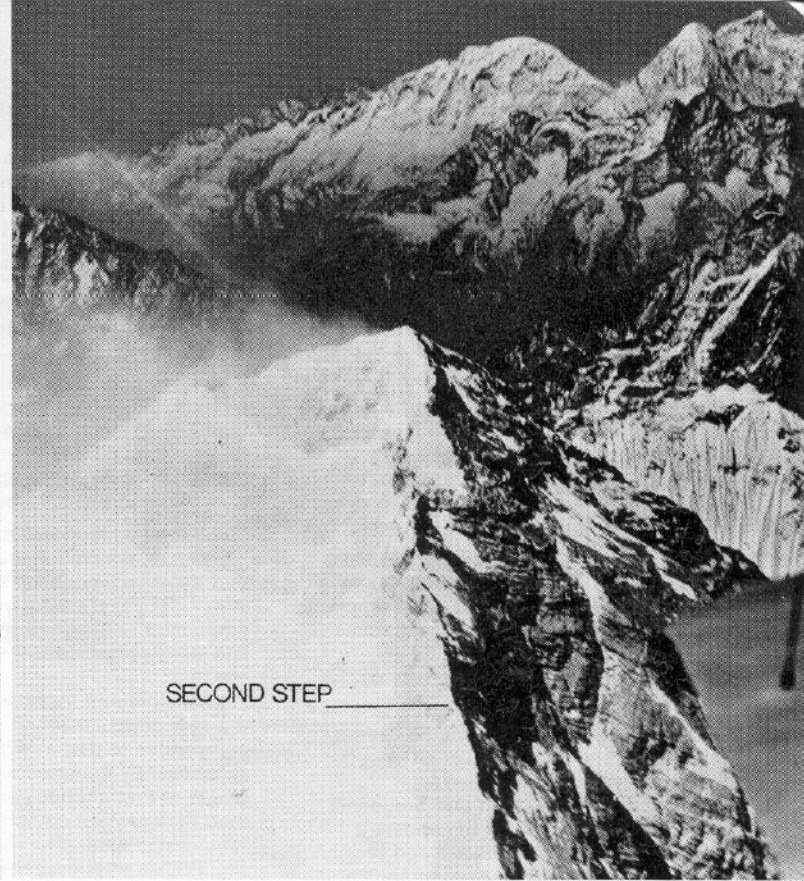
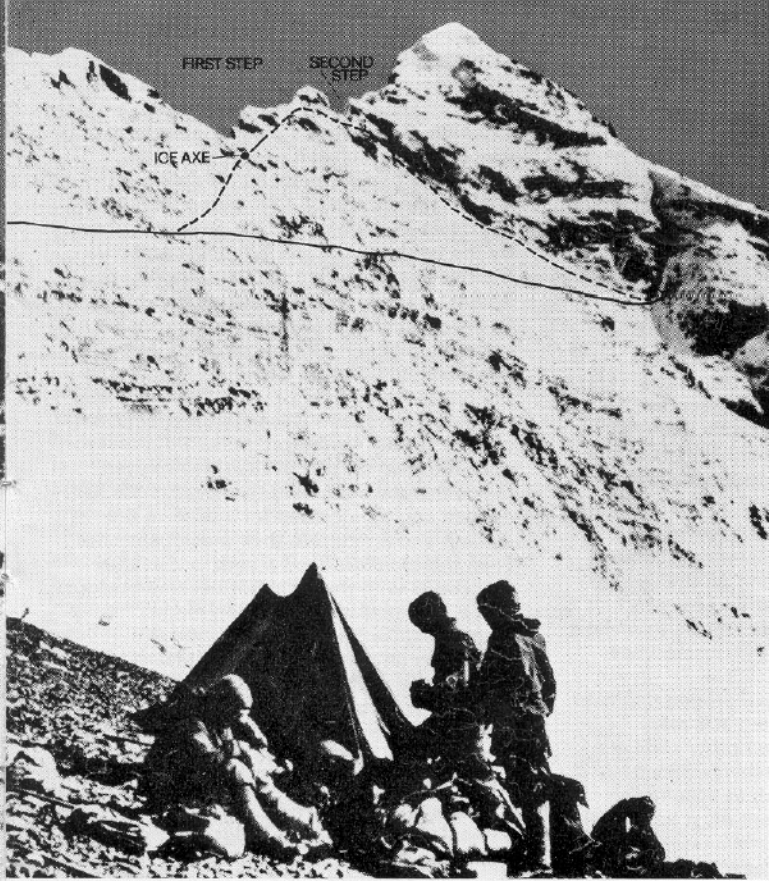
"Later on, Odell says that he saw the first of the two figures actually surmount the step *within the five minutes* of his last glimpse of them. Now it is highly probable that Odell did see the 'second rock step' through the break in the mists. It is not masked from about his view-point. Moreover the 'first rock step' does not need to be climbed — it is easily turned on the North Face. Therefore, if Odell saw figures at all, they were almost certainly approaching the 'second rock step', and one of them may have ascended it."<sup>16</sup>

