
MICHAEL WARD

The Exploration and Mapping of Everest

(Plates 43–47)

From its inception in the middle of the 19th century, the Royal Geographical Society (RGS) took a keen interest in the mapping of the Everest region. This formed an integral part of the many Everest expeditions, some of which had individual surveyors or survey parties attached to them. Many mountaineers took part in this work, particularly those with a scientific background. But it was not until 1961 that a comprehensive map was produced of the Everest region.

The Identification of Everest

The identification and naming of the mountain we call Mount Everest had begun much earlier. Since circa AD 750 the Rongbuk valley monastery and the surrounding region of south Tibet had been considered by Tibetans as places particularly suited to the highest intellectual attainment, since they were within sight of the peak named Chomolungma.¹ This must have been the peak, now known to all as Mount Everest, which dominates the whole region and can be clearly seen from the trade route to Lhasa that runs north of Rongbuk and south of the Tsangpo valley. A mountain in a similar position and with a similar name, Chomo-Kankar, is mentioned in an early Tibetan geographical text; Chomo Uri was another local name. As mountains played an important part in Tibetan culture, being seen variously as ladders by which their ancestors descended from heaven, or as pegs or pillars supporting the sky or fastening it to the earth, any outstanding peak would have held great religious significance.

Although a number of Jesuit missionaries visited south Tibet in the 17th century in search of Nestorian Christian colonies, it seems unlikely that any of them saw Everest, as they were in an area too far west. However, in 1661 Johannes Grüber and Albert d'Orville left Lhasa and travelled west along the Tsangpo valley, crossing the Himalaya at Tengri Dzong by the Nyelam valley and reaching Kathmandu in January 1662. Though Everest would have been visible along much of their route, neither of these missionaries mentioned in their writings having seen a particularly high peak; nor did Father Desiderei who reached Lhasa from west Tibet in 1716, returning by a similar route to Tengri Dzong.

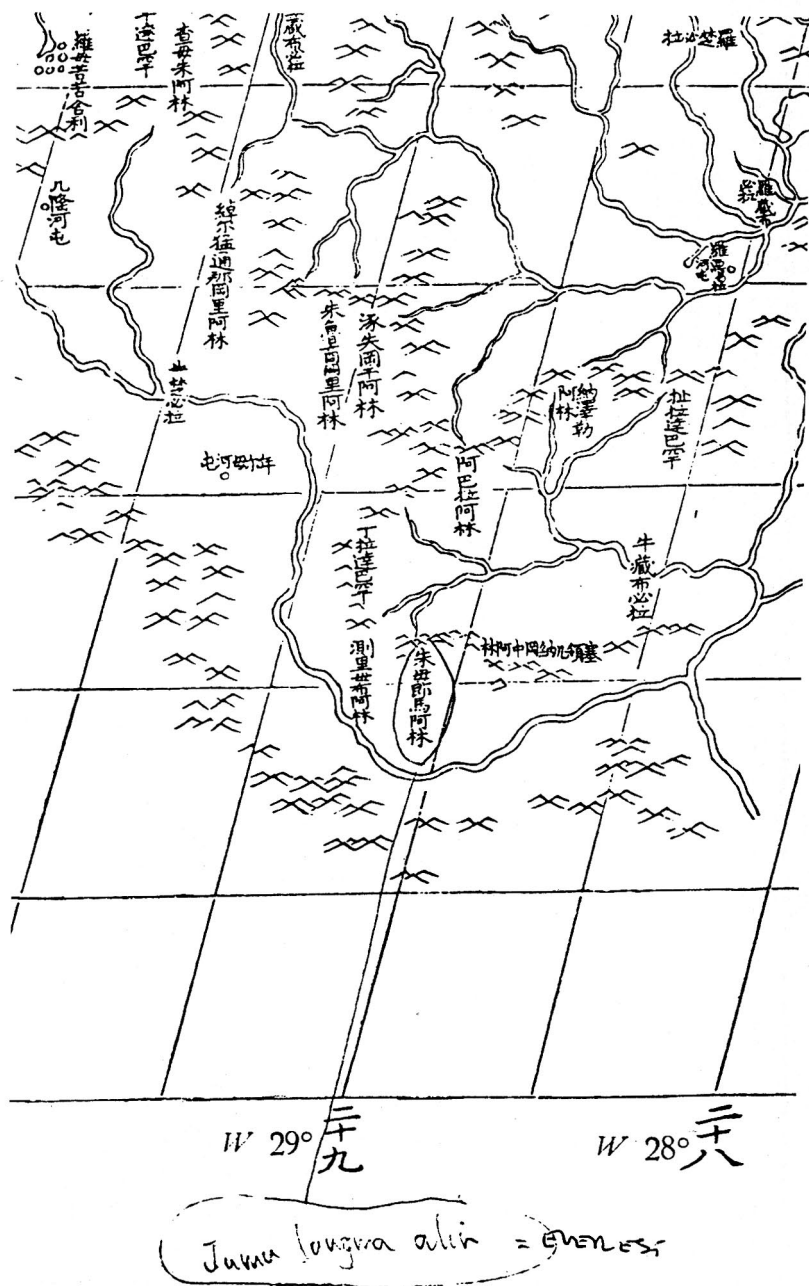
The first survey of the Everest region was made by the Chinese between 1708 and 1716 in the course of a general survey of the Chinese empire. From this survey Jesuit fathers in Peking drew a map that was published in 1717–18 in the reign of the Emperor Kangshi. On this map a mountain group

