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91/8

BRITISH 1991 ANDEAN VOLCANOES EXPEDITION



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British 1991

Andean Volcanoes Expedition

Sponsored by:

Winston Churchill Memorial Trust

Mount Everest Foundation (91/8)

British Mountaineering Council

A two man expedition to climb the giant volcanoes
of the Puna de Atacama, Chile.

FRONT COVER

Cerro de Pili, 6046m, from the
summit of Volcan Simbad.

REAR COVER

Graham E Little and
Adrian W T Baker with
Volcan Simbad, 5924m, behind.

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*'Amongst the strange scenes there are
in the world the scenery of the
Puna de Atacama counts as the
most striking and most wonderful.'*

Lord Conway

KEY MAP



1:72 000 000

BRIEF BIOGRAPHY

Graham E Little

Born: Leeds, 6.3.49

Home: Temple Village, Midlothian, Scotland

Occupation: Marketing Executive with Ordnance Survey

Previous Expeditions: Baffin Island (1978), Parbati Himalaya (1985), Peruvian Andes (1988), Kishtwar Himalaya (1989).

Posts Held: President of the Mountaineering Council of Scotland (1986-1989)
Chairman of the Scottish Mountain Safety Group (current).

Club: Scottish Mountaineering Club

Other Interests: Writing, Mountain Biking, Islands.

Adrian W T Baker

Born: Barnstaple, Devon, 20.3.65

Home: No fixed Abode!

Occupation: Doctor

Previous Expeditions: Peruvian Andes (1988), Karakorum (1989).

Posts Held: President of the University of Birmingham Mountaineering Club.

Club: Midland Association of Mountaineers.

Other Interests: Windsurfing, Mountain Biking.

BEGINNINGS

During the Edinburgh Festival 1990, Adrian Baker and I visited the 'Gold of the Incas' Exhibition. Sitting in a sticky Edinburgh bar afterwards we reminisced over our trip to Peru in 1988 (when we made the first ascent of the SE face of Huandoy Este), and resolved to organise another South American experience. This idea further germinated on spotting the name Cerro de Tocarpori on a Bartholomew 1:5000,000 map. This attractive and hitherto unknown name, together with the substantial height of 6755 metres convinced us that an expedition to the volcanic mountains of Chile/Bolivia/Argentina would be an unusual and worthwhile undertaking.

After further research it transpired however, that the true height of Tocarpori was 5808 metres, despite the publication of the much higher value on a number of maps and in a variety of mountaineering text books. We were soon to discover that this anomaly was by no means unique, and that the height status of many Andean peaks between the latitude of 18oS and 35oS was in question.

Additional research indicated that a peak just south of latitude 27 degrees south by the name of Nevado Ojos del Salado was in fact the second highest mountain in the western hemisphere (after Aconcagua), and the highest active volcano in the world. Published heights varying from 7084 metres to 6863 metres served to intrigue us further. The popularly accepted value for Nevado Ojos del Salado is now 6885 metres although recent Chilean mapping quotes 6893 metres. In any case it is less than 100 metres lower than Aconcagua.

Around Ojos del Salado lie the greatest concentration of 6000 metre plus mountains outside the Himalaya, including such giants as Incahuasi (6610 metres), Tres Cruces (6356 metres), Pissis (6779 metres), and the mysterious Bonete peak or peaks reaching an altitude of up to 6872 metres. In short, this was the area we'd been looking for; relatively obscure, remote, some very high mountains, and a not inconsiderable touch of mystery.

OBJECTIVES

Not being able to completely divorce our interest from the Tocarpori area, Volcan Licancabur 5916m east of San Pedro de Atacama, a spectacular volcano of 5916m was chosen as a suitable acclimatization peak.

The main and ambitious expedition objective was to ascend Nevado Ojos del Salado 6885m then to traverse through the Puna, ascending Nevado Pissis 6779m, to locate and climb Cerro Bonete Grande and Cerro Bonete Chico (if they existed) and to exit the area via Jague in Argentina.

A third objective was to clarify the existence, location and status of the Bonete peaks and to confirm or improve upon available peak height and location information of all peaks climbed.

TIMING

The winter month of August was chosen as likely to offer the most favourable conditions for the undertaking with cold, clear weather and enough snow to provide a ready supply of water, there being virtually no fresh water in the entire area (the occasional lagunas are heavily saline). It was anticipated that high winds (north-westerly) and very low night time temperatures would be encountered.

EXPEDITION CALENDAR

1991

28th	July)
29th)Heathrow to Santiago via Rio de Janeiro
30th		In Santiago
31st)
1st	August)Santiago to San Pedro de Atacama via Calama (coach)
2nd		Jeep to below Volcan Juriques
3rd		To Volcan Juriques/Volcan Licancabur col bivouac
4th		At col, 4680m
5th*		Ascent of Volcan Licancabur, 5916m
6th		Descend to San Pedro de Atacama (GEL)
7th		Descend to San Pedro de Atacama (AWTB)
8th		Out onto the Salar de Atacama saltpan
9th		To Calama via El Tatio geisers and Caspana
10th		To San Pedro de Atacama
11th		At San Pedro de Atacama - Visit Quitar ruins
12th		At San Pedro de Atacama
13th		To Pili base camp via Toconao and Talabre (jeep)
14th		At base camp, 4450m
15th*		Ascent of Volcan Simbad, 5924m
16th		At base camp
17th*		Ascent of Cerro de Pili, 6046m
18th		At base camp
19th		To Lascar bivouac, 4870m
20th*		Ascent and circuit of Volcan Lascar, 5641m
21st		At base camp
22nd		At base camp
23rd		To San Pedro de Atacama via Talabre and Toconao
24th)
25th)San Pedro de Atacama to Copiapo via Calama (coach)
26th		At Capiapo
27th		To Portezuelo Colorado via Mina Marte. Return to Copiapo
28th		To Ojos base camp via Mina Marte and Rio Lamas
29th		To Refugio Jorge Rojas, 5200m
30th		To Refugio Cesar Tejos Echeverria, 5750m
31st*		Ascent of Ojos del Salado, 6885m. Down to Refugio Jorge Rojas
1st September		Descend to base camp, 4650m
2nd		Circuit of the low hills to the east of base camp
3rd		Base camp to police post on foot. Jeep to Copiapo
4th		Copiapo to Santiago (coach)
5th		In Santiago
6th		Walk around Manzano (Maipo Valley) - GEL
7th)
8th)Santiago to Heathrow via Rio de Janeiro

* - Summit days

Day by day Diary

***Note: This diary contains
the abridged personal
impressions of Graham Little
and should not necessarily
be taken to represent the
reality as experienced
by Adrian Baker.***

DIARY

Sunday, 28th July (Depart Heathrow 2200)

It is the day of departure. Our food box (38kg) and two large rucksacks (18kg and 22kg) are accepted at the check in without any excess baggage charge. We celebrate with two very large measures of Lagavulin (16 year old of course). The expedition is truly underway!

Monday, 29th July

Changing planes at Rio de Janeiro we fly on towards Santiago via San Paulo enjoying the comfort and catering of the VARIG (Brazilian Airways) jet. 'Aconcagua!', a passenger across the aisle shouts at us, our big boots giving away our interest in such matters. Through a rent in the boiling cumulus there it is, a massive wedge of whiteness, the highest mountain in the western hemisphere (6960m).

We touch down on schedule (1345) at Santiago and to our delight John Phillips, the President of the Federacion de Andinismo de Chile is there to meet us. As we drive into the heart of Santiago, weaving through a tide of aggressively driven buses, we talk mountaineering, politics and pollution. In an effort to reduce the level of exhaust emission in this city of nearly four and a half million people, private cars are restricted as to when they can and cannot be driven in the city centre. It would appear that even more drastic measures will be required before the grey skies over Santiago turn blue again. Visit the Federacion offices then book into the Hostal Simpson just round the corner (inexpensive and convenient). Take a short walk around the city centre - a combination of modern mirrored glass monstrosities and neglected historic buildings. Back to the Federacion in the evening to meet some Chilean mountaineers. The news is that the Ojos del Salado group is inaccessible. 'It is impossible to get beyond Salar de Maricunga due to thick snow on the road', we are informed. This news is not conducive to a good night's sleep!

Tuesday, 30th July

Wake to heavy rain. The hills hemming Santiago are white with fresh snow. We talk through various options, but decide to stick to our original plan.

Much of the day is spent shopping and sightseeing in the rain. We purchase some fairly modern 1:250,000 mapping from the Instituto Geografico Militar de Chile, Avenida O'Higgins 240 (sheet SG-19-15, Nevado Ojos del Salado not yet available).

Visit Juan Andreas Marambio, a medical contact of Adrian's, and a keen mountaineer (has been to over 8000m on Everest). Juan is involved in research into the physiology of miners working at high altitude and is familiar with many of the mines in the Puna de Atacama. He promises to contact a mine manager to get the latest information on snow conditions.

Enjoy the evening as dinner guests of John and Cynthia Phillips.

Wednesday, 31st July

Bad news from Capiapo - the highest mines (gold) have been evacuated due to snow blizzards. Drifts up to three metres in depth are blocking some roads. It is the heaviest snowfall for many years.

Trying hard not to get depressed we ferry our gear over to bus terminus Norte. The coach is modern, clean and comfortable, and leaves on time. We travel 470 kilometres through low hills covered in scrub and cacti, arriving in La Serena shortly before a spectacular flaming sunset.

Thursday, 1st August

The coach speeds throughout the night up the Pan American Highway, arriving in Antofagasta in the morning. North-east of Antofagasta are low, eroded, sandy hills devoid of vegetation. The morning light picks out the soft folds, throwing softer desert shadows. Smoke belches from the mine complex at Mantos Blancos, a pipeline parallels the road. We arrive at Calama mid-morning (1564 kilometres from Santiago) and leave for San Pedro de Atacama shortly after.

The rough, dusty road straight-lines across the desert, a great chain of dark volcanoes rupturing the horizon to the north-east. One is Cerro de Tocarpori, the reason for our being here. The classic cone of Licancabur welcomes as the coach snakes down through a fantastic eroded landscape and out to San Pedro de Atacama on the plain below (Alt. 2430m).

We book into the basic Hotel Florida then go for a wander around the village. The hardened mud streets are laid out in a rectangular grid, the flanking buildings built of whitewashed mud blocks, their roofs also mud. It is not difficult to conclude that rain in San Pedro is not a common occurrence! One of the streets is called Licancabur and points towards the eponymous volcano, our first objective.

Visit the Valley of the Moon in the late afternoon, marvelling at its weird and wonderful scenery. Perfect clear salt crystals are extracted from a small opencast mine, other crystals litter the desert floor. We wait for moonrise with all its magic, then back to San Pedro.