Thus, if Odell saw Mallory and Irvine, they must surely have been on the second step. In Odell's initial report of his sighting there was no question of where he saw them:

"There was but one explanation. It was Mallory and his companion moving, as I could see even at that great distance, with considerable alacrity, realizing doubtless that they had none too many hours of daylight to reach the summit from their present position and return to Camp VI at nightfall. The place on the ridge mentioned is a prominent rock step at a very short distance from the base of the final pyramid, and it was remarkable that they were so late in reaching this place. According to Mallory's schedule, they should have reached it several hours earlier if they had started from the high camp as anticipated."<sup>17</sup>

It was only in subsequent rewrites that Odell expressed any doubt as to the location.

Other climbers have questioned whether Odell saw Mallory and Irvine at all. On the 1933 expedition, Shipton and Smythe were near the point from which Odell made his sighting. Shipton suddenly looked up and exclaimed: "There go Wyn and Wagers on the second step". Smythe describes the scene: "... Sure enough, there were two little dots on a steep snow-slope at the foot of the cliff. We stared hard at them and could have sworn they moved. Then, simultaneously, we



**Above left:** The final slopes seen from the 1933 Camp 6. The sky in this photo has been retouched in order to outline the ridge more clearly, and the summit tip, cut out in the original photo, has been simulated. Again ——— is the Norton/Somervell route and - - - - - that of Wyn Harris and Wager. Note the abortive attempt made by the latter pair to reach the top of the second step by using a couloir on the right of it.

**Above right:** An aerial shot of the North-East Ridge with the South-East Ridge (the 1953 route) on the left and the West Ridge on the right

realized that they were rocks. And, strangely enough, there are two more rocks perched on a snow-slope immediately above the step; these again looked like men and appeared to move when stared at. It was somewhere in the neighbourhood of Camp VI that Odell thought he saw Mallory and Irvine. The distance from this point to the second step is about one mile, and human figures would appear no larger than dots. Is it possible that he was similarly tricked by his eyes? His view of the North East Ridge was between shifting mists and lasted only a minute or two. The effects of altitude, tiredness, and the strain of climbing combine to impair the efficiency of vision. It was 12.50 p.m. when they were seen. Why were they so late? No one could possibly climb the second step in the short time that he saw them; it is quite 100ft. high, vertical for the most part and even overhangs in its upper portion. It is probably unclimbable and certainly desperately difficult. Odell, however, thinks that he may have mistaken the first step for the second step. If so, it is even stranger that they should have been so late. To reach the summit from the first step and return before nightfall would have been impossible, and Mallory was too fine a mountaineer to throw his life and that of his companion away on impossibilities. On the other hand, they may have decided to go on as far as they could and return by nightfall. Another point in favour of Odell's view of them is that it is certain that they reached a point very close to the crest of the North East Ridge, if not the crest of the ridge itself.<sup>18</sup>

The illusion of 'moving' rocks was perceived by Shipton and Smythe during not more than a few seconds. Certainly Odell, who had five minutes to view the climbers, would have had a much better opportunity to become aware of any optical illusion had there been one.