named Jumu Lungma Alin can be found in the position of Everest. The map formed the basis of the earliest European map of Asia, d'Anville's *Nouveau Atlas de Chine* published 20 years later in 1733.^{2,3}

The first attempt to make a formal survey of Nepal, which was not covered by d'Anville's map, was made by Charles Crawford, a member of the staff of the first mission to Kathmandu, between 1801 and 1804. He calculated the latitude and longitude of the capital and produced a large-scale map indicating the height of some peaks seen from the city. He also completed a small-scale map of the rest of Nepal based on information supplied by native travellers, but on this no high peaks were recorded. Anglo-Nepalese relations deteriorated soon afterwards and Nepal was to remain closed to Europeans for the next 150 years.

In the early part of the 19th century, officers of the newly formed Survey of India began mapping that vast and little known country. In 1818 George Everest, who had gone to India as an artillery cadet in 1806, was made chief assistant to William Lambton, the founder of the newly formed Great Trigonometrical Survey (GTS) of India. From 1830 to 1843 George Everest combined the posts of Surveyor-General and Superintendent of the GTS, and it was during this period that he conceived and put into effect the grid-iron system of triangulation which eventually reached the foothills of the Himalaya; he was unable to go further north owing to the political difficulties presented by the independent kingdoms of Sikkim, Nepal and Bhutan.⁴ However, altitude measurements were made of all the peaks visible from the plains of India, and first Dhaulagiri (Peak 42) in central Nepal, and then Kangchenjunga (Peak 8) on the borders of Sikkim and Nepal, were considered to be the world's highest peaks. At the same time, ignorance of the topography of the Himalaya was so profound and widespread that Joseph Hooker, the botanist, was able to write in his *Himalayan Journals* of 1854: 'It was not then known that Kangchenjunga, the loftiest mountain on the globe, was situated on my route and formed a principal feature in the physical geography of Sikkim.'⁵