Friday, 2nd August

We spend the morning preparing gear and buying petrol and fresh food with a break to visit the museum with its splendid collection of Inca artifacts and mummies. One of the best preserved mummies is a young woman going by the name of Miss Chile! The collection was initiated by Gustavo Le Paige, the local priest, in the mid-1950's.

After a substantial lunch we leave by jeep heading east along a dirt road to the south of Licancabur. We pass several sulphur trucks grinding down the steep incline from Mina Azufreras Purico. Another road runs closer to Licancabur around its northern flank, but as it was mined by the Chilean army, we feel it prudent to take the southern route! We drive to the Portezuelo del Cajon (pass) on the Chilean/Argentinian border (Alt 4480m) then a short distance along the southern flank of Volcan Juriques in an off-road mode. We are dropped off at a height of c4550m. The bitterly cold wind dictates a quick change out of shorts and into multiple 'thermals'.

Contouring round the hill over volcanic gravel and short stretches of lava blocks we admire the beautiful light play over the vast flatness of the Salar de Atacama far below. Huge snow capped volcanoes can be seen on the southern horizon, perhaps Cerro Pular, perhaps Llullaillaco. As we prepare to bivouac a stunning sunset fires the western skies.

Saturday, 3rd August

I spend an almost sleepless night and rise with a splitting headache. It is a grey dawn, the outlook bleak.

We continue contouring over unstable ground to cross a ridge giving access into the basin between Juriques and Licancabur. It is barren ground - the odd tuft of brittle yellow grass, the occasional 'paper' flower. Other than that just stone from orange to glassy black. Reach a suitable bivouac by late morning behind a jumble of dark lava blocks under the east spur of Licancabur. It's good to be out of the cutting wind.

The bivouac is at a height of 4680m and my headache is persisting. Adrian feels queasy with a suppressed appetite. We get into our sleeping bags at 1500 to conserve heat. It is a long restless night.

Sunday, 4th August

Very cold overnight with fresh powder snow blowing about. We watch powder snow whirlwinds spiralling along the flanks of Licancabur. Adrian gives me drugs to suppress my headache, but shortly after taking them I retch violently, getting down to bile. I lie in my sleeping bag all day incapable even of diary writing. Adrian has been to visit the Inca ruins to the north and suggests that I do also. I make the effort but feel shaky. We have come too high too quickly, and are just not acclimatized. The ruins are strewn with pottery shards like flakings of rust red lava. This place exudes a strange power.

Sunset is an inflamed band of light, trapped between churning grey clouds, and the luminous salt sheen of Laguna Verde. Feeling slightly better, I return to the bivouac for a brew and another attempt at sleeping. the body is exhausted, but the mind is wide awake! The gusting, eddying wind gives the impression that a major snow storm is raging outside our goretex cocoons. Completely zipped-up my bivi bag is claustrophobic, even slightly opened it lets in blasts of powder snow - the night is a constant struggle.

Monday, 5th August

I awake at 0600 after an early morning doze. The bivouac has been given the Scottish winter treatment. Both Adrian and I have been dreaming about the crash of BCCI (Bank) - quite bizarre!

The weather is improving slightly, and as we are due back in San Pedro tomorrow this is our last chance to climb Licancabur. We both feel very rough, but by unspoken consent prepare for the ascent.

Travelling very light, we tackle the east spur - unstable lava blocks coated with fresh powder. Adrian's toes become numb and he warms them under my armpits. Clouds break and some brief sunlight filters through. The summit sail of Juriques is glimpsed through a rent.

We gauge our ascent by the diminishing size of the Indian ruins. Buffeted by the wind, we stumble on, heading for two rust-red towers on the crater rim. We stop frequently to gulp for air and to gaze out over the brown domed expanse of Bolivia's highlands to the white peaks of the Cordilla de Lipez.

My motivation is eroded by the constant slipping of scree as each upwards step is negated by a downward slide. Adrian urges me on as he leads the snowy groove between the towers. The rock is worryingly loose, but soon I am pulling out onto the lower crater's rim after a thousand metres of gruelling ascent. The final slope is a fiendish mix of sand, pumice and snow. Drawing on reserves of energy we stomp up, marvelling at the freeze-dried spars of bleached wood littered around, incongruous memories of the Atacama Indians' affinity with these high places.

As I reach the summit I glance down into the inner crater to enjoy a brief vision of a perfect circular ice pool of perhaps one hundred metres in diameter.

Clouds well up again as Adrian joins me on the summit by the dry stone walls that are a feature of Atacama culture present on the summit of many Andean volcanoes (the highest recorded exist on the summit of Volcan Lullailco, 6723m).

With barely an hour of daylight remaining and no headtorches we speed to gain a shallow snow gully on the north-east face. Attempts to rest induce violent shivering, attempts to press on result in bruising falls. Adrian vomits violently

Tuesday, 6th August

After ten hours of purgatory we return to the col with the dawn.

Munching shortbread and gulping tea we have time to reflect on our errors of judgement. We had over-estimated the speed of our acclimatization, and under-estimated the difficulty of ascending Licancabur. Many of life's adventures are the result of poor judgement!

The walk out to the 'sulphur road' doesn't look too demanding. We follow a dry, graphite grey, sandy channel out onto the yellow grass and thorn scrub-covered plane. It is easy going, even under the hot sun and deep in our own thoughts, we take divergent paths, dipping in and out of shallow valleys. Just over half way across I reach a hidden quebrada (narrow canyon) with forty metre high burnt-orange cliffs on its southern flank. It initially appears that I will have to follow the quebrada eastwards to a bifurcation when I spot a narrow gap between the main wall and a pinnacle-like buttress. Through this gateway and up a dusty slab behind I go, and out onto the plane. There is no sign of Adrian. Two more quebradas later and I pass through an area of weird, contorted pinnacles and beyond them scramble into yet another narrow quebrada. Its southern flank is an unbroken vertical wall. The fierce sun burns into the sandy bed of the quebrada as I trudge despondently along. I stop for a drink but milk only a few drops from the frozen contents of my waterbag (in retrospect to delightful irony!). A tablet of rock is propped up against the canyon wall pointing to a deep chimney with a window of light high up. From the top of the tablet this escape route demands a couple of Very Severe (4c) moves, then some sack hindered thrutching to gain the window and the world beyond.

Over more broken ground I go, then spot the dust trail of two sulphur trucks slowly grinding down the dirt road. They are almost certainly the last of the day. Lungs pumping I run across the hillside making it to the road seconds before the final truck arrives. The driver

must stop or run me down. He does the former, and somewhat to his consternation, I pile into the high cab pushing ski sticks and rucksack ahead of me. Conversation is limited to a very basic level by our mutual bilingual inadequacies, the noise of the monster truck and the insidious throat-drying dust. The truck ahead of us kicks up a billowing trail of dust as it crosses the plane, for all the world like an ancient steam train.

The sun is setting as I tramp into San Pedro concerned for Adrian and desperate for a hot shower. I take a cold shower, drink several litres of juice, then despite my exhausted state, lie awake most of the night.

Wednesday, 7th August

The sun beats hotly down through the still air, the perfect cone of Licancabur draws my eyes. I sit in front of the church diary-writing and worrying. I'm very concerned that Adrian may be lying injured in a quebrada.

It is late morning and I wander over to the Police Post. Suddenly there is the man! Dry and dust covered, but definitely alive. We laugh and embrace. He's been concerned that I got down safely! His waterless night on the bare mountain was rewarded by a spectacular sunrise and a substantial thirst.

A lazy day ensues with much drinking, eating and drinking.

Thursday, 8th August

A day on the tourist trail seems in order so we pile into a minibus with a multinational throng and head out onto the salar via the village of Toconao. The true salar is a meringue like crust of evaporated salts veined by slow flowing saline creeks and multicoloured salt-saturated lagoons. Stilt-legged flamingos browse on algae and take to the bluest of skies when SLR's threaten. To the east of this sun drenched crystal field, dark volcanoes line the skyline, exquisite in their contrast to the great flatness of the Salar de Atacama. The two highest volcanoes due east are compelling in their distant symmetry, a closer lower volcano sends a trail of smoke into the lazy blue sky. An idea is born!

As the minibus rattles back to Taconao, Eduardo our driver tells of plans to drill for oil on the salar and we see a fenced compound with bags of drilling 'mud' stacked high. The track, our vehicle and indeed the gaggle of tourists we are part of, is a harmful intrusion into the magical world of the salar, oil drilling will be its destruction. There are some places on the earth that must be left to the natural way of things.

We wander around Toconao with its desert hemmed quebrada full of lushness and spring water, its pale volcanic stone (sillar) quarry and its fine isolated church bell tower (17thC) with cactuswood door (the main body of the church was destroyed by an earthquake). Back in San Pedro after much Chilean red wine and a spirited sword fight with ski sticks, we retire at midnight for a 0300 rise!

Friday, 9th August

It's an 'alpine start' for another tourist day.

The geisers of El Tatio lie in a wide basin surrounded by volcanic hills. We arrive at dawn. There are numerous outpourings of steam, some bubbling boiling water, with colourful mineral flows, some building beehive shaped domes. Plumes of vapour trailing across the plane are catching the first rays of the morning light. A bizarre rusting complex of pipes squats in the centre of it all (the remnants of an attempt to harness the thermal energy to heat a nearby research station). We are informed that a couple of years ago a Frenchman fell into the largest geiser pool and was scalded to death.

Our mad driver races to the village of Caspana (Alt 2900m) along very rough rubble surfaced roads. The buildings, part mud brick, part stone, are strung along the base of a deep quebrada, a clear stream flowing through. A dressed, stone arched bridge leads to a small museum. I hate this tourist round - briefly decanting into one place after another with a mad dash in between - no time to think or to soak in the atmosphere. We visit Lasana and Chiuchiu with their many features of archaeological interest, but I've eaten too much dust to appreciate them.

A night in Calama (Hotel Splendid) allows a hot shower and excellent Chinese cuisine (Chi Kang Restaurant).

Saturday, 10th August

We catch the morning bus to San Pedro, the 'city lifestyle' (fueled by money from the nearby Chuquibambilla open-cast copper mine - the largest in the world) rapidly losing its allure. A dust storm is blowing on our arrival in San Pedro.

By mutual agreement Adrian and I have decided that as Ojos del Salado is still out of the question, we'll spend some time climbing in the group of volcanoes to the east of the salt flat. We make local enquiries about access into this area, but initial responses are not encouraging. We enjoy dinner and beers at the Residencial Andacollo (rapidly becoming our 'local') and retire early.

