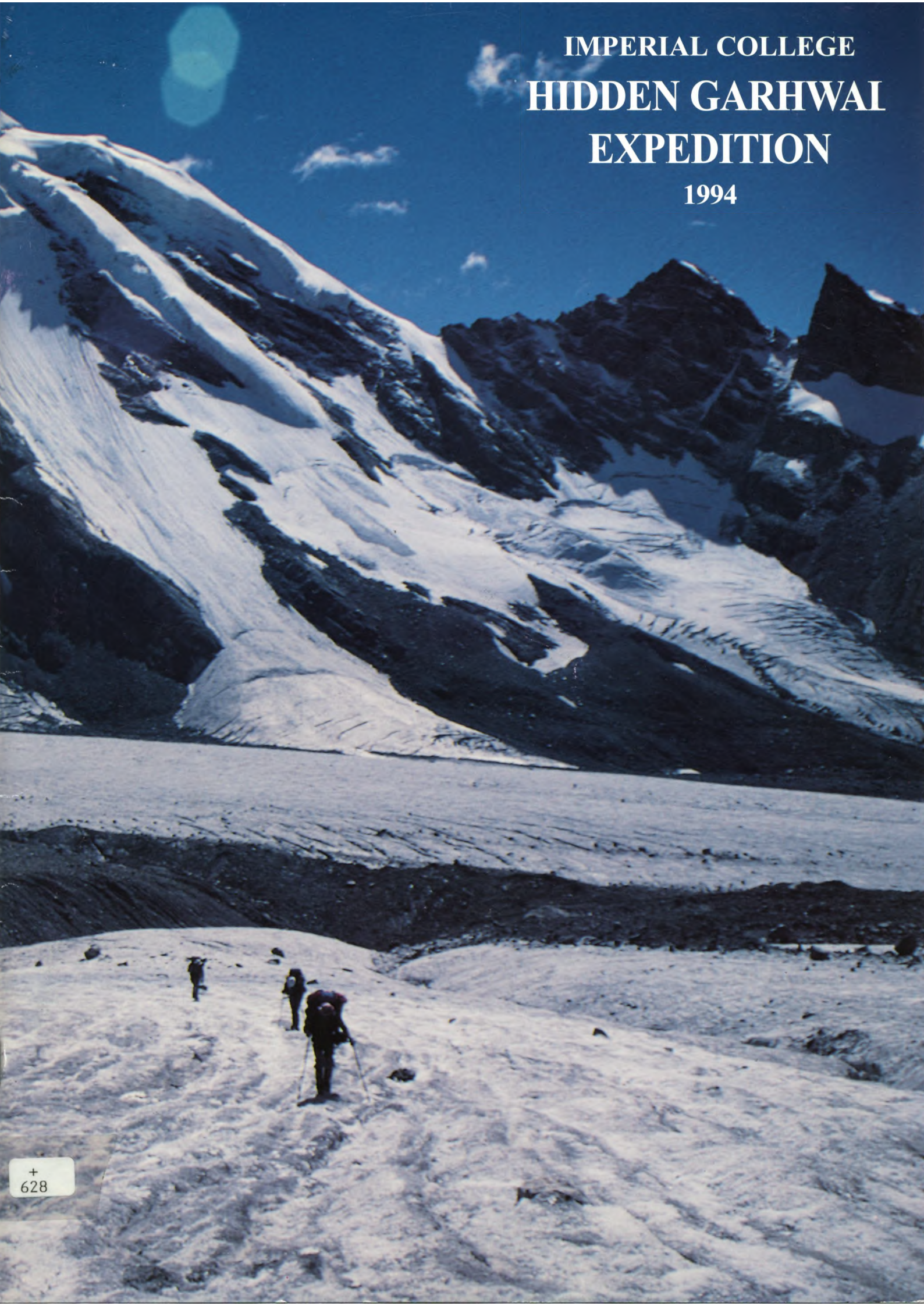


IMPERIAL COLLEGE
HIDDEN GARHWAL
EXPEDITION

1994



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“Long ago a Hindu sage wrote that a hundred ages of the gods would be insufficient to tell all the glories of the Himalayas. In the last twenty years that apparently limitless paradise has come under increasing pressure from mountaineers, trekkers, pilgrims and a rapidly expanding local population. The Imperial College Hidden Garhwal Expedition, in a wonderful combination of adventure and research, approached the beautiful Parbati valley with rare sensitivity, setting a fine example for future ventures in the area.”



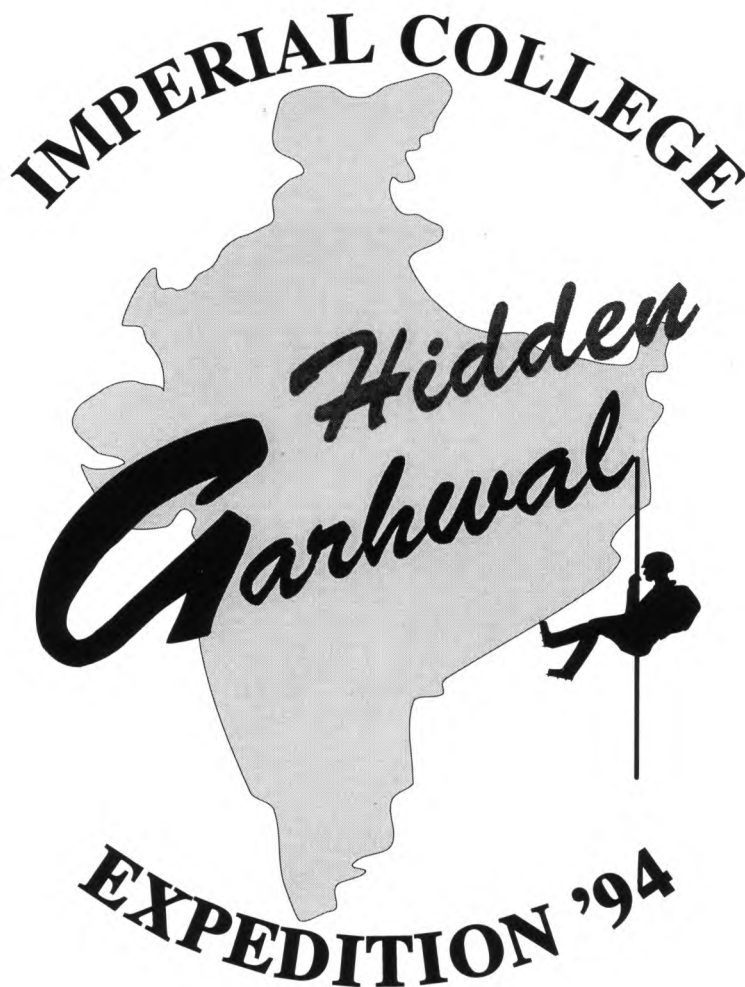
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For further information contact:

Overview

The Imperial College Hidden Garhwal Expedition was the first foreign expedition in over twenty years permitted to enter the relatively unexplored Parbati Valley, in the Indian State of Himachal Pradesh. Whilst there, a long-term study to monitor changes in the state of the valley due to tourism, trekkers and local developments was set up. The expedition was successful, initiating a detailed study of the forests and footpaths, and making first ascents of three mountains.

Our original plan was to enter the Nanda Devi Sanctuary in northern India as this was suited to our projects but, despite a lot of hard work from both us and our colleagues in India, we could not get the necessary permission due to sensitive environmental problems. We changed our sights to the Parbati Valley, which was just opening up to mountaineering expeditions and seemed the perfect alternative. Renowned for its beauty, it is in danger of being destroyed by unmanaged tourism.

We successfully carried out our scientific aims. Starting from the last village in the valley at 2800m, a number of sites were chosen up to our base camp at 4100m. At each of these the health of the forest and abundance of fire-wood was measured to assess the present state of the forest - whether it is healthy or in a state of decline. In addition, the impact of people on the footpaths was recorded by measuring path width and soil density, and combining this with plant transects across the footpaths. Once analysed, this will give a picture of the present situation and how the footpath

changes along the valley. More importantly, every site that was assessed can easily be re-located and the study repeated in future years to see how the valley changes with time. Information of this kind from pristine mountain environments is scarce but much needed. The data collection was complemented by interviews with local people on their views about their environment, on how they collect wood for cooking, and about the number of people visiting the valley.

We also explored the mountains. Our original intention was to climb the South-West Ridge of Peak 6128. Although we climbed much higher than all previous attempts, we were unsuccessful due to bad weather from a protracted monsoon and eventually turned back upon encountering extreme technical difficulties. We were successful on a number of other peaks, all first ascents. These were the North-East face of Pk. 5680, which we called Jung Minar, the North Ridge of Pyramid Peak (6036m), and the North and North-West ridges of Peak A (6248m).





Members



Figure 1. The team (from top left to bottom right): David Singh, Mahesh Rai, Bhagwati Prasad, David Edwards, Oliver Shergold, Philip Wickens, Toby Shergold, Martin Jackson, Martin Shelley.

British Members

Oliver Shergold
EXPEDITION LEADER
Age: 23
Mechanical Engineering Graduate, Imperial College

Philip Wickens
SECRETARY
Age: 24
Biology Postgraduate, Imperial College

Martin Jackson
TREASURER
Age: 21
Materials Graduate, Imperial College

Martin Shelley
EQUIPMENT OFFICER
Age: 26
Computing Graduate, Imperial College

David Edwards
MEDICAL OFFICER
Age: 22
Biology with Management Graduate, Imperial College

Toby Shergold
SCIENTIFIC OFFICER
Age: 21
Environmental Studies Undergraduate, Oxford Brookes University

Indian Members

David Singh
CULTURAL ADVISER
Age: 17
Commerce Student, Delhi

Mahesh Rai
LIAISON OFFICER
Age: 24
Mathematics Graduate, Darjeeling

Bhagwati Prasad
COOK
Age: Old
Professional Cook, Himalaya



The Expedition Story

The state of Himachal Pradesh is dominated by the Himalaya, with its high peaks and lush forests. The first expeditions to explore it reported stunning mountains and beautiful forests. This section tells of our journey to the mountains and the trek to base camp, and of the adventures we had, from collecting data deep in the forests to climbing high in the virgin mountains of the Parbati Valley; the Valley of the Goddess of Beauty....