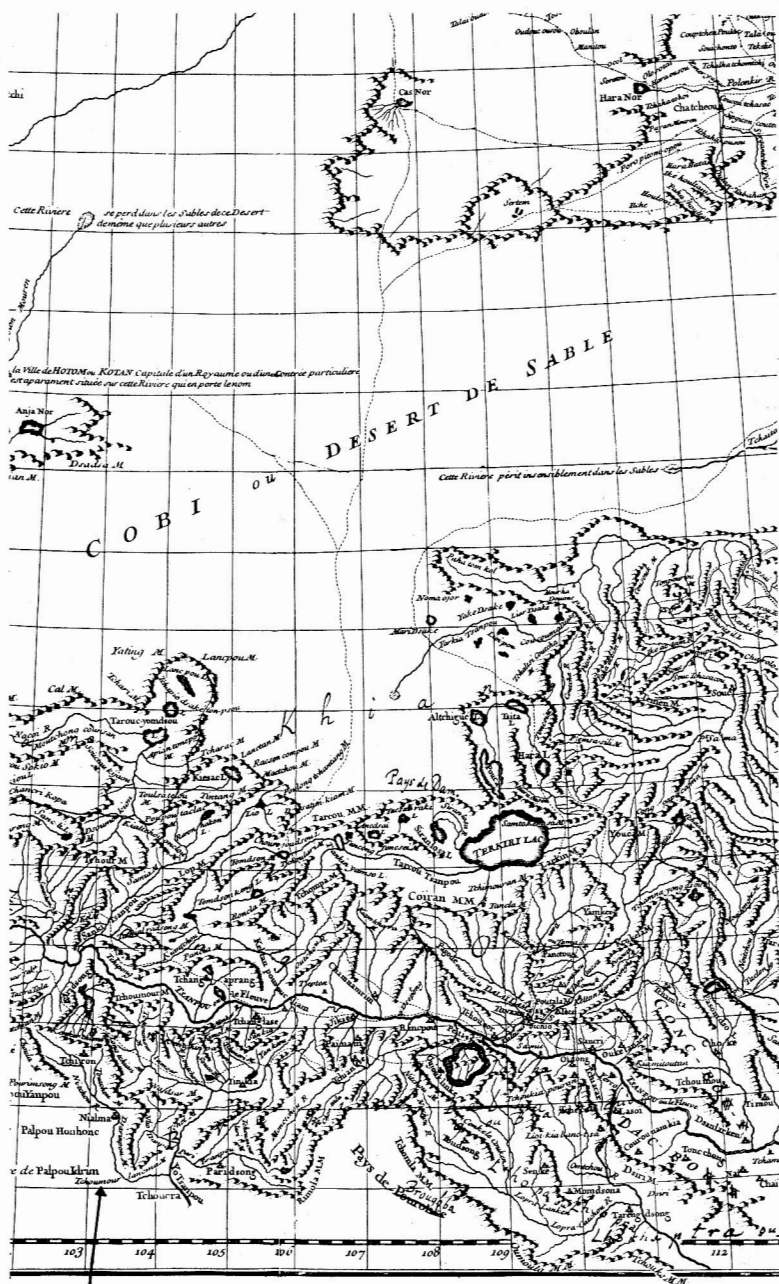
With further routine measurements it became apparent that an insignificant looking peak in NE Nepal, about 70 miles west of Kangchenjunga, was extremely high. First observed around 1848 it had been designated Peak 15 and appeared to be one of a number of seemingly minor summits. Eventually, between November 1849 and January 1850, the highest mountain in the world was discovered at 27° 59.3' north latitude and 86° 54.7' east latitude from Greenwich. An average height of 29,002ft, or 8840m, was computed from six different stations.⁶ This information was conveyed to a meeting of the Asiatic Society of Bengal. On 1 March 1856, Andrew Waugh, who had succeeded George Everest, wrote to Sir Roderick Murchison, President of the Royal Geographical Society, giving him the coordinates and estimations of height. He suggested that the name 'Everest' be given to the peak to commemorate his outstanding predecessor and because there was neither a local name nor a native appellation.⁷ In this he was wrong, because the Tibetans knew the peak as Chomolungma or Jumu Lungma Alin. Moreover, Hooker mentions in his *Himalayan Journals* that



Detail from a map drawn by Jesuit fathers in Peking from a survey of the Everest region made by the Chinese between 1708 and 1716.