Sunday, 11th August

The morning brings clear skies, hot sun and no wind. Two weeks have passed and I'm finding it hard to contain my frustration at our current inactivity. One of the real pressures of a grant aided expedition is the need to 'come up with the goods!'. 'Justifying' the expedition would always be a need for me, but justifying the grants puts one under an additional obligation.

Yesterday and to a lesser extent today, there is some stress between Adrian and I. After breakfast Adrian hitches down to Toconao to discuss the possibility of a lift into the mountains at the local police post. I visit Nativa Expediciones to discuss our needs and arrange another meeting for the evening. I then spend some time filling water bottles and sorting out food and equipment. Adrian returns without good news although the police at Toconao have been hospitable.

In the afternoon we walk to the open air thermal swimming pool (a welcome facility!) Later we visit the Indian ruins of Quitor and watch the sun set over the Atacama plane.

At a meeting with Eduardo Janjari, Ricardo Moreno and Juan Sota Aluayo we negotiate a price for the double journey and agree to leave San Pedro first thing on Tuesday morning.

Monday, 12th August

I write a final draft of my article 'Licancabur - Atacama Initiation' (for the Alpine Club Journal) then go for a wander to the sulphur processing plant and a small oasis beyond. Aggressive dogs keep me moving and I circle back to San Pedro by another sulphur processing plant and the Quitor ruins.

Tomorrow we are heading for the mountains again and celebrate with Chilean red wine and the last of the Lagavulin.

Tuesday, 13th August

Juan and Eduardo arrive at 0800 and we load up and head to Toconao then turn onto the mountain road leading eventually to Argentina. It feels good to be moving again. After forty kilometres we pull off into the tiny settlement of Talabre. At a height of 3600 metres this stone built row of low dwellings commands an expansive view over the vast flatness of the salar far below. The young children run away when approached with a camera. Juan hires an elderly inhabitant to guide us through an area where land mines have been laid by the Chilean army (to deter the Argentinians?).

Beyond the pasture of Tumbre a family of rhea fast-waddle across the track. As we cross the Tropic of Capricorn a small herd of vicuna race the Land Cruiser, accelerating away from us with considerable style. The Cruiser stops before a dip in the dirt road (4400m) where it runs down and round the south shore of Laguna Lejia. The surface of the laguna is a milky white froth of salt and ice reminding us that it is still mid-winter. Our elderly guide wanders over the bone-strewn, stony ground stooping occasionally to pick some small herb-like plants. Juan tells us they are chachacoma and are used by the locals to combat mountain sickness. Adrian fills a plastic bag!

Juan demonstrates his driving skills as he coaxes the Cruiser over hard, frozen fields of sharp ridged snow that block a shallow valley giving access onto the Salar de Aguas Calientes. As we descend to the salar, a long, dark fox sprints across the plain, a strangely comforting sight in this barren land. We bump around the edge of the salar spotting some birdlife including a lone flamingo. In summer this salt pan with its blue lagunas will be alive with the pink flash of these awkwardly elegant birds. Contouring around the east flank of Cerros de Rio Negro we turn west to cross the stony plane and to gain our base for the next ten days. The dust trail of the Cruiser settles back into the desert floor as we erect our tent under a small lava cliff at a height of 4450m.

Adrian produces the first of many chachacoma brews. I tentatively sip the pale green infusion, but quickly decide that conventional beverages are more to my taste. For the rest of our expedition chachacoma will be known as 'the herb'. Adrian quickly becomes an addict!

Wednesday, 14th August

We wake early after a reasonable nights sleep. The sky is almost cloudless and there is no wind. Today has already been designated an acclimatization day, so we eat a full and leisurely breakfast, soaking in the sun's early rays and the surrounding vastness.

A total day of rest is an untenable concept for us and by late morning we decide to wander up the shallow valley to the north-west to recce the approach to Cerro de Pili and to get a general feel of the lie of the land.

A strong wind blows up as we pass through a bone strewn canyon three kilometres above camp. Walking against it becomes hard work. We make a complete circuit of the basin above the canyon. Adrian finds an old dark green, embossed bottle near a small cairn (survey cairn?). The name on the bottle appears to be Dutch; one side weathered by the prevailing wind, the others as clear as the day it was dropped many decades ago.

We return via a dry sandy creek and on between the crumbling cliff-flanked walls of the canyon. There is evidence of roosting birds on the ledges but no sign of bird life. After a brew I head out onto the plain to take a photograph of a stone cross set in a small cairn that our guide pointed out yesterday. At the side of the cairn lies an older wooden cross. This lonely spot, remembering the death of a traveller, moves me deeply; the soft coloured hills behind, bathed in evening light, the desert's substitute for flowers on the grave.

On the way back to camp I find a large, sharp edged block of obsidian (volcanic glass). I hold it tight in the palm of my hand and return with the sinking sun.

Thursday, 15th August

We sleep through my watch alarm but get moving by 0700. For me there is a wonderful irony about altitude - when I want to sleep I can't, when I want to wake I sleep deeply.

Taking one sack, waterproofs, food, and two litres of juice, we head off into a golden dawn with not a breath of wind. For two hours we tramp towards Volcan Aguas Calientes (local name later confirmed as Volcan Simbad) but it doesn't appear to get any closer. We are making for a wide snow gully high on the east face which presents the only obvious break in the rock towers that buttress the crater. Stopping at a small outcrop, to the right of the shallow outrun of the snow gully, we breakfast on nuts, dried bananas, and Tracker bars. Adrian is going very well but I'm feeling weak, the unstable scree sapping my strength even further. I force step after gruelling step, the mind urging the body onwards.

The full stature of Cerro de Pili now becomes evident with Cerro Colachi to the north. To the south and east the landscape is a soft swirling pattern of browns, creams and greys with the wide white frosted flatness of the salar beyond. My legs feel like lead. Adrian forges on making my comparative feebleness even less tolerable. At last we reach the shallow gully and I immediately traverse onto the snow. I build up a satisfying step kicking rythm, almost enjoying the ritual of this familiar pastime. Adrain takes over the lead as we near the end of the snow. The ground above is a nightmare - lava blocks of varying dimension mixed in with pea sized pumice gravel. For every two steps gained there is a one step downward penalty.

I traverse right onto the edge of the rock buttress and make quicker progress. I join Adrian on the crater rim and marvel at the frozen fractured rose-pink lake in the crater bowl (colouration probably due to mineral concentration - manganese?).

The edge of the crater is crested by a series of ragged towers, the one to the north being the highest. We scramble along the ridge and are soon on the top, absorbing the stunning 360o panorama. There are no signs of a previous ascent. To the west the massive crater of Volcan Lascar is belching vapour and we catch a whiff of sulphur on the breeze. Approximately 60 kilometres to the north the distinctive cone of Licancabur stands clear. Between Cerro de Pili and Cerro Colachi a twin headed, snow-covered peak dominates the horizon, perhaps 120 kilometres away in Bolivia, and at least 6500 metres in height.

The descent is the mother of all scree runs, our ski sticks an essential aid to maintaining balance. On the walk back to base I feel seriously dehydrated - I'm running on reserve tank! On the last flats the scattered dry tufts of grass, clinging to the grey volcanic sand, glow butter yellow in the low evening sunlight.

Returning to base after only ten hours we drink and drink. I pop a Naproxen, to kill my headache, then drink again. In the desert water is the only real luxury.

Friday, 16th August

I sleep deeply until the early hours of the morning when slumber is disrupted by a series of bizarre dreams.

A lazy day of talking, writing, sun bathing, planning, eating and drinking. Out of all our foodstuffs only the pepperami fails to excite the palate. Adrian is now heavily into 'the herb' and when at base drinks nothing else!

During late afternoon we notice strange smoke clouds drifting over Pili - otherwise the sky is cloudless blue. We prepare the gear for an early start tomorrow and turn in early.

Saturday, 17th August

We both spend a restless night and again sleep through the alarm. At 0600 I'm woken by a verbal tirade as Adrian realises that we've slept in. Like a human whirlwind he gets ready. I follow in his wake (now I know how my other close climbing partner, Dave Saddler, feels!).

We head off at 0630 by the light of our headtorches for a Pili day. The dawn throws down some welcome warmth as we pull out of a shallow, snow-filled valley running up against the base of Pili's west face.

Adrian is going like a greyhound (due to a combination of pepperami guzzling and herb imbibition, I'm convinced by now). I'm feeling a lot better than on Simbad - keeping a steady pace and each rest bringing renewed strength. We start to traverse along a wide scree ramp below the upper west face aiming for the start of an obvious snow/ice tongue.

Dumping the sacks I start kicking steps up squeaky snow (which would be classic windslab in Scotland) crossing short sections of old neve and bare ice. Getting well into the rhythm I break the trail gaining about 250 metres in height before we are forced back onto the familiar, but dreaded collage of sand, pebbles and rubble. The weather is changing, a thin haze is all around us, strange clouds drift above. Lascar smokes to the south-west. Adrian

powers on, reaching the crater ridge too far to the west, part way up a subsidiary top. I delight in cursing his bad judgement!

Descending to a sheltered basin (not the perfect lake-filled craters of Licancabur and Simbad), we dump everything but cameras then grind up the final lava block ridge to the summit. At 6046 metres we are on the highest point of the main Andean chain between latitudes 18oS and 24oS. Despite the haze the view is absolutely stunning - what an incredible landscape! The mustard coloured Laguna Hedionda lies far below, again our eyes are drawn to the twin snow peaks far into Bolivia (bearing 032o magnetic). We stay for about twenty minutes then head down the northwest face via much hazardous scree running until we are level with the sacks. Across, down and down again we go with effortless bounding strides from mountain to valley. The rays of the sinking sun filter gold through the dust flurries scuffed by our lazy boots as we tramp the flatness back to base. It's been an eleven hour trip of near continuous action, 1600 metres of energy sapping ascent. It is our third peak and we are delighted. My body is wasted with exhaustion but as usual I can't get to sleep!

Sunday, 18th August

Today will be a day of rest - well nearly! Adrian goes for a pre-breakfast walk to the cross then back via the rounded hill to the east of our camp. We spend most of the day writing and planning next year's Himalayan Expedition. I take a pre-dinner walk to the summit (cairn) of the low hill Adrian climbed this morning. It is very windy on top but I linger in welcome solitude, contemplating and camera snapping.

We eat dinner by guttering candlelight, then drift into half sleep, the internal clock set for some unearthly hour.

Monday, 19th August

We wake at 0430 but by mutual agreement decide that getting up would be a bad idea and that a 1200 start and bivouac below Lascar would make more sense. After a very silly morning and a large lunch, we head off contouring around the northern flank of Volcan Simbad crossing bouldery ground. Head down against the usual strong north westerly wind, it takes us three and a half hours to reach a suitable bivouac site to the north east of Lascar in a shallow valley strewn with red pumice. We engineer a level platform on the side of a hillock at a height of 4870 metres.