Smythe's analysis, however, squares neither with Odell's report nor the facts. The visual distance from Camp VI to the second step is nowhere near "one mile", but rather 3,000ft. — a distance at which limbs can be clearly discerned on the human figure. Odell states

plainly that his view of the two climbers lasted not "only a minute or two", but five minutes. Furthermore, his view was not through "shifting mists", but through an atmosphere that had "suddenly cleared". Finally, he could not have been "tired" or suffering from the "strain of climbing", or he would not have tackled "a little crag which could possibly have been circumvented", as a "test" of his condition.

In any case, there is never any hint in Odell's writings that he may have mistaken rocks for humans. Even Smythe, commenting later on the possibility of an illusion, believes Odell probably did see Mallory and Irvine: "It was a strange experience, especially in view of the fact that it was hereabouts that Odell saw Mallory and Irvine for a few moments between shifting mists. Was it possible that he was familiarly deceived, especially in view of the mists which may have enhanced the illusion of movement? I do not think he was deceived. His description is too detailed to allow a mistake in the first place: most important point of all, he describes one figure as moving up to join the other."<sup>19</sup>

It is essential to establish firmly that Mallory and Irvine were seen by Odell on the second step, in order to credit the climbers with success at least in reaching the final pyramid of Mt. Everest. If they were not seen at that point, there exists no basis of fact on which to anchor a train of logical deduction.

#### The Use of Oxygen

Coincident with the increasingly difficult terrain on Everest at 28,000ft. is the crucial problem of obtaining enough oxygen to perform any useful work. It should be noted that no assault team with any real chance of reaching the summit from the north has used oxygen in its attempt — *except Mallory and Irvine*. And, as noted, while the use of oxygen by these two climbers enhanced the success of their climb, it earned them the long-lasting opprobrium of the mountaineering fraternity.

Even a cursory glance at mountaineering literature of the day discloses an almost

universal prejudice against the use of oxygen by the early Everest climbers. Even Odell stated: "Acclimatization to an altitude of 28,000ft. has been demonstrated, and there seems no valid reason why it should not be possible to go over 29,000ft., or the top of Everest."<sup>20</sup>

Raymond Greene, a physiologist who had done much research on the problem of using oxygen, referred to it as an "artificial attempt to speed up the ascent", and went on to say: "... In 1933, siege tactics, owing to the weather and not to any fault of organization, were overdone. But this admission should not be used as an argument for rush tactics, for the condition of the climbers at 28,000ft. was so good (sic) that there can be little doubt of their capacity in good conditions to climb Mount Everest without oxygen and without permanent harm."<sup>21</sup>

Col. Norton, expedition leader in 1924, felt much the same way: "... I still believe that there is nothing in the atmospheric conditions even between 28,000ft. and 29,000ft. to prevent a fresh and fit party from reaching the top of Mount Everest without oxygen."<sup>22</sup>

Among prominent climbers, only Ruttledge was sanguine about the need for oxygen: "... The tests of the Royal Air Force on their pilots indicate that oxygen-lack at very high altitudes causes quite sudden insensibility. I advocate that oxygen be taken to the highest camps for use at the discretion of the climbers. Given all equipment and the right weather, and sent up when they are at the top of their form, they should reach the summit."<sup>23</sup>

The anti-oxygen school ruled all attempts on Everest from the north (except for the 1938 expedition when some use of oxygen was made). Yet recent experience indicates that failure to use oxygen virtually assured the lack of success of all such climbs on Everest.

#### Climbing Speeds

A chart plotting climbing rates at various altitudes on Everest presents a revealing

picture (see opposite). Extrapolation of even the most optimistic portion of the non-oxygen curve suggests that it would be almost impossible to climb the mountain without oxygen, for a zero climbing rate is reached at 28,500ft. In fact, the non-oxygen climbing rate would probably reach zero just at the highest point on the Norton route — slightly above 28,000ft. (This is not to deny that some day a grotesquely trained athlete will probably be dragged up Everest to 'prove' that the mountain can be climbed without oxygen).

The climbing rate curve is based on the assumption that the difficulty of the terrain remains constant as the altitude increases. In fact, on the northern route, the climb becomes abruptly more difficult at about 28,100ft. Four men were all brought to a standstill at that point.

By adding the key element, oxygen, Mallory and Irvine unlocked the barrier that was to hold back climbers for 29 years. This simple, crucial fact was not appreciated at the time and has frequently been ignored by mountaineers and historians in assessing the climbers' chances of success.