Part of a page from d'Anville's *Nouveau Atlas de Chine*, published in 1733, the earliest European map of Asia.



Tchoumour Lancma M = Everest

the Nepalese called a 'stupendous white mountain mass' in this area 'Tsongau', and comments in a footnote that this is 'better known as Everest, the loftiest summit on the globe. Its position is latitude 28°N and longitude 87°E. It cannot be seen from Kathmandu' (which is correct). This last piece of information probably came from Brian Hodgson, former Resident in Kathmandu, with whom Hooker was staying whilst in Sikkim. A letter from Hodgson, quoted in the *Proceedings of the RGS 1855-57*, states that Peak 15 already had a name, 'Devadhunga', a claim later investigated and found to be incorrect. The controversy over a name for Everest has continued to the present day, and current local alternatives are 'Qomolungma' or 'Chomolungma' (Chinese) and 'Sagarmatha' (Nepalese).

Among the first Europeans to attempt to establish the identity of Everest were the Schlagintweit brothers. In 1855 Hermann Schlagintweit painted a mountain from Phalut on the Singalila ridge running south from Kangchenjunga. The title of the painting (Plate 64 in the *Alpine Journal* 97) is 'Gaurisankar or Everest'; Schlagintweit believed that these were alternative names for the same mountain. Two years later, in 1857, while on a visit to Kathmandu, Schlagintweit climbed a small hill, Kaulia, in the Kathmandu valley and from there saw the mountain called by Hodgson, the British Resident, 'Devadhunga'. Schlagintweit identified Devadhunga as Everest, but certified the local name as 'Gaurisankar'. But the Survey of India never accepted the name 'Gaurisankar' as an alternative to 'Everest'. The correct identification from Nepal was made in 1903 when Henry Wood of the Survey of India also visited Kaulia and clearly showed that the peak visible from there was Gaurisankar (Peak 20) and well known to the Survey. Peak 20 was 35 miles west of Everest, and the peak which Schlagintweit painted in 1855 was, in fact, Makalu. The first close-up inspection and identification of Gaurisankar and its higher neighbour Menlungtse was made from Tibet in 1921, and by Shipton and Ward from Nepal in 1951.⁸

Since Europeans were forbidden to travel in Tibet and Nepal during the latter half of the 19th century, Hari Ram (the pundit M-H, or No 9) was the first to circumnavigate the Everest region, crossing the Nangpa La in 1885. However, he left no record of having seen a particularly high peak.⁹ Natha Singh, an Indian surveyor, reached the Khumbu glacier in 1907 but was unable to carry out a survey and just sketched the lower end. In 1898 Dr L A Waddell, later a member of the 1904 Younghusband mission to Lhasa, obtained a Tibetan picture map of the Himalaya south of Tengri. But the group of peaks shown are more likely to be the Menlungtse-Gaurisankar group than Everest.¹⁰

The 1904 mission to Lhasa provided an opportunity to identify Everest from the north and make certain that there were no higher peaks. This task was carried out by a survey party consisting of R H D Ryder, C G Rawling, F M Bailey and Henry Wood. Wood, who had been in Nepal the year before, identified Everest with certainty from Kampa Dzong, and a good and closer view was obtained by Rawling from the Kara La pass 50 miles to the north of the mountain.¹¹ But the immediate neighbourhood of Everest still remained unexplored and unmapped. However, H H Hayden, attached to

the mission as a geologist, took a number of photographs of the mountain and sent them to the Secretary of the Royal Geographical Society. Previously, photographs of Everest had been taken from the south and east, by Vittorio Sella in 1899, and by J Claude White in 1903 from Sandak Phu, 10 miles south of Phalut on the Singalila ridge. Kellas took further photographs in 1920 from the Kang La, 25 miles north of Phalut.