We eat soup and shortbread, then lie in our sleeping bags marvelling at the shifting cloud patterns and the clearing sky. It gets very cold, breath turning to frost on our bivouac bags, a galaxy of stars twinkling above. As usual I just can't get to sleep, even when I am warm and headache free. My mind is as active as the sky above, racing through past, present and future like a shooting star, yet totally oblivious to my body's need to sleep.

Tuesday, 20th August

Adrian wakes me shortly after I've fallen asleep, my internal dialogue burnt out after a night of chasing dreams. I feel very, very rough. Strange clouds are drifting in and, we fear, a serious change in the weather.

Leaving sacks at the bivi we get moving at 0900 crossing a pumice field pocked with fresh mini craters cradling dense black boulders (presumably ejected from Lascar in the recent past). Up sliding slopes we go to gain the slight col where a ridge runs north joining Volcan Lascar to Cerros de Salta. I am feeling very tired and very weak. Adrian starts a rising traverse across Lascar's north-east face making for an obvious 'fresh' lava flow which offers hope of an easier ascent line. The ground we are crossing is the very worst mixture of unstable material imaginable. On numerous occasions my body gives up. I'm in a kind of protracted nightmare, the lack of sleep over so many nights has finally caught up with me. Adrian becomes a tiny patch of yellow against the great rust red expanse of slipping stone between us. I slump down near the lip of the crater in a state of total exhaustion. Adrian helps me on with my jacket and insists that I eat and drink. He raves about the monster crater behind us which is just out of sight, but can be heard breathing like a living creature, its sulphurous breath warm on my back. We are at an altitude of 5480 metres and the summit of Lascar is still well above us to the west. Modern mapping gives Lascar a height of 5154 metres, a value we'd been suspicious of and now realize applies to the base of the crater (spot height on 1:250,000 mapping) and not to the summit.

After a rest I scramble to the edge. The scale of the crater is awe inspiring, the colours mesmerising, the latent power frightening. We traverse along the northern rim of the crater on a knife edge of crumbling minerals, sulphur yellow to cinder red. Walls of lava, some crumbling, some solid, bar our way, giving technical climbing. One particularly difficult loose specimen is dubbed 'The Fowler Pitch'. The crater gurgles and hisses below, belching spurts of vapour.

The vertical cliffs on the far side of the crater are layered in a fantastic array of colours bringing to mind a glass tube of colour banded sand I treasured as a child. We are at the lowest point of the crater rim and commence our ascent on sliding grey scree to reach the west edge and then further west to gain the summit of Lascar. My altimeter is hovering around 5610 metres (the old published value of 5641 metres seems reasonable). Pieces of ancient wood, some charred, are strewn around (evidence of the activities of the Atacama Indians). To the south lies a small hidden crater, all around the sky is hazed with sepia.

We descend over fresh volcanic debris to commence a traverse around the southern crater rim. As we drop to the col the sulphuric acid gasses become overpowering, stinging our eyes and throats and burning our nostrils. I cover my face and speed across the col gasping for air between the blasts of noxious vapour. We ascend a grey gravel arete then cross a stony basin to regain the edge of the crater. A further climb brings us to the highest point on the crater rim (altimeter again reads 5610 metres). As we near the end of our complete circuit of this vast crater the variegated rocks are a constant wonder, so absorbing that I'm able to shrug off my tiredness and revel in the raw beauty of the earth's subcutaneous layers.

Close, to the east, the great bulk of Volcan Simbad dominates the landscape, a streaked grey leviathan thrusting from a barren brown desert. A last glance into the crater, sun filtering through the vapour, and we start a monster scree run, our dust trails streaming out behind us in the breeze. We leave the bivouac at 1600 and with the wind behind us, cover the twelve kilometres back to camp in only two hours. For once I outpace Adrian! Many drinks to rehydrate and we crash into a deep sleep.

Wednesday, 21st August

Lots of dreaming but the best night's sleep of the trip - I actually feel refreshed! A strong wind blows all day, fine sand filtering into the tent and covering everything. Adrian is at his

maddest yet (and that's saying something). Raving lama! With the aid of his sleeping bag he pretends to be a giant Dr Who worm. I'm rolling around in an agony of laughter on the desert floor!

We take a walk up to the canyon to sober up and collect bones. The afternoon is spent reading and writing as the dust storm blows on. I'm back to the old no-sleep routine, eventually drifting off at about 0500.

Thursday, 22nd August

The distant sound of birds can be heard on the morning air, but we see nothing. Our water supplies have lasted well, so I take the plunge and wash my hair and face. The freezing water is numbing, but as my scalp warms a sensational tingling takes over.

The wind still blows. We arranged our collected bones on the stoney slope opposite camp to read '1991 Andean Volcanoes Exp', taking several photos of our handywork. We reflect on our good fortune not to have seen any fresh snow, which could have entailed a walk out to Talabre. The dry wind blows. I watch the setting sun. The sky fills with stars and the temperature plummets. It is a long last night in our desert home.

Friday, 23rd August

Juan, Ricardo and Eduardo arrive at 0900, an hour ahead of schedule. It is a calm, clear day - the best yet. We are all in celebrating mood, laughing, exchanging experiences and taking many photographs. The drive out is a real pleasure, listening to 70s rock music, marvelling at the scenery and stopping for even more photography. We comment on the number of animal skeletons littered around. Juan explains that they are the result of Argentinians trekking over to Chile, with their cattle, to work in the nitrate industry. Many 'torros' perished en route.

After a chachacoma collecting session we head down to Talabre where we chat to our guide from the inward journey. He is adamant that Volcan Simbad and not Volcan Aguas Calientes is the correct name of our first mountain. Adrian mentions the charred wood on the summit of Lascar. Our guide makes an oblique reference to 'The Ark', then indicates that the Atacama Indians made human sacrifices on the summit of some volcanoes! He confirms that Lascar's last major eruption was in 1968, and says that Indian ruins once existed on the summit of Pili (we didn't see any).

Back in San Pedro for soup and beers. We hand out our large water containers as gifts and give Eduardo our Toconao area map which he is delighted with. In the evening we meet Hette and Bettina, two Danish girls studying 'life studies' at Santiago University. We talk drunken politics into the early hours of the morning.

Saturday, 24th August

Gulping down lots of fruit juice, we prepare to leave San Pedro. Approximately fifty sticks of Pepperami are left in the bedside table of room 2 of the Florida Hotel - our sacrifice to Vulcan!

Last goodbyes and the coach leaves for Calama. A full moon hangs over Licancabur, a dusty red sunset flushes the sky behind. We rumble on over the desert in a cloud of dust

with a feeling akin to leaving home. Our luck is in and we change coaches in Calama with barely an hour's delay. Chilean coach services all seem to be excellent: clean, comfortable, punctual, and good value for money. We travel overnight to Copiapo.

Sunday, 25th August

Arrive in Copiapo 0630. We sit on the roadside eating bread, cheese and olives, waiting for the town to come to life. After some wandering around we book into the Residencial Rodriguez - basic but good value. A large cage full of canaries whitter outside our room, but we, nevertheless, catch a couple of hours sleep after a fine cafe con leche.

Visiting the Police post, we are told that the road to Ojos del Salado is still blocked by snow drifts up to two metres deep, and that it may be a couple of weeks before they open it - depressing news, but not the final word.

Copiapo is a curious town - not a tourist haunt, yet it does have a certain charm with many fine, if crumbling examples of colonial architecture. We go to see the film 'The Doors' at a local cinema - Spanish subtitles with the sound turned down! After a couple of beers we talk about women, climbing, ambitions and dilemmas until the early hours of the morning.

Monday, 26th August

The canaries wake me at 0700. We wander all over Copiapo visiting several mining companies in a futile attempt to arrange a lift into the hills and hear conflicting opinions on the state of the Ojos del Salado road. We also enquire at the Tourist Office, but they also draw a blank, eventually suggesting that we try a vehicle hire company. The local Hertz office, much to our relief, has a four wheel drive vehicle which, after some negotiation, we book with driver at an affordable price.

After a pleasant lunch at La Corsario (The Pirate) restaurant we visit the Museo Mineralogico with its superb, comprehensive collection. I phone my daughter Abigail in Scotland, and wish her a happy birthday - a very clear line. Dinner is indulged at the Bavarian, including excellent dry Gran Vino Blanco from the Undurraga vineyard.

Tuesday, 27th August

Our four wheel drive Chevrolet and driver Hugo arrive at 0600. We pile in with gear and set off in an optimistic frame of mind. After pulling off the tarmac road we head up an endless gorge. After more than two hours we reach a pass and descend to Laguna Santa Rosa then on around the edge of the Salar de Maricunga to Mina Marte (a gold mine at an altitude of over 4000 metres). After refuelling we head back onto the salar, passing an incongruous line of new concrete electricity pylons, to swing east into the Quebrada Colorado. Bouncing over ridges of hard frozen snow, the Chevy is forced up the first steep section. The colours of the surrounding hills are spectacular, rust and caramel streaked with copper green.

Turning a bend near the highest point of Pontezuelo Colorado we are stopped by a plug of deep, hard frozen snow, its surface melted into sharp fins of ice. It looks hopeless. We try to outflank it but the ground is too steep or too soft. Two hours of ice axe hacking and the snow plug has taken on a slightly more level appearance. Putting chains on the back wheels, Hugo tries to charge the Chevy onto the ice. Adrian quickly realizes that the Chevy's four wheel drive linkage isn't. We've been hired a bum steer!

Back we go down the long, dusty road to Copiapo via Mina Marte. After twelve hours of eating dust our tempers are already frayed and we are both near breaking point, trying to negotiate an acceptable deal for another attempt. Eventually, after much haggling, we come to an agreement with the Hertz representatives. At \$500 for the total package we know that we are being ripped off, but now have no other options if we want to get into Ojos. Back to the Rodriguez for a wash and bed.

Wednesday, 28th August

Off we go again. The Rocky is less comfortable than the Chevy, but has much better ground clearance. I sit in the back and get well and truly shaken about. We make it to Mina Marte in about three hours and go through the familiar refueling procedure. Rather than risk the snow plug at Portezuelo Colorado, we decide to take the Rio Lamas track skirting around the base of Tres Cuces. After some steep sections we enjoy a fine drive, dodging the wide snow drifts. Hugo has at last got the hang of crossing high obstacles, slowly easing Rocky over them, rather than the high speed ram of yesterday's journey. Gaining the main drag boosts our confidence - nothing can stop us now - even though we spend more time off than on this camino international!