JOURNEY TO THE MOUNTAINS

After an aerial tour of the Middle East we finally arrived in Delhi where we were warmly greeted by Col. Singh, Chairman of the Youth Exploring Society of India, and his son David, who was to join us on the expedition. They took us to our Delhi accommodation, a guest house kindly provided by Tata. After several days of sorting out freight and bureaucracy, and being entertained in the evenings by the Imperial College Alumni Association of India and Tata, we left in a minibus with a jeep for support, both of which we had hired to take us to the mountains.

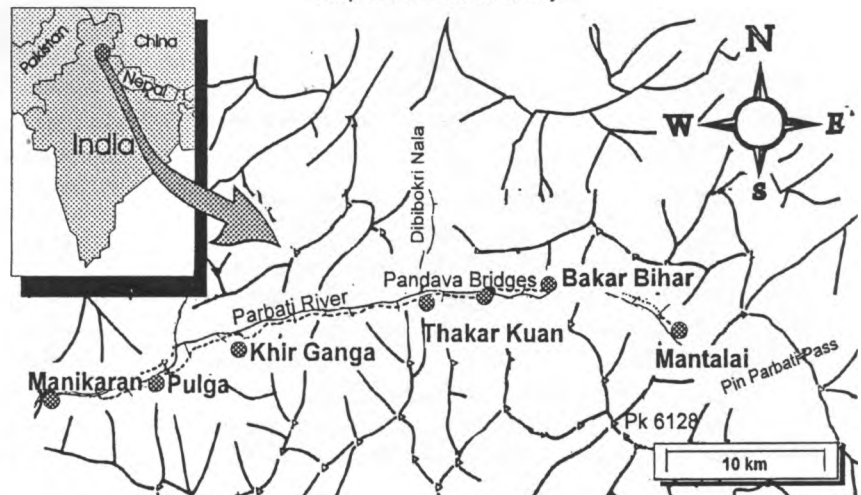
"We joined one huge traffic jam, masses of buses and lorries, each colourfully painted and laden with people." PHIL.

We drove 500km through several states to reach Himachal Pradesh. The monsoon made this a very long journey. In the plains much of the countryside was flooded, and we constantly passed crashed vehicles that had slipped off the road. Almost as soon as Himachal Pradesh is entered the Indian plains end abruptly and the densely forested foothills of the Himalaya begin. We stopped near the old British hill-station of Shimla and the following day

entered the Kulu Valley, through which the Beas river flows.

The road passes through some impressive scenery, with steep hillsides covered with thick forests and palm trees. The occasional temple was passed, together with its supply of Sadhus (nomadic holy men). At Bhuntar the Parbati river flows out of a dark cleft in the hillside to join the Beas. Since it was monsoon and had not rained that day, the drivers were nervous about going up the Parbati Valley that evening. If it rained while we were going up we might get stuck, or be washed away in a landslide. We decided to do it as quickly as possible. There was no

Map 1. The Parbati Valley



trouble at all except at a rather swollen ford which our drivers refused to cross. After a lot of negotiating they decided to do it with some help from local people.

"The road to Manikaran was precarious. Boulders and scree seemed perched, ready to fall off at the slightest bit of rain."
PHIL.

Eventually we arrived at Manikaran. In the dark it appeared magical. Where steam was billowing out of the thermal springs the light caught it, giving the narrow streets a ghostly ambience. We unpacked the coach and managed to book into a cheap hotel, which was to accommodate us for the two days that it took to negotiate for the porters to take our equipment up the valley. Since Manikaran is at the road head all further travel to the mountains is on foot. At Manikaran the Expedition really began.

FROM MANIKARAN TO KHIR GANGA

The village of Manikaran lies perched above the fierce Parbati river, reached only on foot via two suspension bridges. The thermal springs here, where boiling water bubbles out of the rocks, are the sites of several Sikh and Hindu temples, making it a popular destination for tourists and pilgrims.

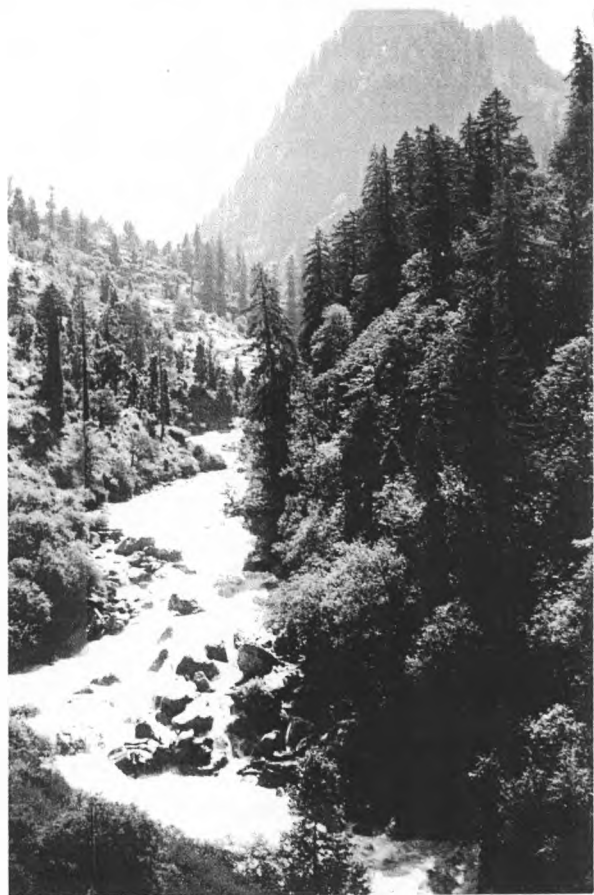
From Manikaran a small path winds its way up the hillside and past several small villages. It is in these that the local porters live. Most of their time is spent either farming or carrying supplies, but if porters are needed, a "head porter" will organise a group of them.

We split the journey to Base Camp into two stages. On the first stage eighteen mules would take our kit to Khir Ganga, where we planned to spend a week carrying out the scientific work, and at the same time acclimatise, increase our fitness, and recover from bouts of 'Delhi Belly'. For the second stage 45 porters would join us for the 35km to our proposed Base Camp at Mantalai (see Map 1).

The 12km path between Manikaran and Pulga is being turned into a road for access to a proposed dam higher up the valley. We took another smaller path which weaved

through spectacular forest scenery, passing thundering waterfalls and chasmous gorges. The forest feels enchanted, with numerous colourful birds, strange fungi, and curious monkeys.

Looking up the Parbati Valley near towards Pulga..



"We were passing through the thick forest early this morning when, suddenly, a flock of parrots flew in front of us and down the valley." PHIL.

Along the way several bridges cross the junction of the Tos and Parbati Rivers. It is up the Tos Valley that many expeditions travel to reach the impressive peaks of Papsura, White Sail and Tiger Tooth. The last major village in the Parbati Valley is Pulga. A police check-post was once located here, preventing expeditions from entering the upper valley. It is now a popular place for travellers due to the large number of marijuana fields. There are also small shops that sell a good supply of food. On

our way up we encountered a curious festival here, which only occurs once every twelve years. The villagers were celebrating the arrival of a god from a neighbouring valley, parading it to the sounds of traditional musical instruments. As the men in front started fighting with swords, the god was taken to the Holy Tree and duly covered with flowers.

From Pulga a steep path leads to Khir Ganga, where there is a lovely hot spring, large enough to swim in and enjoy the mountain views. Local legend has it that Lord Shiva was also based here, though for a little longer (2000 years). In contrast, he spent his time meditating. We soon had the tents up and after a couple of days the camp had become quite comfortable.

"The cook is happy now that his shelter has developed into a rather well homed palace with all sorts of wooden and stone constructions." OLIVER.

"The main trouble with Khir Ganga is the cows. They smell and they pat everywhere." PHIL.

The monsoon made the week at Khir Ganga a wet one, but one in which much of our scientific project was completed. Although at times quite laborious, the research took us deep into the beautiful forest.

"Today when we were deep in the woods we came across some monkeys. 15, 20 maybe even 30 of them with beautiful silver and grey coats with black faces and white feet. They came out of the trees, running through the undergrowth and stopping to look back at us. They would peer down at us as we peered up at them." OLIVER.

We spent our time identifying and measuring trees in more and more remote places, measuring soil density and identifying plant species across the footpaths.

"The ground was very difficult to get across. We were hacking through the jungle. It was tricky to get past bushes and huge boulders in this immense forest. We got extremely wet after doing just a couple of sites and after two transects we came in again, absolutely soaked." OLIVER.

THE TREK TO MANTALAI

On the last day of our week at Khir Ganga a number of ragged local men started appearing; our porters had arrived. Between them they would carry a tonne of food and equipment through the spectacular mountains. After four days we arrived at our base camp.

Above Khir Ganga the remainder of the valley gradually becomes more barren. The dense conifer forest ends at the camping ground of Tungda Bhuj, marked by a hut which has been built to house workers for the dam project. The valley becomes very

Our porters on the path above Khir Ganga.



narrow, enclosed between great walls of granite down which numerous cascades of water fell.



After the rhododendron and birch forests above Tungda Bhuj the valley opens out into great alpine meadows, covered with flowers. The mountain scenery becomes more spectacular, passing valleys with great white peaks at their heads. During the journey we passed shepherds grazing their sheep and goats. We were quite surprised to hear that, as we were going up, they were starting to come down the valley. Winter, they said, was approaching.

We spent a night at Thakar Kuan where another hut is under construction, for it is here that the Dibibokri River emerges from a narrow gorge in which the dam will be built. From the engineers that were at the huts we managed to learn a lot about the project, which was the reason why the valley had been shut to expeditions for so long.

An interesting crossing of the river was made at the Pandava Bridges, where two huge boulders span the water. Supposedly placed there thousands of years ago by five gods, they were crossed by climbing rocks piled high on each side. The almost non-existent path then made its way along ancient river beds and across tiresome boulder fields.