Although Col John Noel reached Tashirak on a tributary of the Arun, 40 miles east of Everest, in 1913, he had only a poor view of the mountain.¹² An aerial survey of Everest was considered but never carried out at that time.¹³

Thus, by the outbreak of the First World War, Everest had been clearly identified and photographed but only from a distance. The whole Everest region between the Rongshar and the Arun, and between the Tsangpo river and Namche Bazar remained to be explored and mapped. This process was to be completed between 1921 and the end of 1953.

Mapping of the Tibetan (north) side of Everest

The mapping of Everest from the north was carried out between World Wars I and II in the course of seven expeditions. As soon as the First World War was over, in December 1918, the RGS and Alpine Club jointly considered obtaining permission from either the Tibetan or Nepalese governments to explore Everest and find a route to the summit. As the world's last major geographical challenge (now that both the Poles had been reached) it was felt that every effort should be made to do this. Permission for a Nepalese approach was refused, but with the backing of the India Office and the Government of India the Dalai Lama gave permission for an expedition to visit the Tibetan side of Everest in 1921. It had two objectives: to survey and to find a route to the summit.¹⁴

The 1921 Everest Expedition¹⁵

The members of the survey party were Major H T Morshead, Major E O Wheeler, Lalbir Singh Thapa, Gujjar Singh, Turubaj Singh, a photographer Abdul Jalil Khan and 16 porters. Their task was threefold: to carry out a general survey, at 4 miles to the inch, of the unmapped area to be explored by the expedition; to complete a detailed survey, at 1 mile to the inch, of the immediate environment of Everest; and to make a revision of the existing quarter-inch map of Sikkim on their way from Darjeeling to Tibet.

At this time, knowledge of the Everest region depended on the work of the pundits, in particular Hari Ram, and on rough notes and sketches made by early Jesuit travellers. The survey made by Col Ryder and others on the Tibet Mission of 1903-4 had approached no closer than 50 miles from the mountain, leaving the area west of Kampa Dzong and south of the Ladak range (now known as the Gangdise range), together with the main Himalayan boundary peaks, as *terra incognita*. This region extended to 15,000 square miles and at its centre lay the Everest group with four of the world's ten highest peaks: Everest, Lhotse, Makalu and Cho Oyu. This area offered one of the last great prizes of mapping and mountain exploration.

Six weeks before the arrival of the main expedition in Darjeeling, three members of the survey detachment started work on the revision of the Sikkim survey. 2500 square miles of southern Sikkim were completed, whilst northern Sikkim was later covered by Turubaz Khan after the main party had left for Tibet. Morshead concentrated on the general survey at 4 miles to the inch and covered a vast area of unmapped country essentially from the sources of the Bhote Kosi (Rongshar river) in the west to the Arun river in the east. Each river cut through the Himalaya in deep, narrow, precipitous gorges about 60 miles apart. Meanwhile, Wheeler surveyed the immediate Everest region using a Canadian method of photo survey which he had developed in the Rockies. Despite poor weather (for much of the survey work was carried out during the monsoon), all the main objectives were achieved and the first reasonable map of the northern part of the Everest region was made.

The expedition's most important contribution to the first ascent of Everest over 30 years later was that the main configuration of the glaciers and ridges on the Nepalese side of the mountain were defined, and that Mallory looked into the Western Cwm and took the first photo of this mysterious high valley. On the north side of the mountain, the approach to the North Col by the East Rongbuk Glacier was discovered by the surveyors and the North Col was reached by Mallory and Bullock.

The expedition produced a remarkably good photographic record and a map available in three sheets at 1 mile to the inch. A geological survey of the whole area was made by Dr A M Heron of the Geological Survey of India. Additions to the map were made in 1922, particularly in the region of the Arun gorge,¹⁶ with further valuable additions in 1924 when an Indian surveyor, Hari Singh Thapa, was attached to the party. The 1933 expedition carried out no exploration in the immediate region, but Professor L R Wager subsequently drew a geological map of the drainage areas of the Arun, Teesta and Ammochu rivers based on work by J D Hooker, F R Mallett, E J Garwood, H H Hayden, A M Heron, N E Odell and by Wager himself.