In his book *Camp Six*, F. S. Smythe demonstrates how carelessly the use of oxygen by Mallory and Irvine was weighed: "... Supposing, like Norton and Somervell, they had been impressed by the apparent difficulty of the North East Ridge and the impossibility of carrying an oxygen apparatus weighing about 35 pounds up the nearly vertical cliff of the second step — a formidable proposition at sea-level and most likely an impossible feat at 28,000ft., taking into account the clumsiness and inefficiency of the 1924 apparatus — and had followed the traverse route ..."<sup>24</sup>

The oxygen equipment described by Smythe was that used in the 1922 attempt. Odell is quite clear on the improved apparatus carried by Mallory and Irvine: "The third expedition of 1924 was equipped with apparatus of an improved kind, including three cylinders of a specially light alloy ('Vibrac' steel), and a total capacity of 1,605 litres, or about 57 cubic feet, of oxygen. This amount at the prescribed continuous consumption of two litres per minute was to provide for a thirteen hours' climb, ascent and descent. The total weight was about 33lb; but it was later reduced to 22lb by discarding one cylinder and modifying the breathing apparatus."<sup>25</sup> (Italics added).

The disputed efficiency of the 1924 oxygen apparatus must be judged by George Finch's and Geoffrey Bruce's phenomenal climbing rates of 1,000 vertical feet per hour from 22,700ft. to 25,500ft. and 900 v.ft./hr. from 25,500ft. to 26,500ft., when using oxygen for the first time in 1922. These rates are about 50% faster than any of those achieved by non-users of oxygen climbing on the north side of Everest. The average rate of non-oxygen-assisted climbing at these altitudes (25,000ft.) is in the neighbourhood of 350-600 v.ft./hr.

The climbing rate chart allows us to estimate Mallory's and Irvine's probable climbing rate using oxygen. Where the curve for the average rate of climbing with oxygen intersects the altitude between Camp V and the top of the second step, we get an estimated climbing rate of 390 v.ft./hr. This figure corresponds with the oxygen-assisted climbing rates achieved (on the South Ridge) by Bourdillion and Evans in 1952 (from 25,300ft. to 28,000ft. at 490 v.ft./hr.), and by Hillary and Norgay in 1953 (from 27,900ft. to 28,700ft. at 230 v.ft./hr.).

**Mallory's and Irvine's Climbing Schedule**  
Mallory and Irvine had requested that expedition photographer Noel be prepared to telephotograph their progress over the second

step by 8.0 a.m. Assuming that Mallory intended to leave Camp VI at 6.0 a.m., this meant that he was calculating on a climbing rate of 800 v.ft./hr. — an estimate that he might have based on the climbing rates of 1922 as well as on his own climbing rate during the previous two days when, according to sherpas, Mallory and Irvine climbed very strongly from Camp IV to Camp V. At that altitude, a climb of 800 v.ft./hr. would indeed be swift, although it does lie within the relevant part of the oxygen climb curve.

If Mallory and Irvine *did* start at 6.0 a.m., their *actual* climb rate to the top of the second step, where they were seen by Odell, was 220 v.ft./hr. — a rate exactly matching that of Unsoeld and Hornbein (in 1963) in their climb from 27,900ft. to the summit by way of the difficult Horbein Couloir route.

Thus, the common suppositions that (a) 12.50 p.m. was much too late for Mallory and Irvine to have been seen on the second step, or (b) that malfunctioning oxygen equipment had caused the climbers to make a late start, do not appear valid. Instead, we see that:

- (1) Mallory and Irvine were progressing over the very difficult second step at a rate comparable to that at which other climbers subsequently mounted similarly difficult terrain at that altitude; and, to accomplish that, their oxygen equipment must have been functioning perfectly.
- (2) With a total oxygen capacity of 1,100 litres, administered at the fixed rate of 2 litres per minute, Mallory and Irvine, after climbing for seven hours, would still have had almost two hours of oxygen remaining when they reached the top of the second step

By culling all the available evidence, we have placed Mallory and Irvine at the top of the second step, 28,230ft. above sea level, at just before 1.0 p.m. on June 8th, 1924. What happened then is a matter of speculation, but it is speculation based on what we know of the personality of these two men, and on what we have learned between now and then of the conditions they faced. The following, again constructed from the best available evidence, is a scenario of the final hours in the lives of George Leigh Mallory and Andrew Irvine.