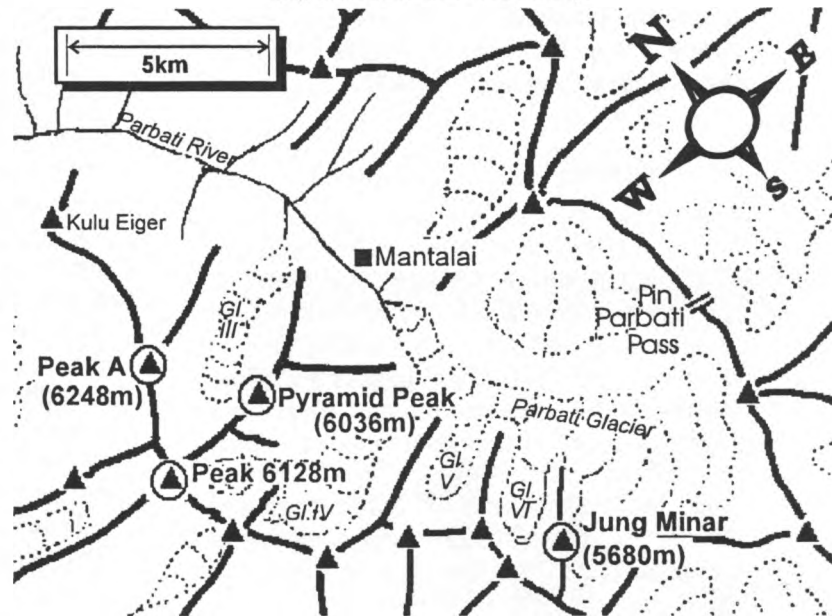
"The footpath is really treacherous. I nearly lost my leg." TOMMY.

The valley becomes dominated by Kulu Eiger, whose sheer walls rise abruptly out of a flat meadow, and under which we camped at Bakar Bihar. The last of the juniper bushes are located here and so it is where the porters returned to after leaving us at Mantalai.

A huge number of small river channels crossed the path beyond Bakar Bihar until a massive moraine bank was reached. Climbing this was arduous, but at last we

reached a large, dried-up and wind-swept lake bed. This was Mantalai, with its small religious site and, a little further on, our Base Camp. The porters were paid off and they left. After four weeks at Base Camp we hoped that 18 of them would arrive to bring our remaining gear back down again.

Map 2. Head of the Parbati Valley.



Base camp was partly sheltered from the winds behind the boulders of an ancient stone-chute. With clear water flowing past the camp and an old shepherds' stone shelter for a kitchen it was relatively comfortable, although often bitterly cold. Ahead of us the Parbati glacier snaked up to a mountainous head-wall.

Whilst at Base Camp we saw very few people - just a couple of trekking parties and some pilgrims, as well as a group of travellers who we helped after they had crossed the pass from the Pin valley with inadequate clothing and food. We were keen to get climbing but the bad weather dampened our spirits for the first few days.

"It rained for most of the day and chucked it down all night. It's absolutely atrocious. We are just wondering when the weather is going to settle sufficiently for us to have a go at our mountain." OLIVER.

MOUNTAINEERING

Apart from the Tos Nala and Dibibokri Nala, the mountains that can be reached from the Parbati valley are relatively unexplored. The first recorded visit by a westerner to the head of valley seems to have been that by Shuttleworth in 1923 when he crossed the Pin-Parbati pass. Since then few other teams climbed there until it was shut in 1973.

Acclimatisation

The Parbati Glacier is now a tortured mess of moraine, ice, sand dunes, quick-sand and rivers which stretch for several kilometres towards the head of the valley. The terrain is extremely arduous and trekking parties crossing the Pin-Parbati pass now climb steeply up the slopes on the east side of the valley to reach a high plateau over which they can traverse to the pass. We needed to cross the Parbati river in order to access Glacier IV, but when we first arrived the monsoon rains meant it was too deep to wade, although later the water level dropped sufficiently to enable us to do so in order to climb Pyramid Peak and Peak A. So, at the start of the expedition, we spent two days

Base Camp at Mantalai.



establishing a route to where the river emerges from the glacier and where we could cross to the other side of the valley.

"It rained as we trudged and trudged over moraine, across rivers, over ice and through sand dunes. Then David fell into the River of Death - completely head first." PHIL.

A four day reconnaissance trip was undertaken by all the members of the expedition up Glacier IV (see Map 2). After two days we reached the base of a peak we dubbed Anya. A ridge drops down from this peak, splitting the glacier in two. At the base of the ridge are a few flat areas with the remnants of litter left by a previous expedition. We established camp here from which we climbed via an interesting icefall to a high plateau between Snow Peak and Peak Anya. From there we continued up Peak Anya to 5300m, 400m below the summit, when a large storm moved in and we descended, culminating in an abseil over a huge bergschrund.

Peak 6128

This is a mass of granite and quartzite that stands at the heads of Glaciers III and IV. It is very impressive from all sides, standing apart from the other mountain. Our attempt was on the intimidating South-West Ridge.

The first attempt was in 1970 by Charles Ainger via the East Ridge, and he was closely followed by Prosser in 1972 who climbed to within 200m of the summit. It fell to an expedition led by Rob Collister in 1973 to finally reach the summit by that route and to climb several of the other mountains around

Climbing Pk. 6128.



the head of Glacier IV. Collister also attempted the South West Ridge, as have subsequent expeditions, but none were successful.

Our initial objective was to make an alpine style ascent of the knife edged South West Ridge. This leads (deceptively easily) to a steepening and a massive platform which we called the Bivvy Ledge. Above this the mountain seemed to overhang before gradually easing off in angle. The mountain was impressive, and very intimidating.

"We saw 6128 for the first time tonight. In the sunset it looked awesome. Our Liaison Officer has gone very quiet." PHIL.

The four climbing members of the expedition established a second camp half a kilometre from the bergschrund at the foot of the South West Ridge.

"Phil has christened the camp at the base of our mountain 'Snowdrop', mainly because it never stops." OLIVER.

Two long days were spent in the tents waiting for it to stop snowing until the climbers were eventually rewarded with a beautiful day. Starting early in temperatures as low as -18°C , they climbed the initial snow slopes to a snow ledge above which the South Face towered. This had to be climbed to get onto the ridge. The first forays onto the rock soon showed that it would be much more technical than first anticipated and a new approach would be required.

Re-defining their interpretation of lightweight mountaineering, the group was cut from four to two who then reduced everything they needed for three days into one small rucksack. The following night was spent in a natural ice cave at the bottom of the rock so that an early start could be made.

"The only worries were those that Oliver had. Every time he woke up to turn over he would hear clinking and clanking of icicles falling down, and I think that he was a bit worried about being daggered by one of them, or the whole snow slope falling off the side of the mountain. But apart from that we both got quite a good night's sleep." PHIL.

The second attempt was made the following day. In perfect sunshine, ten full pitches of hard, spectacular rock climbing were enjoyed on solid granite, amidst tremendous views of the surrounding mountains. A line was weaved through a series of overhangs to get to the face below the ridge.

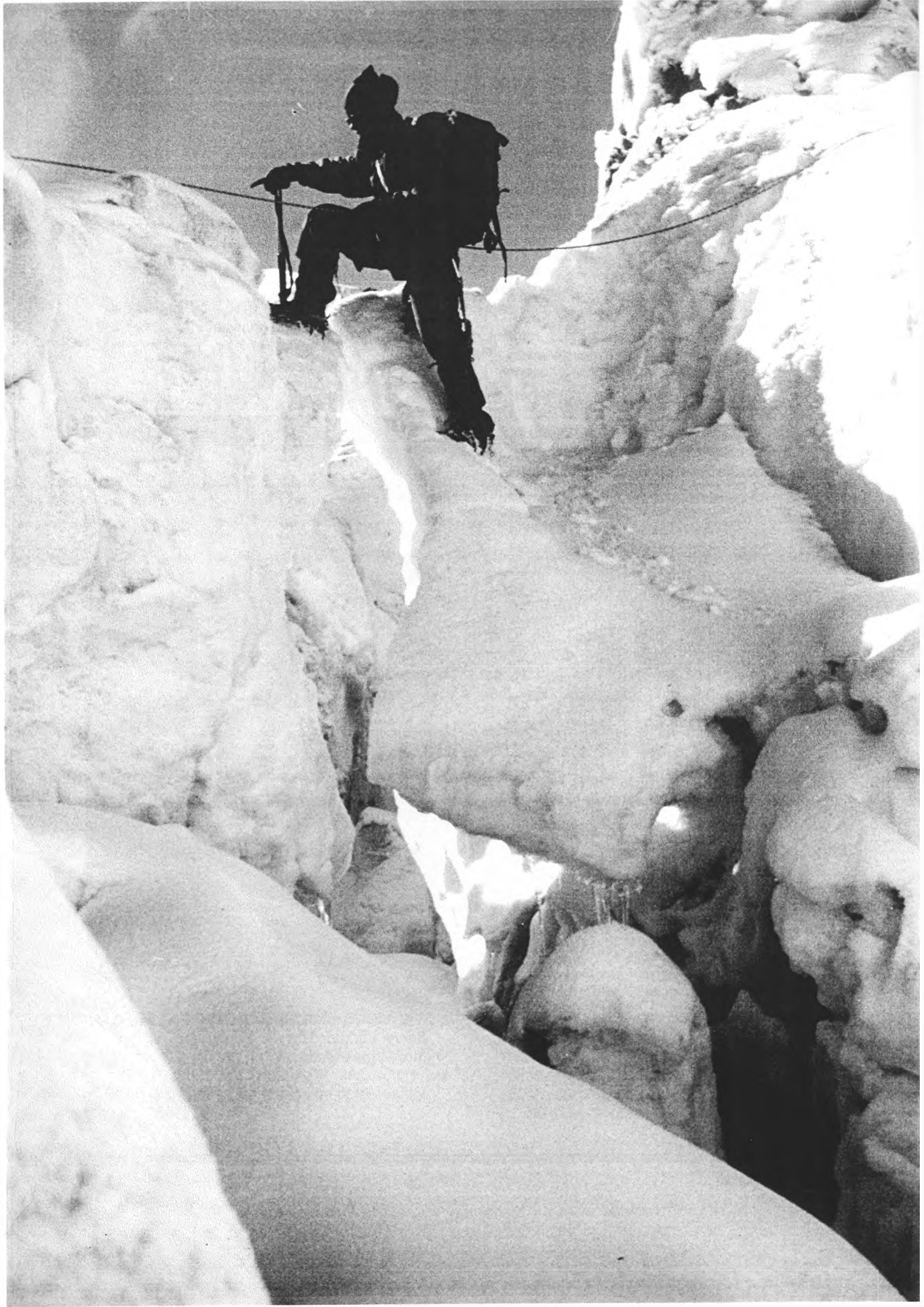
"That was ridiculous. You are not supposed to do that kind of thing at five and a half thousand metres..." PHIL.