The 1935 Reconnaissance Expedition

In 1935 a lightweight expedition visited the north side of Everest.^{17,18} Under the leadership of Eric Shipton its purpose was to assess whether the monsoon season was suitable for attempting the mountain despite the poor weather experienced at the same time of the year in 1921. Its other objective was to make a detailed map of the north side of Everest so that a precise route could be planned for an attempt in 1936.

Michael Spender, the surveyor, had developed new methods of photographic survey in Greenland; throughout the expedition he was assisted by Shipton, Charles Warren the medical officer, and Edwin Kempson, a mathematician and housemaster at Marlborough College. Spender borrowed a Zeiss photo-theodolite adapted for rapid work by the use of roll film and used by him in Greenland. In addition, the Wild photo-theodolite belonging to the RGS and used by Kenneth Mason in the



Some map-makers of Everest:

Left

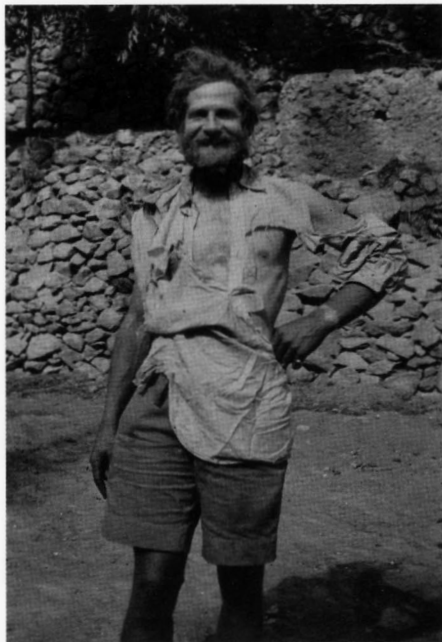
43. Major E O Wheeler, a member of the survey party on the 1921 Everest Expedition, carried out a general survey at 4 miles/inch, a detailed survey at 1 mile/inch of the immediate environment of Everest, and a revision of the existing quarter-inch map of Sikkim. (p103)

Below left

44. Michael Spender, surveyor on the 1935 Everest reconnaissance, made a 1:20,000 photogrammetrical survey of the N face. (p104)

Below right

45. A R Hinks completed, in 1945 with H F Milne, the first composite map of the N and S sides of Everest. (Hugh Rutledge) (p105)



Karakoram (Shaksgam) in 1926 was taken, together with a third, very portable instrument of great simplicity – the Watts-Leica photo-theodolite. This had been made from a Leica camera mounted on a Watts mountain theodolite, and was intended to be used by climbers more interested in climbing than in surveying.

The 1935 Everest expedition was exceptionally successful, since it achieved the ascent of more 20,000ft peaks than had ever been climbed before. Though primarily a reconnaissance expedition, its members reached a higher point on Everest than was to be achieved by the formal attempt, plagued by atrocious weather, in 1936. Finally, Spender completed a 1:20,000 photogrammetrical survey of the North Face in which accurate measurements of height and distance were made. He also commented, very pertinently, that there was little point in spending a great deal of time, energy and money on field-work unless there were adequate back-up facilities for processing and writing up the results – a point that is still relevant today.

The 1936 and 1938 expeditions carried out little significant exploration or survey work. However, N E Odell made many observations in the Earth Sciences.

Mapping the Nepalese (south) side: the 1933 flight over Everest

The Nepalese side of Everest was examined in detail for the first time in 1933, from the air.¹⁹ The aim of the Houston–Westland expedition was to fly over Everest from Nepal – as Tibetan airspace was forbidden. Two flights by two planes were made from Purnea in India. Both vertical and horizontal photographs were taken and were processed by A R Hinks, a mathematician and cartographer who was secretary of the RGS, and H F Milne, the chief draughtsman for the Society.