The two climbers could now see the last major barrier to the summit of Mt. Everest — the 700ft. final pyramid. In the foreground was a gently sloping snowfield stretching 150 yards across to the base of the final pyramid. That they were behind schedule was all too obvious.

Comparing the remaining oxygen with their actual climbing progress must have spurred them on relentlessly. For although their calculations showed that they might just reach the summit, it would be at the cost of exhausting their entire oxygen supply.

Gazing up at the rocks and footholds of the final pyramid, a mere 700ft. of medium-difficult climbing, Mallory must have felt a suffocating sense of frustration at the realization that once again Everest was going to defeat him. A simple attempt to climb a few steps at 28,300ft. without oxygen would quickly have brought home the fact that any effort beyond loitering was completely impossible.

#### **The Ascent of the Final Pyramid**

It would have been somewhere before the final pyramid that Mallory and Irvine were to face their greatest crisis. It was now after 1.0 p.m. They would be close to exhaustion from their desperate climb of the second step. A storm was approaching and they had only enough oxygen for less than two hours of climbing; perhaps enough for a suicidal attempt on the summit, but not nearly enough for a return to 28,000ft. where a non-oxygen descent would still be possible.

## **CONCLUSION**

It is difficult to speculate realistically about the motivation of two climbers in such a situation. Faced with a distinct possibility of running out of oxygen near the summit, would any two men jeopardize their lives just for the chance of conquering the highest mountain in the world? One answer is given by the behaviour of Jim Whittaker and Sherpa Gombu during their successful ascent in 1963. The magic attraction of Everest's summit was no less diminished ten years after its first official conquest, as Whittaker and Sherpa Gombu, struggling up the South Ridge in high winds, stopped near the south summit to calculate their remaining oxygen supply. Whittaker worked out that if each dropped off one of their two oxygen tanks, thereby lightening their load, sufficient oxygen could be carried for a dash to the summit and a return to their precious cache. Each therefore dropped a tank, but as they proceeded with their climb it became obvious that a miscalculation had been made. Yet, by then, Whittaker, normally as cautious a climber as any mountaineer must learn to be, also felt the powerful attraction of Everest's summit; at a point where common sense dictated a return, he pushed on, reaching the summit just as he received the last breath of oxygen from his tank.

So it may have been with Mallory, particularly as he had the added incentive of becoming the first to set foot on the mountain's summit.

Yet there was another possibility which may have occurred to Mallory — a course of action which, in similar situations, occurred to both Norton in 1924 and Smythe in 1933: when two could go no longer, one might still go on alone.

The two hours of oxygen remaining in each man's apparatus suggests that each man was carrying one empty cylinder and one cylinder containing the remaining 240 litres of oxygen. It would have been possible for Irvine, with his demonstrated ability at handling the equipment, to redistribute the oxygen load by connecting his partially full tank to the spent one in Mallory's harness. This would have given Mallory 360 litres and a fighting chance at the summit, while Irvine could have turned back with his remaining 120 litres — a full hour's supply and enough to get him back to the breathable 28,000ft. level. Irvine's totally empty tank may well have been abandoned as a marker of this separation of their paths.

#### **Irvine's Death**

Having effected the oxygen exchange, and with the squall already on the climbers, Irvine would have descended as rapidly as possible to reach a safe altitude before his oxygen ran out. He may have reached the top of the second step in a matter of minutes, but the further descent would have been difficult. Without Mallory to guide him, in a cold wind, and with greatly reduced visibility, Irvine would have been descending at a painfully slow rate. By 3.0 p.m., just as his oxygen was about to run out, he would probably have reached the base of the second step. Perhaps dumping his now useless oxygen apparatus, and exhausted by nine hours of arduous climbing, he would begin his fatal traverse across the treacherous snow-covered slabs. Norton describes this part of the mountain which he traversed (some 500ft. below the actual Mallory route) in clear weather: "I found myself stepping from tile to tile, as it were, each tile sloping smoothly and steeply downwards; I began to feel that I was too much dependent on the mere friction of a boot nail on the slabs. It was not exactly difficult going, but it was a dangerous place for a single unroped climber, as one slip would have sent me in all probability to the bottom of the mountain. The strain of

climbing so carefully was beginning to tell and I was getting exhausted."<sup>26</sup>