Steady progress was made by staying on the South Face, but occasionally emerging onto the ridge which actually overhung the West Face for much of its length. The final

Crossing the glacier on the approach to Peak A.



two pitches were climbed as the sun set and darkness fell, and eventually the climbers arrived, in freezing temperatures, on the Bivvy Ledge. This, it turned out, was no more than a flattening on the ridge.



The following day an un-climbable section was soon encountered. After failing to find an alternative way up, a retreat was made as bad weather came in, with the last two abseils having to be made in a snow storm. By climbing above The Bivvy Ledge at 5750m we believe this to be the highest point yet reached on this route.

Jung Minar

The two climbers who did not make the attempt on Pk. 6128 returned from Camp 2 to Base Camp, picked up more food and equipment and moved up to the unexplored Glacier VI. They planned to attempt an unclimbed mountain, which they named Jung Minar (Rusty Tower). We had noticed this from various places in the area, consisting of a spectacular tower of granite, thrust up from a glacial base.

The mountain was reached easily from Glacier VI, whose head it dominates. A camp was set up and the following day was spent looking more closely at the mountain. They planned to climb it via a large gully which splits the North East Face diagonally from left to right. It was a cloudy day as they set off, crossing the bergschrund and following an ice slope to a gully in the rock tower.

A beautiful 50° gully, full of icicles, was climbed on snow, ice and rock until five pitches of very technical rock climbing led into and up a chimney.

"Mash leads through and nearly comes off above me. Following him I come off... Mash leads the next pitch because I'm still shaky. He then tries to lead on up the chimney - desperate entrance. Stones keep falling down as he leads up. Big rock fell. Turns out Martin's foothold came away. He fell 15 feet." MARTIN.

The condition of the rock here deteriorated until, at last, the summit was reached. The whole climb was hampered by bad conditions, which made the location and following of the descent quite difficult. The climbers had decided to come down the

South East Ridge. This proved to be very difficult indeed, but they eventually arrived back at their tents, exhausted, 21 hours after setting off.

"As I packed the tent away it blew off..."
MARTIN.

Pyramid Peak

The only previous attempt on Pyramid Peak seems to have been that by Roberts in 1940, who thought it was Pk. 6128. It offers a number of imposing faces and ridges from all but one of its sides.

The North Face seems to have been unnoticed since, apart from the summit, which can be seen from the tents at Mantalai, it is only visible from high on the peaks facing it. The ice-flanked Parbati river was waded and the grassy slopes and glacier were climbed to establish a camp at 5000m. The following day's climbing to the summit was an arduous slog through powder snow. This was knee deep for much of the way, and often covered with a soul-destroying crust.

"Left foot up, right foot up, left axe up, right axe up, left foot up, right foot up, left..." OLIVER.

A furrow was ploughed that was visible from Base Camp, 2000m below. All the time the four climbers were aware of the potential avalanche danger that resulted from the deep covering of snow and so the safest possible route was climbed so as to minimise the risk. A few steep sections of up to 70° added interest on a route which demanded a high degree of determination to just keep moving. The summit was eventually reached with great relief after eight hours of climbing.

"You can see everything now. Our Peak, Peak A, looking out across the whole Himalayan chain." OLIVER.

The descent was much more enjoyable than the ascent, bouncing down through deep, soft snow until the camp was reached in just over two hours.

Peak A

Peak A consists of three distinct and impressive summits, of which the middle one is the highest. Collister (1973) describes it as having "A series of

On the summit of Pyramid Peak.



impressively steep and compact rockwalls with no easy way up...[it] was quite definitely higher than us as we stood on the summit of Point 20,101ft [6128m]".

Our original intention was to attempt it from the South East Ridge, which would take us to the snowy North East Ridge and thence to the summit. The route was approached by first wading the river.

"I didn't want to walk too quickly because I thought my toes might snap off, they were so cold." MARTIN.

We then wallowed through the quick-sand, and climbed up steep, grassy slopes. After a few hours of easy but exposed rock-climbing, scrambling and climbing vertical grass it was soon realised that the route would take longer than planned.

As food was only taken for three days the climbers dropped off the north side of the ridge and climbed to a bivouac site at 4500m by the snout of the glacier. A further day's climbing and traversing the glaciers around Peak A allowed them to avoid a number of subsidiary summits. They worked on through the deep snow until they gained a wide couloir, above which towered the North Summit. They hoped to contour around the back of this to access the Central Summit. The second bivouac was made at the top of the couloir at 5600m on the west side of the mountain. After flattening an area for the sleeping bags they tried to prepare some dinner.

"I have to cook food on a dodgy stove at -10°C at a 5500m bivouac. Food, as a result, is not too good." MARTIN.

"From his cursing it was obvious that Martin could not use the stove. We had cold soup, followed by curry salad, and fruit salad for pudding. It was COLD!" PHIL.

After a very cold, sleepless night, the trio started off extremely lightweight. A lot of complicated route finding through a series of large crevasses, with a few rather steep

Traversing the summit ridge of Peak A.



sections, took them to the summit slopes. The final section, being covered in crusty

snow, was physically very difficult. This sapped both strength and morale, involving punching through the crust and then inserting one's body into the hole that is made.

Route-finding through crevasses on Peak Anya.



"I'm just following Phil's footprints with my head down in my own little world. With all the snow around it's like being in a cocoon." OLIVER.

As they neared the Central Summit they were unsure whether or not it was the highest point. Eventually the East Ridge was reached, giving them a new view over the other side. Opposite them nothing else was higher; the South Summit lay somewhere below. They had reached the highest point, not just of Peak A, but of the whole South Parbati area. After admiring the outstanding views the team descended

back to Base Camp the same day, arriving there in the dark at 22:00.

"When we got back we had half a pint of the beer which has been brewing. It's coming along quite well now, getting a bit of a body to it and quite a nice taste"
OLIVER.

RETURN TO CIVILISATION

"My clothes are dirty and smelly. And yet I don't have the inclination or time to wash them. I think everybody smells so we are all getting used to each others' body odour." OLIVER.

Three members of the expedition returned to Pulga a week before the others to carry out more research. Our eighteen porters did arrive on time, and it took four days to walk back to Manikaran. We really needed twenty porters, so some were paid extra for heavier loads, and the remaining weight was distributed amongst the expedition members. Before leaving, all our litter was burned and the remains put inside a barrel. This really confused the porter who carried it, who couldn't understand why we didn't leave it at Base Camp.

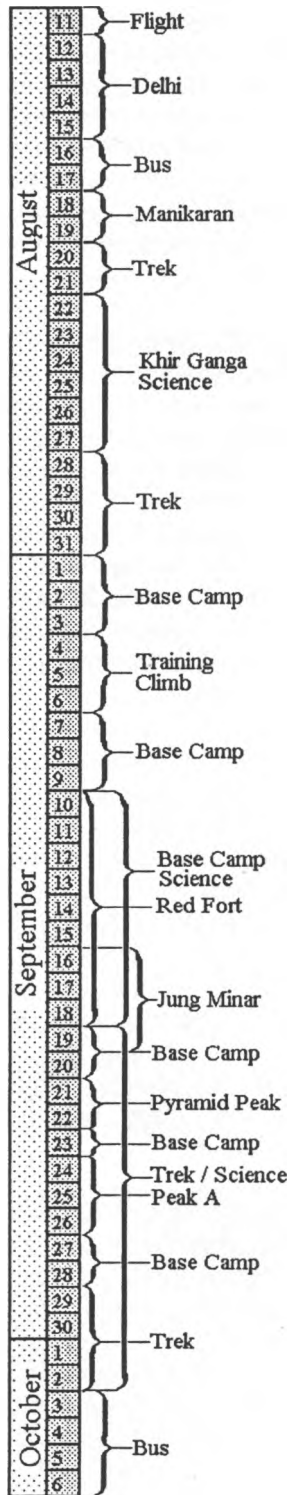
The differences in the valley on the way down were striking. It was now autumn, and all the flowers we had seen on the way up had gone. The main thing we appreciated, having had a very wet and cloudy walk in, was the good weather. Another was the increasing availability of food, which led to a feast beyond belief - twelve courses of mouth-watering dishes, including fresh chickens, conjured up by our cook on a single wood fire.

"Our dinner's still running around the kitchen." OLIVER.

It was during the descent that the warmth and friendliness of our porters showed through, and we finished the trek sharing dinner with our porters, in our head porter's house.



Expedition Details



TRAVEL FACTS

The expedition itinerary is shown on the left.

Freight

Allow one day to get freight out of customs. A lot of patience and a Hindi speaker are useful. Go to the Indian Mountaineering Foundation first to collect an expedition freight form to avoid paying duty on non-consumable items. 100% import duty may still have to be paid on food items. Ensure that an expedition member rather than the freight company or agent is registered as the sender and receiver. Ownership may otherwise be difficult to prove.

To the Mountains

Private buses can be hired from many agents in Delhi. They are relatively expensive due to the cost of the inter-state passes that are required. State-run buses are cheap but very packed and so luggage is virtually impossible to transport. Trucks are a difficult option because they are not allowed to carry people, they still require inter-state permits, and the destination cannot be guaranteed. Taxis, although expensive, would be convenient for small groups.

Mules and Porters

Mules carry 60kg but are difficult to hire earlier than September due to the apple harvest. The rate was 6300Rs for 18 mules for one day.

If a number of porters are required it is best to employ a head porter to arrange them. Singhi from Rushkett Village, 3km east of Manikaran, is well recommended.