By incorporating Spender's map of 1935, the first (Hinks–Milne) composite map of the north and south sides of Everest was completed in 1945. A photostat of the final drawing was taken by Ward on the 1951 reconnaissance expedition, as there was no lithographed copy available until 1952.²⁰

The 1951 Reconnaissance Expedition

Although no formal survey work was carried out on this expedition,²¹ Ward made a compass traverse of the area west of Everest that had not been covered by the photographs and mapping of the 1933 Everest flight. This included the Ngozumpa glacier in the Nimagwa region and, further west, the Gaurisankar–Menlungtse basin. In the course of these explorations, Cho Oyu and Gyachung Kang were seen clearly from the south, and the Nangpa La was visited by Murray and Bourdillon.

These explorations yielded data around which the 1952 Cho Oyu expedition was later planned. The area east and south of Everest (the Imja and Upper Hongu), visited by Hillary and Shipton during the 1951 reconnaissance, was already well depicted on the Hinks–Milne map, of which Ward had a copy. Hillary and Riddiford crossed the Tesi Lapcha pass and descended the Rolwaling valley.

The 1952 Cho Oyu Expedition

Though again no formal survey was carried out on the Cho Oyu expedition,²² the party completed a formidable amount of exploration: in particular, the area on the Nepal-Tibet border, north of the Tesi Lapcha pass and south of the Menlung La, was clarified. This contained a group of peaks, clustered around the Tolam Bau glacier, that ended in the Upper Rolwaling valley. This area was later surveyed by the Merseyside expedition in 1955.

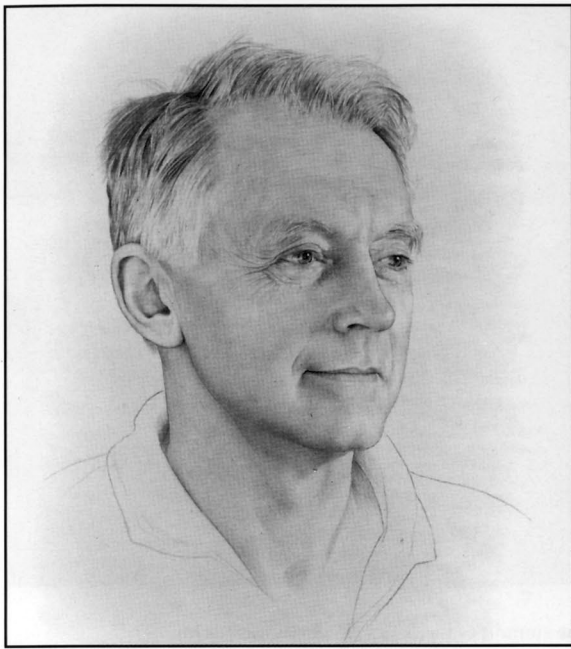
The party then explored east towards the Barun glacier and Makalu. This major glacier, which drains the south and west side of Makalu, was discovered from aerial photographs taken on the 1933 Houston-Westland expedition, and in 1952 it was followed throughout its whole length from the Tibetan border just west of Pethangtse to the junction of the Barun Khola with the Arun river.

1953 Pre- and Post-monsoon Expeditions

No survey work was carried out during the successful 1953 Everest expedition, and the maps used were based on the Survey of India, in particular a map of the immediate Everest region at 1:126,720, printed in 1930. Concurrently with that expedition J O M Roberts, who had brought in the extra oxygen cylinders, made the first exploration of the peaks immediately south of Namche Bazar: the Numbur-Karyolung group. He then clarified the area of the Upper Inukhu Khola, made the first ascent of Mera Peak, crossed the Mera La on 19 May, and established the position of the Hongu Khola which was wrongly depicted on the Survey of India quarter-inch map.²³ After Everest, Charles Evans stayed on and surveyed the Kang Cho group, just west of Everest, which had been climbed during their acclimatisation period by the main Everest party. He also climbed Kang Cho (6038m) and then extended his survey to the peaks between the Ngojumba glacier and the glacier leading to the Nangpa La and the area which had already been explored in 1951/52.