Irvine, who had climbed higher and longer than Norton, must surely have been as exhausted. There is no evidence to say at what time he slipped and fell, although if the ice axe marked the point of his fall it would probably have been near the end of the squall, since the axe was found a full 250 yards east of the first step. Odell, who scrutinized the slopes immediately after the storm had cleared at 4.0 p.m., may have missed Irvine's fall by only minutes.

### Mallory's Fate

Whether or not he left Irvine to descend by himself, Mallory had to decide which of three routes up the final pyramid was the safest under the worsening conditions. Ruttledge describes these three routes:

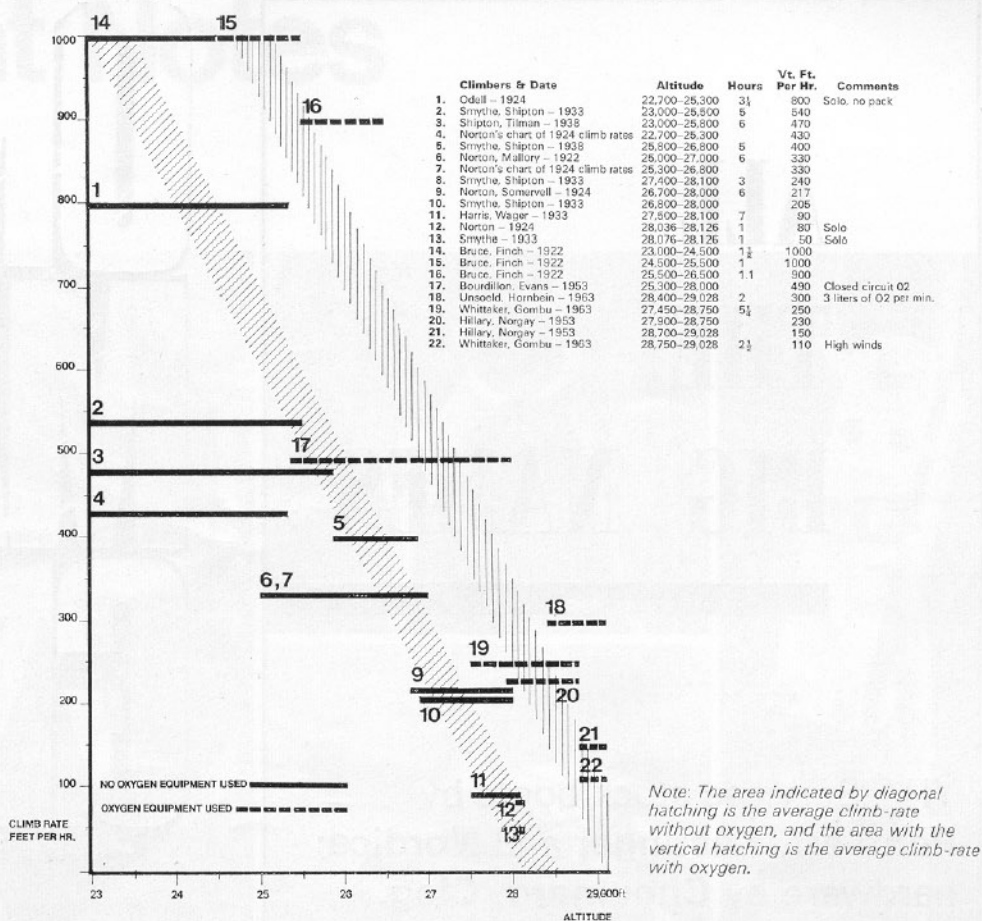
"From here (the base of the final pyramid as reached by the Norton route) there seems to be a choice of three routes: one traversing back towards the final snow slope at the head of the North East Ridge; another more or less straight up the centre of the final pyramid, where there is a series of linked snow patches which indicate a line of weakness; lastly, a traverse along the face of the pyramid on to the great North West Arête. For my part, I think the second of these routes offers the best chance. The third involves a very long and difficult traverse and would probably exhaust a climbing party."<sup>27</sup>

With the weather getting worse, Mallory's only possible route must have been the continuation along the North East Ridge he had followed thus far. Because of his critical oxygen shortage, any type of traverse merely in the hope of finding an easier route up the final pyramid would have been out of the question. In all probability he would have decided to assault the peak by means of the rock ridge that appears to lead directly up to a break in the summit cliff.