Porters carried 22kg each at a rate of 110Rs per day. For every 2 days that loads were carried they were paid for 3 days (not negotiable) to cover the return journey. They provided their own food in addition to this. Each stage of the journey was pre-set by the local authorities. The porters would not go further than this set distance in a day.

The porters appreciated being given one packet of local cigarettes ('Bidis') per day and this may have helped to prevent problems.

Camping Grounds

Fresh water is available at Khir Ganga, Thakar Kuan, Bakar Bihar Thach and Mantalai. Tungda Bhuj only has silty water. Firewood, is available up to Bakar Bihar Thach, consisting of juniper wood at Thakar Kuan and Bakar Bihar Thach.

SCIENCE

Until now very few long term studies have been undertaken to investigate the impact that local people and visitors have on the mountain environment. This expedition selected a valley which, until recently, has had limited access for trekkers and mountaineering expeditions. With the removal of restrictions, promotion by the Indian government, and problems in Kashmir, the Parbati Valley now has the potential for a growth in the number of visitors.

The intention is that future expeditions will repeat our experiments so that comparisons can be made on a time basis. The data collected is currently being analysed and results will be released when available. At present a qualitative assessment can be made.

The work consisted of three projects - a forest study and two footpath studies, one measuring soil compaction, the other recording plant species. Each of these was complemented by interviewing both local people and visitors to the area.

Use of the Valley

The high season for visitors to the Parbati Valley is in the spring when, between Manikaran and Pulga, there may be as many as 200 people travelling per day, compared to a low-season (monsoon and post-monsoon) average of 35 people per day. Most tourists in the area are Indians, mainly from Punjab, and are a mixture of holiday-makers and pilgrims. About a fifth of these are foreigners, most of whom come during the post-monsoon season when the marijuana is harvested. Above Pulga there are far fewer visitors. Apart from western travellers, this only seems to be popular with Hindu pilgrims.

The increase in the number of visitors started fifteen years ago when the Sikh Guru Dwara temple was constructed over a hot spring. Before then Manikaran only had a Hindu temple with just a few visiting pilgrims. Only five years ago the village of Manikaran was much smaller with very few tourists but a greatly increasing number of Sikh pilgrims. Since then the Indian government has been actively promoting tourism, for Indians, in Himachal Pradesh. The village has grown five-fold, with houses, shops, hotels, restaurants and Guru-Dwara souvenir stalls springing up everywhere. There are also more buildings in the valley above Manikaran.

Five years ago the path from Manikaran to Pulga was about one foot wide, but is now five to seven feet wide. Local people have noticed that every year there are more and more foreign visitors. Foreign visitors, usually hippies, did come to the area twenty years ago but, although some bought apple farms lower in the valley, their numbers seemed to decline. Although very few go much above Khir Ganga, the relaxing of restrictions means that this trek is bound to increase in popularity.

For as long as can be remembered by local people the valley has been used by shepherds for grazing their sheep during the summer months. Those that we met did not come from the local area, but had travelled there from different districts within Himachal Pradesh. During the winter they travel hundreds of miles to the Punjab before returning to the Parbati Valley. While we were in the valley, though, we only met three groups of shepherds, although the main impact from them would be that caused by their sheep.

The reason why the valley had been shut for so long was the proposal for building a dam. Although permission for it has not yet been granted, huts are being built at Tungda Bhuj and Thakar Kuan, and a road up to them from Manikaran is under construction. It is proposed that an underground pipeline (it cannot be above ground since the winter temperatures are too low) will transport water from the dam at the base of the

Dibibokri Nala to a generating house just above Manikaran. Over the seventy year length of the project three dams will be built, the other two in neighbouring valleys, of which the first is the Parbati project. At the moment the engineers are still seismic testing the mountain sides, but it seems almost certain that the project will go ahead. Since the dam will be above the forest, the land that will be flooded will be the high grassy plains of the Dibibokri Valley. The most damaging effects on the environment are likely to be those caused by the construction of the road. If the road is opened for general use then access to the fragile, remote upper Parbati Valley will be easier and could well be opened up for tourism. The road will also mean easy access to the forest, which will make it easier for loggers to exploit. The project, however, does bring benefits. The local people will have reliable electricity, and the jobs that it brings will help the local economy. The general feeling about it, though, is that it is bringing jobs, but seventy years is a bit too long to wait for electricity.

Forest Study

The aim of the forest study was to find out how healthy the forests are and to assess if this varies along the valley and with distance into the forest from the camping areas. By repeating this in the future we should be able to see if the forest can be sustained and, if not, be able to give an early warning to try to prevent deforestation.

The areas that we concentrated on were those forests nearest to the camping grounds. These are quite obvious since there are few places along the valley that are flat and have a supply of drinking water. We anticipated that the health of the forest would increase with distance from these camping grounds. We also expected that, initially, dead wood on the ground would be taken for fires. Once

depleted, the smallest and youngest trees would be felled, being the easiest to remove. This would leave the forest in an unhealthy state of decline since there would be no trees to replace the older ones once they die.

The study involved identifying the tree species present in a forest and measuring their size, which is a rough indication of age, and forest density. The abundance of dead firewood was also measured. Data collected from points at different distances from known campsites should indicate whether firewood collection affects the forest. In addition to this a number of people were interviewed to investigate their techniques for collecting firewood, and to see if forest decline had been noticed. These included villagers, shepherds, our own porters and western trekkers. This should give a more complete picture of what is actually

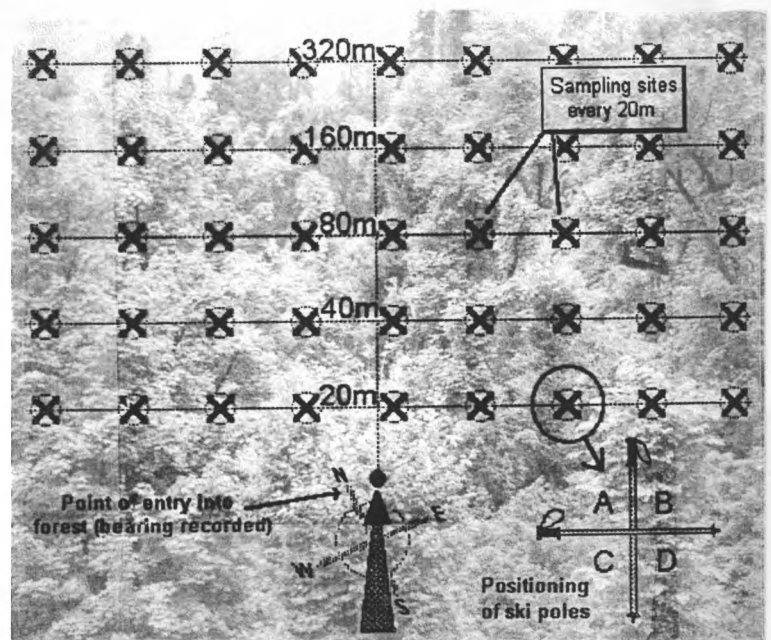


Figure 1. Location of sampling sites for the forest study.

happening in the valley, and possibly show how different groups of people affect the mountain environment.

A representative section of the forest was selected by asking local people to identify the areas from which they collected wood. A bearing was chosen on which to enter the

forest and this was recorded. The point of entry into the forest was marked on a map and located using a Global Positioning System (GPS). Walking along the bearing the working group would walk into the forest for 20m. At this point an imaginary line was drawn perpendicular to the bearing walked in on (and parallel to the edge of the forest) and along this nine sites, each 20m apart,

Carrying out the Forest Study.



were sampled. The group then returned to the point of entry into the forest and repeated this at 40m, 80m, 160m and 320m into the forest. This is illustrated in Figure 1. At each sampling site two ski-poles were laid in a cross on the ground and the quadrants formed labelled A, B, C and D, as shown in Figure 1. The ski pole between quadrants A and B was laid down so that it pointed into the forest along the bearing on which the forest was entered. For each quadrant the nearest adult tree, juvenile tree (those with a chest height circumference of less than 0.5m) and understory species (perennial shrubs and bushes, such as *Rhododendron* and *Hybernum*) was identified and the distance measured from them to the centre of the ski-poles. The chest height circumference of the adult tree was also measured. At the point where the ski poles cross, an area 3m square was marked out and all the dead wood located within this square was collected and weighed.

Since this technique of forest assessment was unsuitable for the juniper forest higher up the valley, whose plants are a maximum of one metre in height, a different method of assessment was devised. Sites were photographed showing a 30m tape measure as a scale. From the photographs the sites will be overlaid with a grid, composed of squares representing known areas, and within each of these the percentage cover of each woody species will be measured. The sites that were photographed included those areas around the camps as well as those areas from which porters collected firewood.

Initial Findings

The composition of the forest changed gradually as one progressed up the valley. At lower altitudes conifers such as Himalayan blue pine (*Pinus wallichiana*) dominate, but many deciduous trees such as beech and maple species are also present. These deciduous trees disappear at around 3000m to be replaced with silver birch (*Betula utilis*), which starts to appear at around 2900m. When the altitude becomes too high for coniferous trees, at around 3400m, there is a stand of birch which lasts for around only 100m.

At Pulga, the forest is highly affected by human activity. Cattle graze here and the pressure for firewood is high; the evidence for which is the many grazed glades and the criss-crossing paths in the woods. The density of juvenile trees and shrubs is severely low and at the edge of the forest they are nearly non-existent. Although the adult trees are healthy enough and are not under threat, the long term implications for the ecosystem are not good. If there are no juvenile trees to replace the adult individuals when they die then the forest will slowly deteriorate with time.

At Khir Ganga there were much fewer people. They were mostly transient (travellers, dam workers, etc.) and there was also a small herd of cattle. At the edge of the forest at Khir Ganga, the cattle either eat or trample the juvenile trees. The hardy understorey, which is not eaten by the cattle, is becoming dominant and out-competing the forest. It appears that the woodland is being replaced by scrub, which is encroaching inwards from the edge as the cattle graze in the outskirts of the forest.

Over the 320m distance covered by the sampling, a rapid improvement was noted in the health of forest. The vegetation became denser the further one went in; everything seemed to be in a much better state of rejuvenation with fallen trees, deep forest litter and many young trees. This gave a marvellous comparison between pristine and utilised woodland.