Our first view of Ojos del Salado is a special moment, and one we've almost given up hope of experiencing. Even at a distance of nearly thirty kilometres this great grey mountain is unmistakable. After frequent detours around hard frozen snow fields, Rocky jolts over one last obstacle and we descend to the stoney plain of Pampa de Barrancas Blancas.

Disbelieving our eyes, a large chalet-like building comes into view. It is a police post, presently unmanned, built at the side of the burnt-out shell of the Hosteria Louis Murray at an altitude of 4500 metres. The Hosteria was built in memory of the geologist, Louis George Murray, who died when the helicopter he was a passenger in, crashed near the summit of Ojos del Salado.

We drive across a wide plain towards Ojos, then bumping over ribbed snow patches, turn into a shallow, sandy valley. Rocky starts to sink. It is 1330 and we can drive no further. Quickly decanting the gear, Hugo wishes us good luck before heading off in haste. We hope he can find his way back through the snowfield maze.

A cold wind blows up the valley, blasting sand into our faces. It is not an ideal place to camp, but we make the best of it, building a windbreak out of blocks of compacted snow. After a gritty meal (the fine sand gets everywhere) we make plans for the Ojos climb. Adrian is in a particularly zaney mood and entertains with various bizarre impersonations. Deprived of music, books and card games, we resort to role play, Basil Fawity and the Major being our favourites. My stomach muscles ache from laughing!

Thursday, 29th August

I wake in the early hours of the morning with a bladder under pressure. Drifting in and out of sleep I put off a visit into the cold dawn until 0700. Taking sleeping bags, food and fuel, we get going at 1030, following the sandy valley with its criss-crossing jeep tracks (how alien they seem in this wild terrain). Reaching the head, we turn left into a curving rocky defile, cross several large snow/ice patches with mini penitentes to reach and cross a wide plain, heading directly towards Ojos. I am going well today - for a change, Adrian's not so good. I cross a grey ridge, then up into an area of pale sandy hummocks. The altimeter registers 5200 metres which is the height of the refugio marked on Simon Frazer's map

Journal

(1985 Alpine, Volume 90). Climbing to the top of the highest mound I spot the orange roof of the Refugio Jorge Rojas. It has taken us three and a half hours from the tent.

A considerable amount of sand and snow has blown inside the refugio, which has a real feeling of polar exploration about it, with rope hung sleeping platforms, wood lining and the names of visitors written on every available space. After some basic housekeeping we embark upon a protracted brewing and eating session. I have now started to imbibe the herb, hoping that the chachacoma effect, rather than age difference, is the explanation for the disparity of performance on previous volcanoes!

Even with the stove roaring and two bodies steaming, it still remains well below freezing inside the refugio. Cold toes are becoming a problem for both Adrian and I. The insides of our leather boots never really dry out (freeze at night) so socks quickly become damp and toes chilled, particularly when standing around. We stuff our damp socks into sleeping bags, then wearing all our clothing, try to get some sleep. Non-sleeping follows its usual pattern, first too cold, later too hot!

Friday, 30th August

We get away to a hard frost, leaving some food in the refugio. A zig-zagging track leads upwards, presumably made when the crashed helicopter was being sledged down the mountain. It gives easy walking but greatly detracts from the mountain experience. Strange feathered clouds race above us, much thicker, darker clouds lie waiting to the west. We are apprehensive. To our disgust, if not our amazement, in less than two hours we reach a second refugio in a shallow grey basin, below the north face of Ojos (we'd heard rumours of its existence). At a height of 5750 metres, Refugio Cesar Tejos Echeverria, named after the aviator who died with Louis George Murray near the summit of Ojos on the 14th April 1984, was donated to the Chilean authorities by the Anglo-American Corporation of South Africa Ltd in 1985. It is a large, sturdy, well equipped refugio, but both Adrian and I are of the opinion that it had no place on the mountain. It is already surrounded by piles of half buried rubbish and is certain to encourage ill-prepared, poorly acclimatized attempts on the mountain. To pretend that it doesn't exist would be foolish, and after considering carrying on we opt to rest up at the refugio, then set off in the early hours of the morning, hoping to make the summit by dawn.

I experience my first attack of diarrhoea since arriving in Chile (such a contrast to India!) but otherwise feel quite good. We set the alarm for midnight and try to sleep.

Saturday, 31st August

After several brews and some food we leave the refugio at 0130 by the light of our headtorches. We take one sack with ice axes, water bottles and food, but wear all our clothing to combat the bitter cold and rising wind. We plod up to gain a large snow/ice patch on the north face and climb on or immediately left of it for an interminable period of time. There is some moonlight, but dark clouds soon drift in, blotting out the pale light and bringing snow flurries. The horizon to the north is a vast wad of charcoal greyness. After four weeks of near clear skies a storm is fast approaching!

We stop at 0515 and half shelter behind a low rock. The cold is bone penetrating (-25oC) with gale force winds blasting into the mountain flank. Adrian vomits violently and the wind whips the foamy mess across my overtrousers. It freezes instantly. We huddle together to retain some warmth. My toes are cold, but not freezing, the vapour barrier lining obviously

doing its job. Adrian pushes his frozen feet under my armpits. I cradle my injured thumb (ligament torn on Licancabur) in the palm of my hand. Our morale has sunken to an all-time low.

The first glimmer of dawn is a thin red flush on the horizon under the leaden clouds. Our frozen spirits rally and optimism returns. The weather still looks serious, but up the endless sliding volcanic special mix we grind. I reach some rocks on the skyline and wait for Adrian who is valiantly carrying the sack. Scrambling round the next outcrop over ice-glazed lava blocks, I feel a surge of energy, the tiredness of earlier falling away, as the summit rock tower, rising from a snow basin, comes into view. The cliffs, eroded remnants of the old upper crater, are splashed with every shade of orange run through with cream and oxidised copper green. The darker, partly detached summit tower is frosted by the freezing wind. After warming Adrians toes, I dash (a relative term at this altitude) across the snow basin and up over snow dusted, shattered rock debris heading for the obvious gap between the tower and the twin summit of the crater rim. A cracked blocky groove leads to the gap then difficult iced rocks lead rightwards, past an assortment of ragged fixed ropes onto a narrow ridge and thence to the summit.

I balance against the buffeting wind, the reality of being on top gradually sinking in. Adrian arrives and with broad grins we embrace and exchange potographs. It is a moment that had seemed elusive, a dream that had so nearly been abandoned. Adrians beard is encrusted with ice. Below, on the great snow bowl of the crater, whale-like plumes of smoke billow into the grey expanse above us. Smells of sulphur taint the clean air but are soon whipped away. Through a brief rent in the clouds, our eyes are at one with the mountain as we gaze down on the salt plains far below.

A dark pyramid-shaped object, perhaps perhaps two feet in height is visible on the Polish summit opposite us on the crater rim. The two tops appear to be of equal height but it is impossible to be certain without a level. There is a metal spike on our summit with half a metal box containing a book, wedged into a crack nearby. I enter our names in large letters on a fresh page. The mist swirls in, dictating a speedy descent.

Down from the world's highest active volcano we begin our descent, searching for an easy way. After a short section of sensible scree we are on unstable blocky lava with a ball bearing coating of pale pumice. A thousand metres of this and I'm nearly finished, legs buckling, the light sack weighing me down like a hod of bricks. Water bottles are completely frozen, so dehydration approaches somewhat quicker than the refugio. We arrive back after a ten hour round trip, crawl into sleeping bags to brew and drink for several hours.

Leaving Cesar Tejos at 1600, into the teeth of a cutting wind, we take less than an hour to reach Jorge Rojas and a substantial dinner. It is a fiery sunset with churning, angry clouds. I am physically very tired, but just can't sleep. By headtorch light I write into the early hours of the morning.

Sunday, 1st September

The wind has been whipping around the refugio all night and a thin, fresh coating of snow laces the visible volcanoes. We indulge in a Sunday morning lie-in, our success on Ojos and indeed the success of the expedition as a whole creating a warm self-satisfied internal glow.

After a protracted breakfast, we head off into the 'weather' - it all looks very much like a 'Scottish winter' and rather serious. A big dump of snow now would play havoc with our

tight schedule for the homeward journey. On the gravel flats we stay close to the edges of the snow/ice patches where the ground is hard frozen. It seems to take an age to return to the tent, but we do it in just two hours. Despite our fears, the tent is intact, although the snow -block wall has largely melted.

Howling winds and bursts of snow add realism to our speculation about being cut off in this strange, hostile, yet strikingly beautiful world. Dinner is a celebration: Patum Peperium on oatcakes, smoked haddock and a carton of pina (pineapple) juice. We spend the evening working out a framework for the expedition report.

Monday, 2nd September

The wind drops, but we can't get to sleep, talking into the early hours of the morning. I go out for a pee at 0100 - the clouds have blown away leaving a starlit, frosty night - a great relief. I eventually drift off, thinking about Abigail, my daughter, and the other people who are special in my life.

The sun's warmth filters through the tent fabric, dripping melted frost onto our sleeping bags. It is our last day in the magical land of the Puna de Atacama. After breakfast I go for a walk up the small hill to the east of camp, then make a round of the hills behind. From the highest hill I get a fine view of Nevado Incahuasi, 6610 metres, with its distinctive wide cratered top. The sun is hot; one small feather of a cloud is lost in the immense blue openness of the desert sky. I am lost in the enchantment of it all.

I experience a chronic case of the runs in the evening, with much smelly wind (Adrian experienced the same earlier in the day). I hope that it clears up before the jeep journey tomorrow! I lie in the tent with churning guts, with much achieved in terms of mountaineering, but little resolved in terms of relationships and my emotional life. Being in the mountains is both an escape and a confrontation; a time to be free, yet a time to reflect and understand. Perhaps when I return to Scotland destiny will have set the course.

Our headtorch batteries are fading, the candles have melted away, the mountains around us are moonlit and silent. Lying side by side in this small tent we are so close, yet isolated in our individual futures. It is another night of dreams.

Tuesday, 3rd September

It is another very cold morning. Fruit juice in a container next to my sleeping bag has frozen solid. A pink flush of dawn over the snows of Ojos is its parting gift. Thankfully the stomach and bowels seem to have settled down, allowing a light breakfast before dismantling the camp. It is a perfect, clear, still morning and we bask in the sun, anticipating the distant drone of Rocky.

Hugo had intended to stay at Mina Marte overnight and to get a very early start. The hours tick away and by mid-day I suggest that we pack the gear down to the police post about five kilometres away.