How long would such a climb take? No one has ever climbed to the summit from the north (except perhaps Mallory and the Chinese). Unsoeld and Hornbein did climb the western North Face up to the perpetual part of the snowfield, but traversed to the West Ridge in their final assault of the summit. Their climb of the final pyramid, at an oxygen flow of 3 litres per minute, was about 300 v.ft./hr. Hillary and Norgay, approaching from the steep South Ridge, managed only 150 v.ft./hr.

If Mallory was relieved of the responsibility of the less strong Irvine, his climbing rate could have increased substantially. As there was no great difficulty involved in the remainder of the climb, it is unlikely that his rate would have been less than the 300 v.ft./hr. necessary to get to the summit with his remaining oxygen. He had the will, the strength, and adequate weather; without the burden of Irvine, he would have had enough oxygen to reach the summit of Everest by 3.0 p.m.

But his triumph would have been short-lived. With his oxygen supply exhausted on or near the summit, his descent would rapidly have become a nightmare of danger. Gasping at up to 20 complete respirations per step, vision and consciousness fading repeatedly with the slightest increase in exertion, and with muscles drained by ten hours of some of the most demanding climbing ever done, Mallory would have recognized only too clearly the inevitable cost of his victory. Stupefied by acute hypoxia and exhaustion, with the daylight hours slipping by, he would have had ever greater difficulty in forcing himself to continue his desperately slow descent. Would he have been capable of descending the pyramid? It is barely possible, but the descent of the 80ft. sheer cliff of the second step would surely have



### Some Climbing Rates on Everest

This chart shows some average climbing rates achieved by climbers on Everest. All non-oxygen rates are from North Face climbs.

The purpose of the chart is to substantiate Mallory's and Irvine's most probable rate of climb. However, many factors mitigate this evidence. Most oxygen climb rates were achieved on terrain far steeper than that facing the non-oxygen climbers of the North Col. oxygen users on the North Face would be expected to achieve faster rates than those achieved at the higher altitudes by the South and West Ridge climbers.

It is interesting to note the approach of the non-oxygen climb curve to the zero rate of climb at a theoretical 28,500ft. This is not to say that no climbing could be done above that altitude without oxygen. Jim Whittaker and Sherpa Gombu descended from the main summit and climbed the 30ft. hump of the South Summit (28,750ft.) without oxygen, but the effort almost killed them. The debilitating effects of sustained effort without oxygen above, say, 27,000ft. are so acute that it appears unlikely that any oxygen-less climber could ever climb fast enough to get close enough to the summit in good enough condition to make an ascent and return in one day.

been an insurmountable task. An alternative descent by Norton's route offered the faint possibility of several hundred feet of less extreme terrain. But could Mallory take a chance of descending this unknown route with his own path hopelessly blocked?

Nothing short of the discovery of Mallory's body or the camera lent to him by Somervell can ever hope to give us the final clues needed to determine whether the summit was attained or how close the climbers came to reaching the safety of Camp VI. But there can be little doubt that at least one of the pair had an excellent chance of reaching the summit of Mt. Everest.

Whether, in retrospect, the achievement was worth the price is a question many would find it difficult to answer. What is awesome about the deaths of Mallory and Irvine is not the mystery, but the magnificent audacity shown by the climbers in challenging Everest. For, as Mallory once said in describing an arduous ascent of Mt. Blanc: "Have we vanquished an enemy? None but ourselves. Have we gained success? That word means nothing here. Have we won a kingdom? No . . . and yes."

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### SUMMARY

**Everest: North Face and North-East Ridge**  
The article discusses the events leading up to the disappearance of Mallory and Irvine in 1924, and postulates the theory that Mallory might have been able to reach the summit.