The woodland exhibited the same characteristics and effects caused by humans and cattle as at Pulga, but to a lesser degree. Since fewer people use the forest they do not have to venture far for their needs, resulting in a much healthier forest.

The way in which firewood is collected here differs between the types of people present. Many travellers collect dead wood that is lying on the ground, whereas local people fell a large tree and gradually use tiles of timber cut from this. This burns better than the wood on the ground, producing a hotter fire, and has the benefit that the sap, when applied to a piece of wood, acts as a fire-lighter. Since only a few of the largest and oldest trees are felled, the local people have little effect on the health of the forest. When the porters go up the valley they utilise this stock of wood, being friendly with the resident people.

At Khir Ganga the greatest threats to the future of the forest appear to be the trampling and grazing of the cattle, and the

possible collection of juvenile wood by travellers for firewood.

At Tungda Bhuj the forest consists of Himalayan Blue Fir (*Abies spectabilis*) and Silver Birch mix. More people are stopping at this site due to the construction of a government hut, but only a handful of them live there for nine months of the year. As a result there was less firewood and fewer juvenile trees near the edge the forest. From 40m into the forest it seemed as though there was no effect on its health. Continuing the assessment of this wood over future years would be of great interest as more and more people ascend the valley to reach Tungda Bhuj.

Beyond Tungda Bhuj is the Silver birch band, but this disappears before one reaches the next camping ground at Thakar Kuan. The only firewood available here is rhododendron and juniper. The porters and dam workers select their firewood, taking dead wood and the largest, oldest stems. They told us that if they take the younger plants then the shepherds will have nothing to graze their sheep on in following years and the plants will disappear. They were

The forest at Tungda Bhuj.



well aware of the sensitivity of this scrubland, but whether or not this awareness will become clouded by economic benefits, such as the presence of more expeditions, remains to be seen. However, it does seem that firewood at Thakar Kuan is becoming

more scarce. Local sources say that two to three years ago they only had to travel 200-500m to collect enough firewood, now they have to walk up to a kilometre.

We could not find out what trekkers to this part of the valley do about firewood. If they are not cooking with local porters or on stoves, it is unlikely that they will scavenge for older pieces of firewood, but will take younger pieces. Once the scavangeable firewood is not sustainable, or it is further away from the camp than the porters and shepherds are prepared to go, it is likely that the younger trees will suffer. Higher up the valley the shepherds burn juniper before they leave for the winter so that it grows back with young and succulent shoots suitable for their animals to eat when they return. It seems that both juniper and rhododendron plants react in a similar way to European heather, which is promoted by burning. If this is true then the shepherds and porters may play an important role, controlling the quality and health of the forest.

The last of the juniper is passed between Bachar Bihar and Mantalai. Beyond that there is no firewood, and so it has to be brought up. Even so, shepherds do graze their sheep at Mantalai during the summer months, although by the time we arrived they had left and so we were unable to find out more about where they collected their wood from.

Footpath Study

Footpath erosion is a specific problem created by human traffic along the valley. The pounding of feet results in a disappearance of the plants or a change in the species present, as well as compacting the soil.

If this becomes serious then the soil can become so compacted and dense that roots cannot penetrate it or essential organisms,

such as insects and worms, cannot burrow and live within it. There is then nothing to hold the soil together or to protect it from

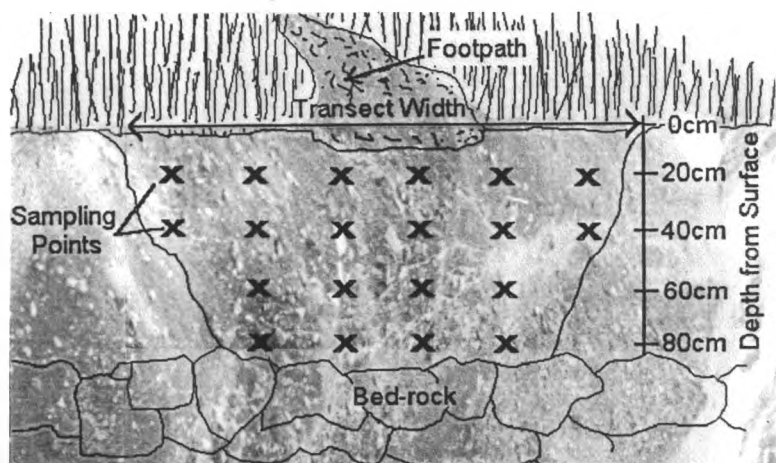


Figure 2. Sampling for the soil study.

the impact of rain and so, when it does rain the top-soil can easily be washed away. In the mountains of northern India this can become a very serious problem both during the monsoon and during the spring melt.

It is this compaction that must be measured to assess the extent of erosion and its consequences. This was tested at eight sites

Transecting a footpath.



along the valley, each representative of different environments and situations. In the lower valley the path was large and well

used due to the number of villagers, whereas near the glacier it was small, rarely used and sometimes totally non-existent.

A site that was representative of the general state of the footpath in that area was chosen. A line (transect) was marked across the path, so that it extended beyond the visible extent of the path. At intervals along this transect, which depended upon the width of the path, a hollow metal cylinder (density ring) was hammered into the ground. When the cylinder was extracted it contained a soil core which was collected and weighed. The soil samples were later dehydrated and weighed, and from these values the density of the soil calculated. A trench was then dug along the transect and at depth intervals of 20cm the soil core collection repeated until the trench could go no deeper i.e. if rock was hit or the trench hit the water table. This is illustrated in Figure 2. The soil characteristics were identified using the methods described by Baise (1993). Knowing the type of soil is vital as there is a great variety of type and each will be affected by compaction to varying degrees.

Once these results have been analysed a profile of the soil density at each site will be created, showing how it changes both across and beyond the footpath, and with depth beneath the footpath.

Vegetation Study

This study ties in closely with the soil study. It is important to see how the trampling that occurs along the path affects the plant species and the abundance of those present. The plants bordering the path will also have their root growth affected by the compaction of the soil. Some species are more tolerant of this than others. Once identified, the tolerant and resistant species may then be used as indicators of the degree of trampling. These indicator species may vary depending upon the altitude and habitat.

The same eight sites were used as those for the footpath study. A 28m transect was laid out, 14m either side of the centre of the path. Along the transect a 0.5m x 0.5m square (quadrat) was placed on the ground at intervals of 1m for the first five meters either side of the centre of the path and then every 3m beyond that. For each quadrat the percentage ground cover for flora such as mosses and grasses was noted. Each different plant species present was identified and the number of individual occurrences counted.

The data may show if there is a correlation between changes in the vegetation and the proximity to the path. In locations, such as our Base Camp, which are potentially very fragile and sensitive to disruption, an early indication of the effects of trampling may help to prevent excessive damage.

Identifying plants in a quadrat.



Initial findings suggest that there are a handful of trample resistant species, including grasses and strawberry species. It is interesting to note that these occur at all the altitudes surveyed and that different resistant plants are not found at different altitudes. At lower altitudes these plants are seldom found away from the footpaths, but at higher altitudes they are very widespread.

MOUNTAINEERING

The following figures show the mountains with the routes that were climbed or attempted.

Figure 3. Peak 6128. Highest point yet reached on SW ridge, 5750m, ED1. 16/9/94. Climbers: O. Shergold & P. Wickens.



Figure 4. Pyramid Peak (6036m). First ascent on 21/9/94 via N ridge, AD⁺. Climbers: M. Jackson, M. Shelley, O. Shergold & P. Wickens.



Figure 5. Jung Minar (5680m). First ascent on 18/9/94 via NE face, TD⁺. Climbers: M. Jackson & M. Shelley.



Figure 6. Peak A (6248m). First ascent on 26/9/94 via N and NW ridges, AD⁺. Climbers: M. Jackson, O. Shergold & P. Wickens.



Further Potential

During the expedition members also made ascents of smaller peaks on the east side of Base Camp. These gave easy, unglaciated climbs, and allowed routes on the larger peaks to be seen. East of here are a number of peaks up to 6243m that have had no recorded ascents. Peak 5988, which is pyramidal in shape, has a straight forward west-facing ice slope and two long ridges, and a very long ridge traverse to reach the higher of the two summits. On the west side of the glacier there are still a number of peaks that are awaiting ascents. Although those around Glaciers III and IV have now been well explored, Glaciers I and II do not appear to have been and, whilst passing them, gave us glimpses of some very attractive glaciated peaks. For those that do not mind struggling through the broken, bouldery glaciers for a further two days beyond Mantalai, there are a number of very impressive peaks and faces at the head of the Parbati Glacier. It may be easier and quicker to approach these from the Pin Valley.

ENVIRONMENTAL POLICY

During the course of the expedition a conscious effort was made to minimise our impact on the area. Unless dead wood was abundant, no fires were lit and all cooking was carried out on kerosene and petrol stoves. All litter, including that left scattered by previous groups, was burned and the remaining unburned material packed into a barrel and carried back to Delhi since there were no facilities for waste disposal in Manikaran. Human waste was deposited in a trench away from the drinking water supplies and covered over before leaving.

To make it easier for other expeditions to behave in a similar way more information is required on where to properly dispose of litter in mountain villages and towns. We found it hard to acquire a large quantity of kerosene or petrol since a licence and countless papers are required. If it was

easier to purchase these then expeditions may be more willing to spend more so that porters do not have to cook on open fires, and trekkers would not have to burn wood.

WEATHER

Reports from other expeditions, and from local people, suggested that the monsoon in the Parbati valley ends around the first week of September. When we were there the last storm ended on September 22nd. Before then we only had a handful of good periods, the longest being for 2½ days. Once the last storm had finished, every day started magnificently, but often clouded over in the afternoon and cleared again in the evening. The clouds form over the plains to the south and the prevailing southerly wind brings them to the mountains, where the plummeting evening temperatures then disperse them.

The post-monsoon period is said to be better than the pre-monsoon season for climbing because, although it is colder, the weather is more stable and the rock routes on the mountains are clear of snow. When we first arrived the snow on the faces was well consolidated and the rock on Pk. 6128 was clear of snow until the storm that followed our attempt.