We trudge down the valley with heavy shoulders. Adrian is angry at the broken arrangement, I'm surprisingly less so. This taste of carrying heavy loads on soft ground puts our original objective into perspective! Reaching the police post in just over an hour,

our increasing concern is the reconfirmation of our Santiago to Heathrow flights, necessitating gaining access to a telephone within the next twenty four hours.

Just as we have given up all hope for the day, we hear the distant drone of an engine and then Rocky comes into sight - a very welcome sight even though Hugo is six hours late.

The journey back to Copiapo is initially stunning, the low sun golden-glowing on the great bulk of Tres Cuces, the last couple of hours a nightmare as Hugo tails two Chevies kicking up thick dust trails - he is driving blind at a speed that allows no margin of error. Rocky's stability and our composure are tested to the limit! I have visions of being pitched through the windscreen, but the Gods are with us and we arrive dust covered but intact in Copiapo at 1930 - a truly amazing piece of driving!

I immediately take a shower at the Rodriguez while Adrian, with equal single mindedness, heads out to have his beard removed. He returns with a ragged half beard, his tangled facial growth proving too much of a drain on the rechargeable batteries of the cutter. I try not to laugh, but fail!

We book a coach to Santiago for the following morning, phone John Phillips regarding flights and other arrangements, then head out for a memorable meal at the Bavarian Restaurant (clams in parmesan, grilled trout, and banana split washed down with some more of the excellent dry white wine from the Undurraga vineyards).

Wednesday, 4th September

Wake up feeling much refreshed. We bid farewell to le patron of the Rodriguez who has become almost a friend, then board the coach. Initially the scenery is obscured by mist and drizzle, but as we head south the sun filters through and our eyes feast on the green fertile landscape. Purple and white trumpet-like flowers carpet the roadside, tall green cacti litter the rolling hills - it is no more beautiful than the desert, just an amazing contrast.

The bus stops at Orvalle, south of La Serena, for a lunch break, where we drink more crisp white wine, then on we go down the Pan American Highway. We pass numerous bays with surf, sand or settlement, often all three, arriving in Santiago at 2000. Back to the Hostal Simpson to dump gear and wash, then out for beers, food, and more beers.

Thursday, 5th September

Walking into the city centre along O'Higgins we bump into Hette and Bettina, the two Danish girls whom we'd met at San Pedro de Atacama. We have a coffee and chat, and arrange to go out for dinner on Friday night.

Adrian has a month's desert dust removed from his big boots by an ambitious roadside 'shoe shine boy'. Passers by are greatly amused by the vigorous polishing activity. Adrian is very pleased with the transformation achieved and the 'shoe shine' delighted with a substantial tip!

We visit Juan Andreas Marambio to present him with a bottle of malt for all his help, then take a taxi out to Santa Carolina Bodega to purchase vast quantities of Chilean wine.

Back at the Federacion offices, John Phillips presents me with a medal from 1983 Chilean Everest Expedition and we discuss the possibility of a joint Chilean/British expedition in the future (1983?).

John and his wife Cynthia drive Adrian and I up Santa Cristobel to view the city lights, and a white stone madonna that graces the summit. Later we all enjoy a fine meal and talk politics.

Friday, 6th September

I rise early to hitch a lift out of Santiago with some young Chilean skiers. They drop me off at Manzano, well up the Maipo valley. They head for the ski slopes (an easy day out from Santiago) whilst I go crag hunting. I enjoy the walk and the scenery, but fail to locate the rocks (the only cragging area near Santiago). The smog layer blanketing the city can be seen at the end of the valley, whilst the Maipo valley vineyards bathe in sunshine. It reminds me of childhood walks in the Peak District, with a great distant sea of dirty grey defining the Manchester conurbation.

After a delicious bottle of chilled Nectar (peach juice) I return to the Hostal via bus and metro (efficient and inexpensive).

I meet Adrian in the Centro Artesanal where we buy a variety of excellent crafts at very reasonable prices. Unlike similar places in Peru, there is no hassle - the traders being helpful and friendly.

In the evening we meet Juan, Hette and Bettina, and enjoy a vast and excellent meal at the Venizia Restaurant, the conger eel being of particular note. After some entertaining street theatre we head back to the Hostal with the girls for a champagne nightcap!

Saturday, 7th September

It is our last day in Chile. It is hard to believe that in two days I'll be back at work in Edinburgh, and Adrian will be at University in Liverpool.

Before leaving, John Phillips kindly allows us access to the Federacion library where we enthuse over old mountain photo montages, making mental notes of the unclimbed lines on peaks within a couple of days travel from Santiago!

John drives us to the airport via the affluent part of the city, with much office new build, then past the 'shanty town' area (not bad by South American standards).

We make our goodbyes (I'm sure that we will meet John again), then spend several hours haggling over our excess baggage. Using various ploys and weight re-distribution we manage to get our excess 30kg through without charge.

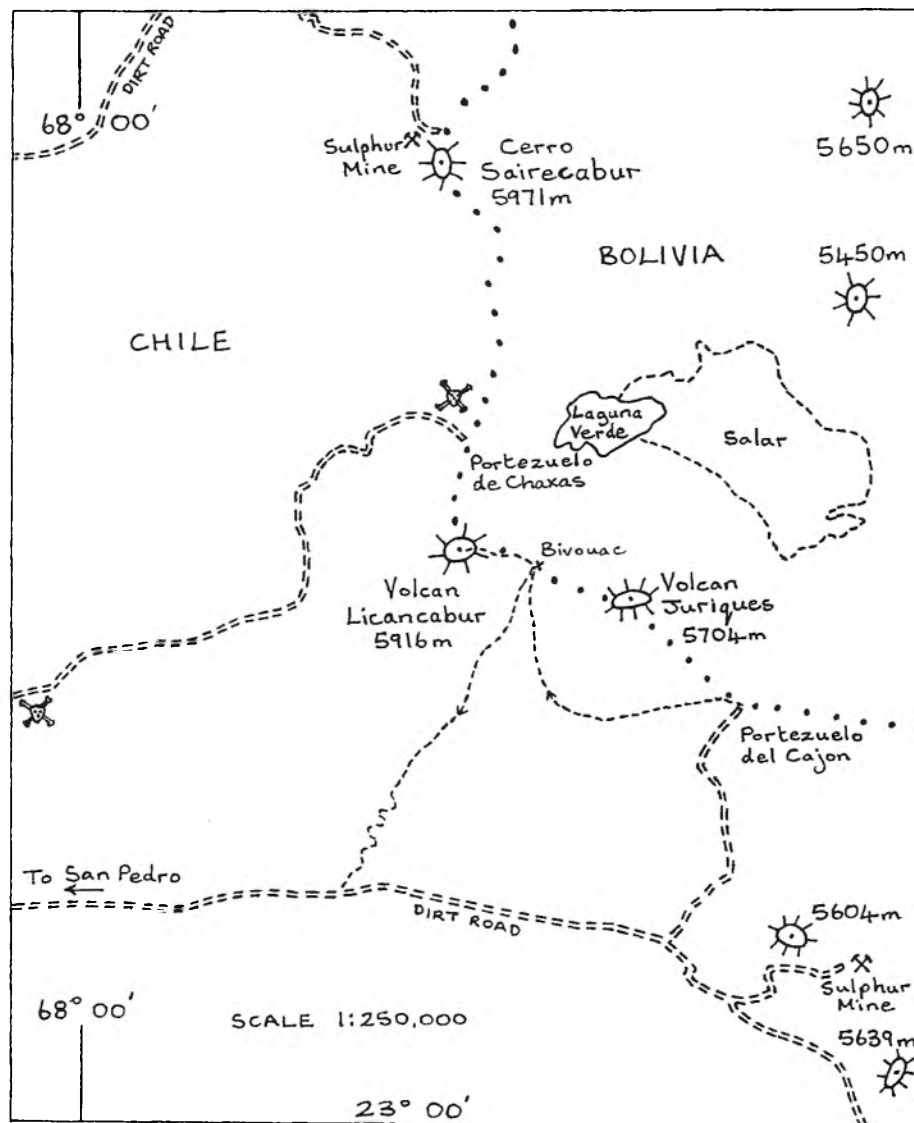
The VARIG service and catering are again excellent. A quick change of planes at Rio and we are off to Heathrow. I express concern over the transfer of hold luggage in such a short time (prophetic!).

Sunday, 8th September

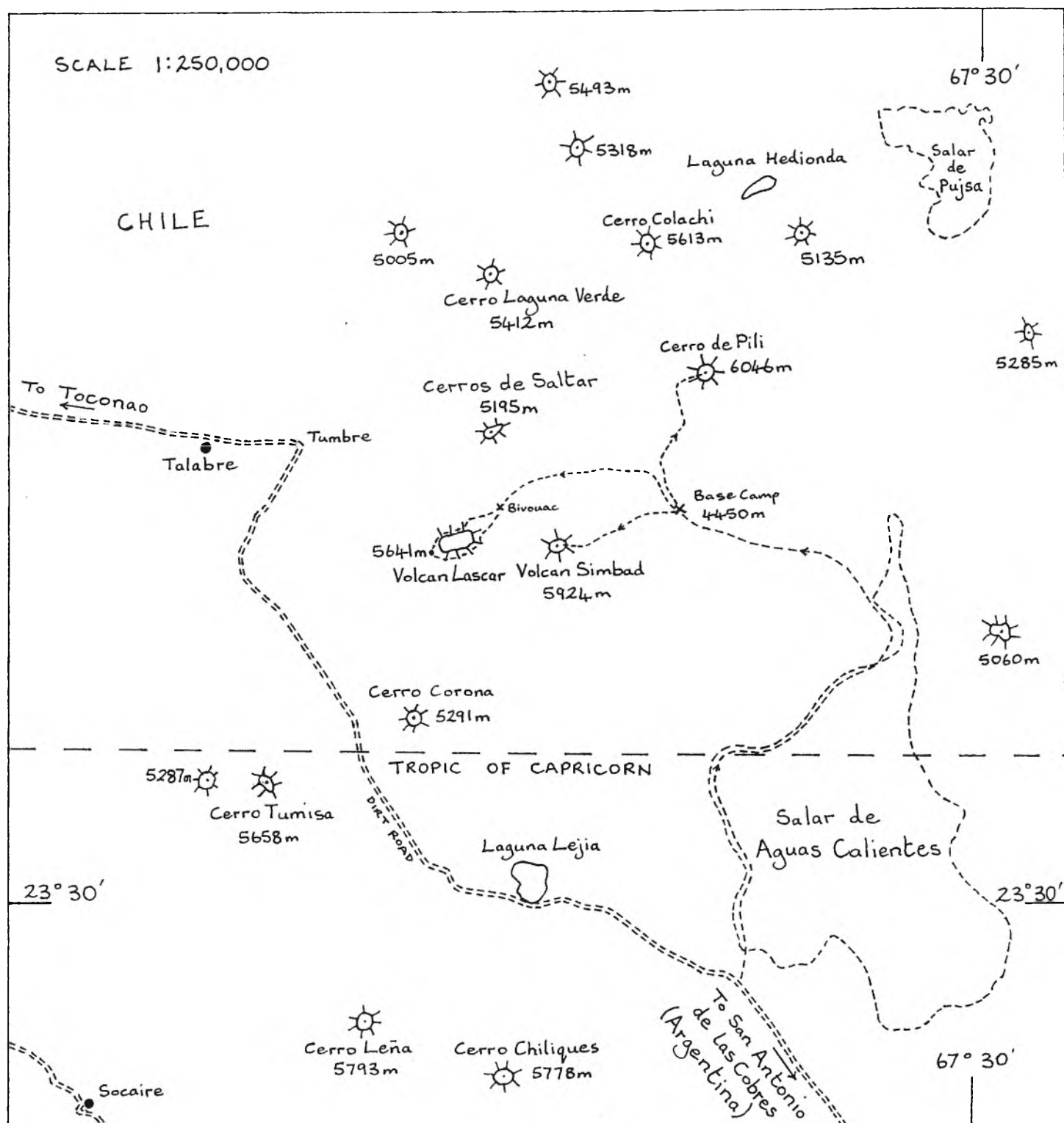
The jumbo touches down at Heathrow, virtually on time but my concerns are realized. The box has arrived but there is no sign of our rucksacks. After much form filling formality we go through the red channel at customs declaring drugs in the medical kit and the chachacoma samples (in the missing sacks). The customs official asks if our 'herb' has spiky five-pointed leaves!