Charles Evans now decided to explore the Numbur-Karyolung group where J O M Roberts had only spent two days. Following Roberts's route onto the Lumding glacier, Evans found it impossible to cross the ridge running north from the summit of Numbur (6959m), the highest peak in the group. He therefore had to retrace his steps down the glacier and go a long way south to a small hamlet, Thangu. From here he went west and north onto the Dudh Kund glacier which rose from the south and west faces of Numbur and Karyolung (6511m). Ascending this glacier, he again had to break out west into the next valley, in which lay the Zurmoche glacier. Going west again, he managed to cross a ridge running south from the summit of Bigphera Go Nup (6666m) and finally descended into a group of glaciers running into the Rolwaling valley west of the Tesi Lapcha pass. At last he was in familiar country again.²⁴

In accomplishing this difficult piece of mountain exploration, Charles Evans had finally filled in the last 'blank on the map' of the Everest region. As a result, by the end of 1953 not only had Everest itself been climbed but all the main peaks, passes and glaciers of the whole region had been seen



Above

46. Charles Evans, in 1953 after Everest, carried out some difficult but essential mountain exploration W and S of Everest to fill in two 'blanks on the map' of the Everest region. (*John Merton RA*) (p106)

Right

47. G S Holland, in 1961, completed the first comprehensive map of the whole Everest region. At 1:100,000, this map incorporated work from all previous expeditions. It was revised and extended in 1975. (p107)



and photographed and a considerable amount of both ground and aerial survey work had been completed.

1954 to the present

On the 1954 New Zealand-British expedition to the area east of Everest, Charles Evans consolidated his explorations with a photo-survey which was incorporated in the Holland maps of 1961 and 1975.²⁵

In 1954-55 the Federation Française de la Montagne produced a 1:50,000 map of the area between Makalu and Everest, whilst in 1957 Erwin Schneider, the Austrian cartographer, drew a map at 1:25,000 of the south side of Everest. In 1963 this was extended and reissued at 1:50,000.

In 1961 the first comprehensive map of the whole Everest region, from Rongbuk to Namche Bazar and from the Tesi Lapcha pass to the Barun valley, was drawn by G S Holland of the RGS.²⁶ At 1:100,000, this incorporated work from all previous expeditions. In 1975 Holland's map was revised and extended and further detail was added. It is now the landmark map of the area, against which all others are judged.

In 1977 Chinese cartographers from Lanzhou University under Professor Chen Jiaming printed a map of the Everest region in Chinese. Survey work had been carried out between 1966 and 1975. In the copy in the RGS archives, the Chinese names have been translated into English [Wade-Giles system] and placed on the map.

In 1980 Bradford Washburn, Director of the Museum of Science in Boston, wished to increase the accuracy of the maps of the Everest region, so that glaciologists and geologists could have a large-scale 1:10,000 detailed base, with 20m contours, on which to work. To this end he obtained permission to overfly Everest at 12,000m. The resulting map at 1:50,000 was published by the National Geographic Society in 1988. It was drawn by the Swiss Federal Office in Berne and place names were decided in consultation with Nepalese and Chinese cartographers. A second edition was published in 1991 showing the names and dates of ascents of Everest made over the years by different routes.²⁷ The larger scale maps are to be found in the map archives of the RGS.

Of all the mountain areas of the Himalaya and Central Asia, the Everest region is the one that has received the most attention from mountaineers and cartographers. In the course of many pioneering expeditions, these dedicated men worked together to produce a succession of maps of the region that are as delightful to look at as they are nostalgic and informative to study.

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