Since the weather after the last storm was very cold none of the snow was able to melt or consolidate during the remaining two weeks, despite the very good weather. This meant that all routes involved a lot of wading through snow and we had to be especially aware of the avalanche danger around us.

During the monsoon the freezing level was between 5000m and 6000m. After the monsoon had ended the night-time temperatures dropped below freezing every night at 4000m, and only rose to about 10°C by mid-afternoon. At 5000m temperatures as low as -18°C were recorded. The wind in the area was often strong in the valley, but presented us with little problem whilst on the mountains.

EQUIPMENT

A full list of equipment used is given in Appendix A. We were very fortunate to be able to borrow equipment from the British Army to equip the Liaison Officer and the two scientific members of the expedition. They also provided some of the specialised climbing hardware, such as pitons and jumars.

In the six weeks of the walk-in and at Base Camp we used 110 litres of kerosene. We took 30 litres of petrol for use in the MSR stoves at altitude, of which we used only 18 litres. The stoves did not perform reliably or efficiently above 5000m in the cold, requiring constant cleaning to keep them working. We took waterproof matches and several lighters, but the matches did not light at altitude and the lighters were soon used up by our cook (approximately one every three days). We recommend taking 'Zippo' lighters as these can always be fuelled with petrol.

Several of the expedition members used very lightweight (750g) down sleeping bags with just a single box construction. Although sleep was hard to come by at -20°C, and they were probably using them at their very limits, the weight saved was invaluable and on most occasions they were comfortable. Another weight saving idea for long rock routes was to leave behind mountain boots and use rock boots. Whilst belaying, down boots were put over the top.

Both layering and non-layering clothing were used. Both approaches found that the most important properties were a wicking layer, as opposed to a thermal layer, next to the skin, over which clothing that remains warm when damp was worn. This should allow easy ventilation of the body, either by using zips and flaps, or by layering. Over this a breathable waterproof top was used in wet and very cold conditions. An effective sock system was found to be a thin wicking sock (we used 'Tactel' socks) against the skin, followed by a thick thermal sock. This kept the feet relatively dry, preventing dry skin and reducing the chance of frostbite.

FOOD

Food was divided into two categories - generally heavier, bulkier and sometimes fresh Base Camp food, and lightweight, high energy Mountain food. The mountaineering food was purchased as arctic rations from the British army, and was supplemented by Isostar drink. Almost all other food was purchased for us in Delhi, during the journey or at Manikaran.

Most types of food, except de-hydrated and tinned meat, can be purchased in Delhi. At Manikaran and Pulga all basic foodstuffs can be bought, as well as biscuits, chocolate, vegetables, live chickens, etc. At Khir Ganga there is a tea house which can be easily reached in 2-3 days from Mantalai in an emergency. In the forest during the monsoon there are edible fungi. Local people know which are safe to eat.

We took a cook with us to act as both guard over our equipment and to cook for us at Base Camp. At Base Camp it is worth being able to serve up a few home luxuries - we baked bread and cakes. Dried eggs and dried yeast are therefore useful ingredients to take. Such things can do wonders for group morale.

Fresh vegetables from Manikaran were ingeniously planted by our cook in his own Base Camp Garden (complete with flower beds and garden path) to keep them fresh. At Base Camp we successfully brewed 40 pints of beer. Although the colder temperatures slowed down fermentation, by the time we left the mountains it had matured quite well.

MEDICINE

Extremes of hygiene, temperature and altitude complicated the task of ensuring the health and safety of expedition members during our time in India. Three of the team held First Aid certificates prior to leaving and four members attended a refresher course organised by the Imperial College Health Centre. In addition, the Medical

Officer attended a St. John's Ambulance basic First Aid course. We were fortunate in not having to purchase medical supplies, the bulk of which were donated by pharmaceutical companies to the Health Centre's expedition specialist. The remaining medical kit was loaned by the Tidworth Group Practice, Royal Army Medical Corps. The medical kit is given in Appendix 1.

Gut Infections

Most team members suffered intestinal infections at some point during the expedition despite rigorous hygiene precautions. The risk of cross infection was greatly reduced by simple measures such as avoiding sharing towels, bottles of water and eating utensils. Symptoms of gut infection were firstly treated with Immodium and electrolyte solutions. Cyproxen was then administered followed by Metronidazole after five days. Three cases of Giardia were suspected although this was difficult to confirm without laboratory testing. Codeine phosphate was used during long journeys to relieve diarrhoea symptoms.

Altitude

No drugs were taken to prevent altitude sickness as the ascent to base camp at 4100m was undertaken at a slow pace. Occasional headaches were treated with paracetamol. The only other effects encountered were occasional lethargy and shortness of breath.

Dental Problems

Despite dental check-ups before departure one member suffered infection around an upper molar. The abscess grew but was controlled with antibiotics. One member of the team knocked out a front incisor after slipping on rocks. This did not cause any pain and there was no subsequent infection. No further treatment was needed.

Septic Bites

The healing of minor cuts and bites, to which Betadine paint was applied, was prolonged due to various weather and

hygiene factors. On one occasion an insect bite on a shin became severely infected in a large, swollen red area with a penny-sized greyish wound in the centre. This was treated effectively by cleaning, covering and administering Augmentin.

Muscular Inflammation

Muscle, ligament and joint problems were treated in a variety of ways. With inflamed areas Voltarol Retard was used to reduce swelling and enable movement. Support bandages and Tubigrip were also used.

FINANCE

A detailed breakdown of income and expenditure is given in Appendix II, whilst the pie charts in the text give an overview. Observations follow on how over £15,600 was raised and spent.

Income

All but three of the donations were made to us through our universities, or from contacts made through the Imperial College Alumni Association. Over 50% of the income came from three large donations. These were the Imperial College Exploration Board (£2,000), the University of London Convocation Award (£3,000) and the Imperial College Harlington Fund (£3,000). The latter was spent on equipment which

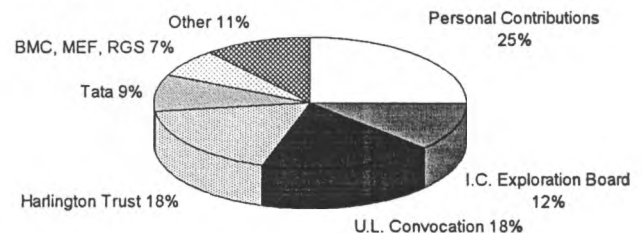


Figure 7. A breakdown of the expedition income, totalling £15,672.

was returned to Imperial College Exploration Board stores after the expedition.

Another large contributor was Tata, one of India's largest companies. Not only did they provide assistance in India, but they also donated £1,500, including £500 from their

environmental fund. Initial contact was made with the company through the Imperial College Alumni Association of India.

Smaller donations were also received from several sources throughout Imperial College and Oxford Brooke's University, amounting to £1860. Grants totalling £1,400 were received from the Royal Geographical Society, British Mountaineering Council, Mount Everest Foundation and Sports Council. Expedition members, who also had to buy a great deal of personal equipment, made up the shortfall in the budget.

Expenditure

Expenditure was largely in line with expectations. Personal insurance for the Imperial College students and for the group equipment was paid for by the Imperial College Exploration Board. The expedition paid for the coverage of the other two members. The equipment was insured for a total of £22,000, consisting of £1,000 per person for personal equipment and £16,000 for group equipment. This was the replacement value for all the equipment. Additional insurance was required for the goods that were freighted.

Some of our food, and all of our medical supplies were donated by manufacturers, the Royal Army Medical Corps and the

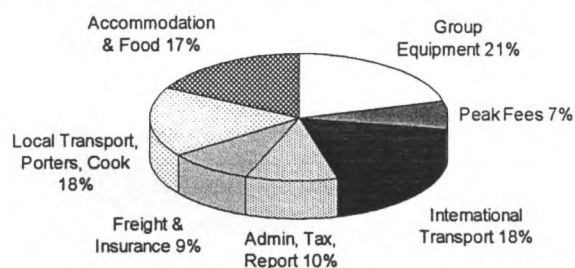


Figure 8. A breakdown of the expedition expenditure, totalling £15,672.

Imperial College Health Centre. Mountain food consisted of British Army Arctic Rations, and these were purchased at very reasonable rates. Some camping equipment was borrowed from the Imperial College Exploration Board stores and the army. The

rest was bought at reduced prices (usually about 35% off rrp) direct from the manufacturers.

A major unexpected cost was import tax. This is charged at 100% of the cost of consumables taken into India. Unfortunately the equipment lists used to collect the freight were the same as those used for insurance, so the actual value for the food had been written down as opposed to the price we paid. As a result we had to pay the equivalent of 200% of what we originally spent. Freight costs to India were slightly lower than estimated, but the return fee, for two thirds of the original weight, was higher. This was arranged in a rush, and the short time available may be partly to blame. Insurance of freight for the return journey was also organised in India, and was ten times more expensive than the equivalent insurance in the UK.

Porters cost 110 Rs (£2.25) per day, charging one and a half times the number of load carrying days. Using horses for the trip between Manikaran and Khir Ganga, where we stayed for one week, proved to be the best option both practically and economically.

Our cook cost 300 Rs (£6) a day and was well worth it for the convenience, security, and a friendly face on returning from the mountains. Most Base Camp food and cooking equipment was purchased in India. Without contacts in India this would have been extremely time consuming, frustrating and costly. Enough fuel for an expedition would be almost impossible to get hold of in a short space of time without the help of a local guide or high quality Liaison Officer.

\$US 900 were paid for permission to climb Pk. 6128 before we left the UK. When we returned to Delhi an extra \$600 was paid for the extra two peaks that we climbed. Avoiding this means having to keep quiet about achievements and jeopardising the future for other expeditions in India. The money goes straight into central government funds.