I catch the shuttle to Edinburgh, returning to that other reality, leaving Adrian with his family reception committee. The expedition is now but words, memories, and hopefully some good 35mm slides. It is, however, hard to imagine that we will not return to Chile, a country that has given us much more than we have given in return.

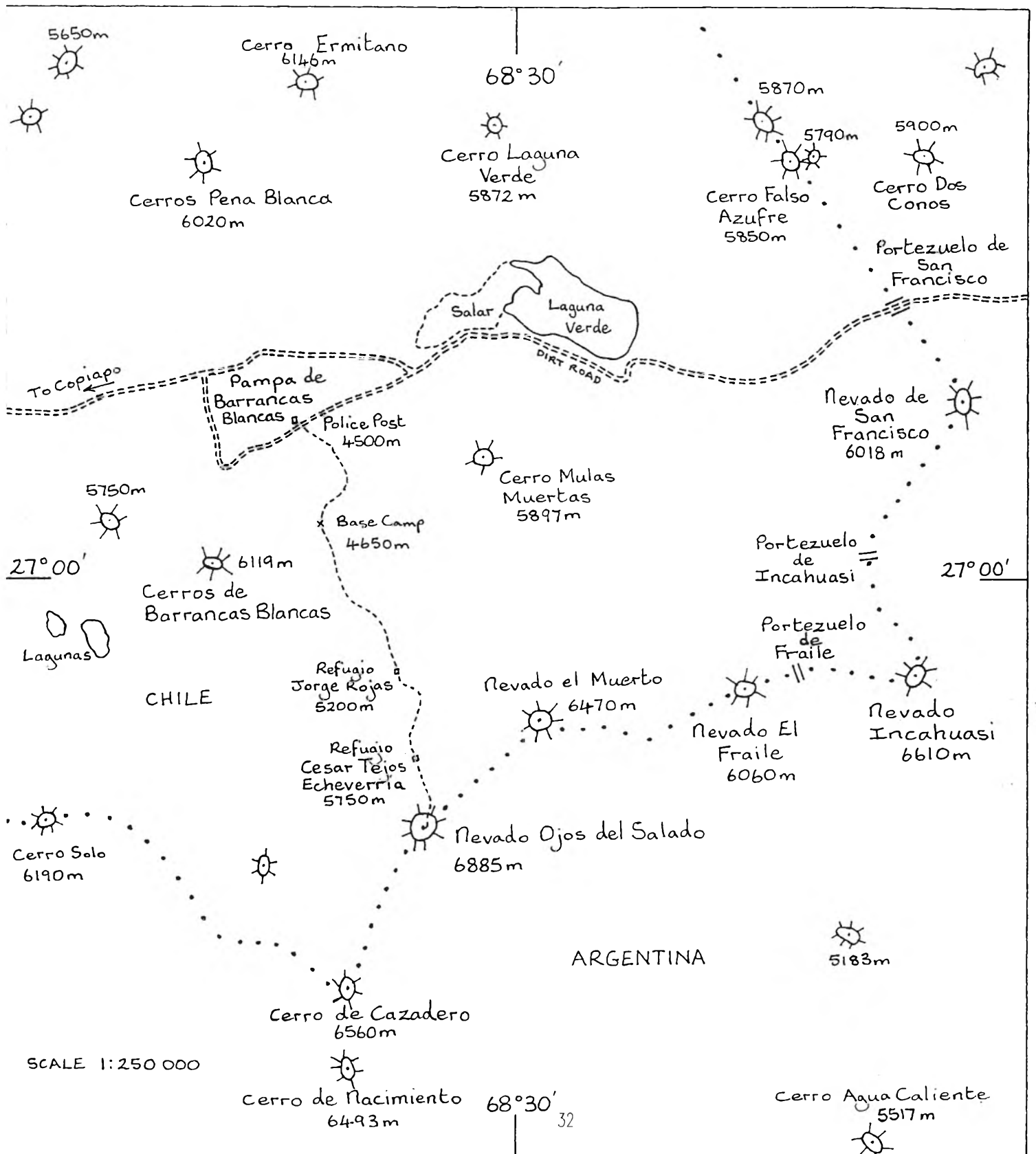
MAP I LICANCABUR



MAP II CERRO DE PILI



MAP III OJOS DEL SALADO



Puna de Atacama

*Mountains forced up
From the earth's core,
Spew coloured ash
Upon the desert floor;
Volcanic colours,
Hues within colours
Dance with the light,
Fade with the night.
We gaze amazed
At this subtle frieze,
A kaleidoscope
Of melting oils;
The earth turned
Inside out by some
Cataclysmic hand,
The primitive form
Of this naked land.*

G E Little, August 1991, Chile

EQUIPMENT

PERSONAL

Graham Little

Adrian Baker

Headwear

Lowe Mountain cap
Excellent windproof, waterproof, warm 'sun hat'.

Lowe Mountain cap
Mountain Equipment balaclava
warm, tightfitting headwear.

Eyes

Reactolite glasses
2 pairs
Carrera goggles

Tinted glasses and Polaroid
clip-ons
Carrera goggles

Underwear

Patagonia lightweight and Expedition weight Capilene tops.
Performed well - very warm.

Tops

Patagonia Synchilla snap
T sweater - heavy guage
Very good
Patagonia jacket - Synchilla
Good

Patagonia Retropile jacket.
Warm but very bulky and
cumbersome
Mountain Equipment Ultra
-fleece mountain jacket.
Good, well sited pockets.
Helly Hansen double pile top.
Favourite warm jacket.

Legs

Patagonia Expedition weight
thermal long johns
Warm and comfortable.
Cobor salopettes. Owned
since 1984. Favourites!

Mekralon long johns.
Jaylin super salopettes.
Ideal, hard wearing legwear.
No cold spots.

Socks

Helly Hansen thermal socks. Excellent.
Thor Lo pads, Mountaineering. Excellent.
Black Diamond vapour barrier liners. Worked well in the
dry conditions as the leather boot never became wet.

Boots

Raichle Ecosse leather boots. Very comfortable and hard
wearing. The success story of the expedition. Ideal for the
dry, rough terrain even at 22,500 ft.

Inners

Sorbothane. Added comfort and insulation.

Gaiters

Wild Rover.
Fully intact at the end!

Berghaus Yeti.
Rad superglued down. Used
on Ojos del Salado only.

Gloves

North Cape Thermals
Disintegrated.

North Cape Thermals
Survived Well.

Wild Country Goretex/Fibre pile integral mitts. Functioned
very well. This line should be re-started!

Rucksacks	Karrimor 60-80L Alpiniste. <u>Good features</u> - good ice axe strap, lid pockets, side straps length, back design. <u>Problems</u> - shoulder straps with inadequate padding and width. Drawcord pulled out.	
Headtorches	Black Diamond 20 Below Zero and lithium cell. Good torch. Lighter weight lithium cell than Petzel.	
Axes	Own personal alpine axes taken but not used.	
Crampons	Grivel F2 clip-ons. Not used.	Salewa and french bindings. Not used.
Outer Layers	Patagonia Storm Jacket. Wind/waterproof and breathable. Cut not generous enough for the layers underneath. A tight fit - larger size than normal required! Pockets good.	
Overtrousers	Patagonia Storm Pants. Good.	Berghaus Goretex overtrousers. Good, needed shoulder straps.
Skisticks	Leki Tour. Better of the two.	Edelrid 3 part. Good for transport. Abused but survived. Essential over terrain with rucksacks.
Sleeping Bags	Mountain Equipment Redline. Nearing the end of its life after many years of excellent service.	Rab 1200 Premier. Never a cold night. Wonderful bag!
Bivi Bags	Wild Country Alpine Good for a sitting Bivi. A lot of velcro and studs.	Phoenix Phreeloader. Simple, practice design. Little to go wrong. Good.
Mats	Green one. Found in rubbish bin in Glasgow.	Karrimor Expedition. Fine
Cameras	Canon EOS 650, 28-70mm zoom. Will be good when he learns how to use it! Dust got into camera and 5/15 were over-exposed.	Olympus AFII 35/70mm lens. Dust/waterproof. Can be used with Mitts on. Flash. Excellent - apart from dust giving awful sliding action on cover. Very good slides.
Altimeter	Thommen 9000m model. Combined barometer. Excellent, very practical.	
Knife	Victorinox. Swiss 2 blade flat.	
Suncream	Boots Factor 25 cream. Ski sunstick for lips.	

Small Sewing Kit/wash kit	Graham only.
Vicks Inhalers	Absolutely essential and very addictive!