Appendix I - Inventory

PERSONAL EQUIPMENT

Item	Usage	Supplier			
Altimeter watch	General	Casio	Penknife	General	Cotswold
Balaclava	General	var.	Personal Stereo	Trek/B.C.	var.
Batteries	General	Duracell	Plastic Mountain	Mountain	Koflach,
Bivi Bag	Mountain	Phoenix,	Boots		Asolo
		Mountain	Rock boots	Mountain	La Sportiva
		Range	Rucksack (40-50l)	General	Berghaus
Camera + lenses	General	var.	Rucksack (60-80l)	General	Berghaus
Climbing harness	Mountain	Camp	Sewing Kit	B.C.	var.
Compass	General	Cotswold	Shorts	Trek	Troll
Compression Sack	General	Cotswold	Ski sticks	General	-
Crampons	Mountain	Troll	Sleeping Bag plus	General	Rab
Belay device	Mountain	Cotswold	liner		
Down boots	Mountain	Rab	Sleeping Mat	General	Karrimor
Down jacket	General	Rab	Sun hat	General	Cotswold
Film	General	Kodak	T-shirts	Trek	var.
Fleece jacket	General	Phoenix, Tog	Thermal inner	General	Wild Country
Fleece salopettes	Mountain	Phoenix	gloves		
Glacier goggles	Mountain	Bloc	Thermal long-johns	Mountain	Sub Zero
Gore-Tex jacket	General	Phoenix	Thermal top	Mountain	Sub Zero
Gore-Tex Gloves	Mountain	Wild Country	Thermometer	General	Cotswold
Gore-Tex salopettes	General	Phoenix	Thick walking socks	General	Wild Country
Head torch + bulbs	General	Petzl	Thin wicking socks	General	Wild Country
Helmet	Mountain	Petzl	Track-suit trousers	Trek	Cotswold
Ice axe + spares	Mountain	Mountain	Trekking trousers	Trek	Troll
		Technology	Umbrella	Trek/B.C.	var.
Ice hammer	Mountain	Mountain	Underpants	General	var.
		Technology	Wash Kit	General	var.
Walking boots	Trek/B.C.	Karrimor	Ortlieb Water Bottle	General	Cotswold
Long-sleeved shirt	Trek/B.C.	var.	Whistle	General	Cotswold
			Yeti gaiters	Mountain	Berghaus

GROUP EQUIPMENT

Item	Usage	Supplier			
Abseil tape x25m	Mountain	Troll	Bolts and hangers	Mountain	Troll
15mm			x20 10mm		
Abseil tape x25m	Mountain	Troll	Camming devices	Mountain	HB
25mm			Candles	B.C.	var.
Bamboo Canes 3x8'	Trek/B.C.	Delhi	Cigarette Lighters	Trek/B.C.	market
Battery lamps x2	Trek/B.C.	Delhi	Cooking utensils	Trek/B.C.	Delhi
Bolt driver x1	Mountain	Troll	Cord x50m 6mm	Mountain	Troll
			Dead men x4	Mountain	DMM
			Extenders x15	Mountain	var.

Frying and Chapati Pans	Trek/B.C.	Delhi	Nuts x3 sets	Mountain	DMM
Garden Sacks	General	market	Nylon rope 20m	Trek/B.C.	Delhi
Hexentrics - 1 set	Mountain	-	Pans and bowls	Trek/B.C.	Delhi
Ice pitons/pegs x20	Mountain	Army	Petrol Containers	Trek/B.C.	-
Ice screws x30	Mountain	var.	Pitons - 100 various	Mountain	Army
Karabiners x30 screw-gate	Mountain	HB	Plastic Sheet 10'x8'	Trek/B.C.	Delhi
Karabiners x40 snap-gate	Mountain	HB	Ropes 5x9mmx50m	Mountain	Edelweiss
Kerosine Lamp	Trek/B.C.	Delhi	Slings x20 8', x8 4'	Mountain	Troll
Kerosine Stoves x3	Trek/B.C.	Delhi	Binoculars	Mountain	-
Large Tarpaulin	Trek/B.C.	Delhi	Snow shovels x2	Mountain	Army
Light billies x3 sets	Mountain	I.C.	Terra Nova Quasar tents x3	Mountain	Terra Nova
MSR XGKII stoves x3	Mountain	Cotswold	Tools (pliers, file, spanners, etc.)	Trek/B.C.	var.

GENERAL MEDICAL KIT

Adrenalin	Immodium	Voltarol Emulgel	Plasters
Audicort	Metronidazole	Voltarol Retard	Polythene Gloves
Augmentin	Normasol		Scissors
Betadine	Paracetamol		Steristrips
Buccastem	Piriton	Cotton Wool	Suturing Kit
Chloramphenicol	Rehidrat	Crepe bandages	Syringes
Codeine Phosphate	Senokot	Forceps	Tubigrip
Daktarin	Temgesic	Inflatable Splints	Zinc Oxide Tape
Erythromycin	Trimethoprim	Melolin Pads	
Eurax	Trimovate cream	Micropore	
Hydrocortisone cream	Ventolin Inhaler	Needles	
	Vermox	Paraffin Gauze	

MOUNTAIN MEDICAL KIT

Dressing Pack	Codeine Phosphate (20 tablets)
Cotton Wool	Eye Ointment
Eye Pad	Immodium (15 tablets)
Inflatable Splint	Paracetamol (20 tablets)
Plasters	Rehidrat (10 sachets)
Triangular Bandage	Saline Sachets (2)
Tubigrip (1m)	Savlon (1 tube)
Steristrips	Temgesic 0.2mg (10 tablets)
Sun-cream + lip salve	Voltarol Retard (14 tablets)
Ventolin Inhaler	
Zinc Oxide Tape	

Weight: 350g For: Four persons for 7 days away from Base Camp.

INOCULATIONS

Typhoid	Meningitis
Cholera	Hepatitis A
Rabies	Tetanus

Appendix 2 - Finance

Income (£)	Expenditure (£)
Personal Contributions	Flights
2867.77	2665.50
Imperial College Exploration Board	Air Freight
2000.00	907.18
Harlington Trust	Truck hire
3000.00	957.45
Rector's Fund	Mule hire
750.00	134.04
Imperial College Trust	Porters up
600.00	733.09
Imperial College Alumni Association of India	Porters down
272.77	431.91
University of London Convocation	Cook
3000.00	377.66
Oxford Brookes University	Mountain food and utensils
250.00	1438.68
Royal Geographical Society	Accommodation and meals
500.00	850.00
Mount Everest Foundation	Accommodation, food and travel for Liaison Officer
300.00	67.02
British Mountaineering Council	Fuel
300.00	73.62
Foundation for Sports and the Arts	Equipment
300.00	3064.14
Tata Environmental Fund	Lost/Damaged army gear
531.91	91.19
Tata Exports Ltd. (London)	Insurance
1000.00	489.72
Total	Import Tax
15672.45	851.06
	Exit Tax
	38.00
	Cost of travellers cheques
	58.55
	Handling charges
	45.45
	Peak Fees
	1017.18
	General Administration
	130.56
	Visas
	96.00
	Gifts
	24.00
	Conference Fees
	60.00
	Training
	29.00
	Report
	797.91
	Consumables
	243.54
	Total
	15672.45

Bibliography

- Ainger, C. (1970). South Parbati. *Himalayan Journal* (30) pp. 228-236.
- Baise, D. (1993). *Soil Science Analyses: A Guide to Current Use*. Chichester.
- Chadha, S.K. (1987). *Himachal Himalaya Ecology and Environment*. Today and Tomorrow's Printers and Publishers, New Delhi.
- Collister, R. (1974). Parbati South, 1973. *Alpine Journal* (79) pp. 121-127.
- Collister, R. (1973). Himalayan Grand-Course. *Mountain* (39) pp. 14-17.
- Ganguli, P.K. (1979-80). Upper Parbati Valley Expedition, 1979. *Himalayan Journal* (1979-80) pp. 188-193.
- Hodgson, J.M. (1975). *Soil Survey Field Handbook*. Harpenden: Soil Survey of England and Wales.
- Imperial College Cameroon Expedition (1993). Expedition Report. Imperial College.
- Imperial College Pamir Expedition (1992). Expedition Report. Imperial College.
- Polunin and Strainton (1987). *Concise Flowers of the Himalaya*. Oxford University Press.
- Prosser, J. (1974). Parbati South, 1972. *Alpine Journal* (79) pp. 115-120.
- Prosser, J.D. (1972-3). Parbati South, Kulu. *American Alpine Journal* (18). p. 491.
- Roberts, J.O.M. (1939-40). Lieut. J.O.M. Roberts in Kulu and Spiti. *Himalayan Journal* (12) p.129.
- Roberts, J.O.M. (1940). Himalayan Byways. *Alpine Journal* (52) pp. 233-242.
- Royal Geographical Society (1993-4), *Expedition Planners' Handbook and Directory*.
- Van Derhammen, T. *Manual of Methods for Mountain Transect Studies*. Unesco.

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Imperial College Department of Materials	Sevenoaks Ramblers Association
Imperial College Exploration Board	University of London Convocation
Imperial College Harlington Trust	Tata Exports Ltd (London)
Imperial College Rector's Fund	Frederick Gregory Fund

Support

Dr Sarah Freedman	Mohan Puri
Professor Martin Haigh	Col Amit Roy (IMF)
Expedition Advisory Centre	Lt Col Surjit Singh
Dr Syamal Gupta (Tata Exports)	Professor Robert Schroter
Imperial College Marketing Division	Vice-Chancellor of Oxford-Brookes University
Mr Steve Joshua (Tata Exports)	Youth Exploring Society of India
Mr Richard Hermitage	Steven Singh
Nigel Winser	

Equipment

Allcord Ltd	Sub Zero Ltd
Berghaus Ltd	Mountain Range Ltd
Glacier Imports Ltd	Mountain Technology Ltd
Casio Electronics Ltd	Rab Down Equipment Ltd
DMM International Ltd	Phoenix Mountaineering Ltd
Group Practice, Tidworth (Royal Army Medical Corps)	Regional Depot, Thatcham (Royal Logistics Corps)
HB Climbing Equipment Ltd	Princess of Wales' Royal Regiment
Karrimore International Ltd	Troll Safety Equipment Ltd
F Duerr and Sons Ltd	Trimble Navigation
In-Line UK (Bloc)	Terra Nova Ltd
High Places Ltd	Ventura Ltd
Kodak UK Ltd	Wander Ltd