SHARED EQUIPMENT

Tent	Wild Country Mountain Quasar. An excellent, strong tent which withstood duststorms amazingly well. Very stable. Ventilation a problem when the doors were fully shut.
Cooking	<p>1 metal spoon each.</p> <p>Nalgene bottle - wide neck, useful when water partially frozen. Good seal, and tough.</p> <p>1 plastic cup</p> <p>2 x 1.5L Aluminium pots - 1 clear fluids, 1 soup.</p> <p>Stove - MSR-XGX. Excellent cooker. 4 star petrol was used which led to carbon deposition. Regular pricking and cleaning of the cable was required in 5 weeks of intensive use. Very hot and highly recommended. Worked well at 5750m.</p>
Film	Kodak Kodachrome 64.
Waterbags	Survival Aids Liquipak 7 Litre. These leaked after a few days use. The water had frozen and this may have contributed to their failure. They are a good idea, but a more durable inner would be less likely to have disastrous consequences in a desert.
Plastic Waterbottles	20 litre. Locally purchased in Chile. Good quality, very pretty colours.
Equipment Box	Roadair Prestwick. More of a way of life than a box. A symbiotic relationship was achieved. Food, gear, transport, secure, seat, paddling pool, gin bin. Don't leave home without one.
Stuffsacks and Plastic bags	Many!

THINGS WE SHOULD HAVE TAKEN

Walkman and speakers.
Cards, games, books!!
Pee bottle.
Proper karrimat for Graham.

FOOD AND WATER

DIET

The 2nd most important part of the trip, water being the first!

Water

'You don't miss your water 'til your well runs dry'

Living in the desert has an enlightening effect on one's appreciation of water. Normal daily requirement is about 3 litres. Altitude, dry air, warm temperatures and physical exertion increase this to 4 -5 litres. At altitude more water is lost through the lungs, kidneys and skin. Dehydration will lead to reduced endurance, early exhaustion, frost bite, and strokes.

- A. On Licancabur we took 8 litres each which lasted Graham 4 days and myself 5 days. We were unable to find any snow to melt or any running water. We were both vomiting with altitude sickness due to the dangerously fast ascent. Fluid intake was rationed to 2 litres a day, one litre of which was probably vomited for 3 days. The walk back across the high plateau (4000m) took Graham 5 hours and he hitched a lift into San Pedro de Atacama. It took myself 6 and a half hours, which meant there was no lift. I also wasn't sure whether Graham had got a lift, or had not made it to the road, possibly due to an injury in the quebradas. An extra night out was the result. On returning to San Pedro de Atacama it took Graham 12 hours, and myself over 24 hours to return to 'normal' (the typist wants to know who he's kidding. You'd have to be normal to start with!). Clinically, I was probably dehydrated by 5 to 6 litres.
- B. For the 10 days in the desert we took:
1) 60 litres in 3 x 20 litre local containers
2) 14 litres in 2 x 7 litre bags
3) 2 litres in 2 x 1 litre bottles
Total of 76 litres = 3.9 litres per man per day.
This was ample. We had rest days between peaks which reduced consumption. We carried 5 litres into Cerro de Pili and 6 litres for the bivi at the base of Lascar. This kept us well hydrated and our performance reflected this.
We had sufficient at the end for Graham to wash his hair! Kept under the tent flysheet, the water containers did not freeze (4450m). In the event of this happening there were enough snow drifts in the area to melt. Only 60 km south of Licancabur with considerable variation in lying snow.
- C. Ojos del Salado
Being 500 km further south it is more affected by the winter. There was plenty more snow lying around - enough to prevent us getting in, initially. Having learnt some very valuable lessons on Licancabur we again took in 56 litres of water. This was not taken above base camp for the above reasons.
We melted snow with the MSR. This provided more than enough fluids. We were very well hydrated before the summit climb. We took 2 x 1 litre bottles, but these froze partially (-20°C). The wide necks enabled us to drink some water. The round trip from the top Refugio took us 10 hours, so we did not become seriously dehydrated.

Conclusion	<p>The greatest health problems encountered on the whole trip were when there was inadequate water. Altitude sickness, vomiting, frost-nip, chest infection.</p> <ol style="list-style-type: none"> 1) Take secure containers. 2) Purify if at all in doubt - boil or 3 drips iodine per litre. 3) Take the best stove money can buy and know how to maintain it. 4) Keep well hydrated at all times. Especially if ill or vomiting etc. 5) Flavouring drinks with powders helps to cover up the taste of iodine/chlorine.
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FOOD

'Carbohydrates lower the summit'.

Rather than buy dehydrated meals and specific hill foods, we went to the supermarket and bought what we liked eating. The priorities were what we both liked, and what were the 'numbers'; calories over 500/100g, and carbohydrate over 60g/100g. A conscious decision not to take any food that required cooking (except soup) was taken. This ensured that the food was more accessible and that less fuel was required.

The rationale was that fats use more oxygen to be metabolised than carbohydrates. So, despite being more calorific (9kcal/g compared to 4.5kcal/g for carbohydrates), they give less available energy the higher you go.

The diet was vegetarian.

Very popular:	<p>Shortbread Mixed nuts (salted and unsalted) Oat cakes Gentleman's relish (Patum Peperium) Trackers Drink flavours Whitworth's banana chips Batchelors soups</p>
Good	<p>Marzipan Chocolate Sweets Honey Dried fruit</p>
Useful	<p>Margarine</p>
Awful	<p>Pepperami sticks (left in a hotel drawer somewhere)</p>
Local Produce	<p>Very good for breaking up the monotony and titillating the palate.</p> <p>Cheese Onions Garlic Jam</p>

Chili sauce
Tinned fish - excellent
Bread
Fresh fruit - as much as possible

All the hill-food was purchased at Sainsbury's, Edinburgh and freighted out in 'The Box', arriving in a good state - even the biscuits.

Treats are very important; garlic, onion, chili sauce, fresh fruit and fish were all 'luxuries' but made a huge difference to our appetites and gave us something good to look forward to.

Ideally we should have been eating 5000 - 6000 kcal per day. At base camp we probably achieved 4000 - 5000 kcal per day. When on the hills it was much less - a chocolate bar and some biscuits. The reasons were weight, little time to eat, Anorexia, and bulk.

As we were travelling fast, hydration was more of a priority and we were able to be back within 24 hours. We were able to do so much in such a short time due to the rest days when we had the chance to replenish reserves.

Prior to the expedition;			Post expedition
Graham	Height 187 cm	79kg	78kg
Adrian	Height 175 cm	72kg	70kg

Graham had been 'in training', drinking plenty of wine and beer before departure. I had my appendix removed four and a half weeks prior to flying and my muscles had turned to jelly.

Local Eating

Water did not need to be purified, although that taken to base camps was purified as gastroenteritis would have been disastrous. The local food was excellent - especially fish dishes.

Next Time

Mayonnaise sachets
Marmite
Peanut Butter)
Tartex Pate) tubes/plastic
Cheese Spread)

MEDICAL

'Improve or else'

I am grateful to Dr David Hillebrandt for this advice on what to take and Dr Martin Watt for his invaluable help in equipping us. As this was a two man trip in remote areas, there was a limit as to how much could be done if someone fell ill. Understanding this can be regarded as essential psychological preparation.

Problems encountered;

Chest Infection (AB, 7th August), following the ascent of Licancabur and severe dehydration, exhaustion and anorexia. Treatment: Cephadrine 500 mg 4 times a day, for 5 days. This cleared very well with a complete return to normal.

Vomiting (AB). Altitude sickness. Treatment: Buccastem. Outcome: cured but still very anorexic.

Chronic Insomnia (GEL). Sleeping tablets had little effect.

Headaches (both members). Altitude and dehydration. Treatment: Naproxen - excellent for these headaches.

Sprain to left thumb (GEL). Hit on the descent of Licancabur. Unable to rest, so it became a recurring problem. Poor circulation in the tip of the thumb on Ojos del Salado.

The Medical Kit

It is pointless having the best medical kit in the world if it is miles away and you don't know how to use it.

Personal	Each	Dressings 2 x Melonin Pads Frusemide 40mg x 6 Dexamethasone 2 mg x 10 - Organon Laboratoriz Steristrips Asprin, Naproxen - various Temgeric, Baccustrem
	Adrian Baker	No 3 Airway 1 course cephradine 1 course metranidazole Elastoplast strapping

As we were operating up to 2 days away from our base, antibiotics were carried to treat an infection or open wound promptly. Small dressings and improvisation for larger dressings, splints etc, from clothing, karrimats, poles etc.

Base Camp Kit

This had to be portable but comprehensive enough to deal with a Jo Simpson epic! We were operating 40 -64 km from the nearest help and up to 10 days away from our pick-up, with no radio communications. The kit (eventually) fitted into a 2 litre ice cream container and weighed 2 kg.

Contents	3 Melonin Dressings
	10 gauze swabs
	2 2.0 silk sutures
	2 3.0 Ethilon sutures
	1 3.0 Catgut suture
	2 Bactigras dressings
	steristrips
	scissors
	forceps
	artery forceps
	20 ml Chlorhexidine
	20 ml Lignocaine 1 %
	25 ml water for injection
	5x2 ml (20mg) Nubain injection (Dupont)
	5x1ml (20mg) Papaveretum injection*
	6 x21G needles
	3x5ml syringes
	1x16G venflon
	1x14G venflon
	1x21G butterfly
	1x15 scalpel blades
	2x20 scalpel blades
	2x1:1000x1ml Adrenaline
	4g Chloromycetin cream
	15g Fusidic Acid cream
	20ml iodine
	3x10x250mg Ciprofloxacin (Bayer)
	30x200mcg Temgesic*
	20x500mg Metromidazole suppositories (Rhone-Poulmec
	41x200mg Metromidazole tablets Rorer)
	4x10x500mg Cephadrine tablets (Bristol-Meyers
	2x1g Cephadrine injections Squibb)
	60x3mg Prochlorperazine sub-lingual (Reckitt & Colman)
	12 Anusol suppositories
	6x100mg Diclofenac sodium
	36x250mg Naproxen
	40x300mg Aspirin
	36x30mg Codeine
	30x150mg Ranitidine
	14g foley catheter
	Spare sunglasses carried at all times
	Fisherman's Friends
	Vicks inhalers

* Controlled drugs - requiring Home Office clearance for customs

I am grateful to these Sponsors for their invaluable help in supplying the following:

Eileen Rowley	Drug Information Crosshouse Hospital, Kilmarnock
Mr Moran, Surgeon	Crosshouse Hospital, Kilmarnock for the excellent job on my appendix!
Kathy Filcher	London Sports Medicine Institute for dietary advice
Dr A M Raymond	Rekitt & Colman for Buccastem
Miss A Walker	Bayer for Ciproxin
Dr P F Wood	Bristol Myers Squibb for Velosef
Mr K A Pieniazele	Rhone-Poulmec-Rover for Flagyl
Gerry Kennedy	Du Pont for Nubain
	Organon Laboratories for Dexamethazone

Peak Heights

As already mentioned, it was the name Tocopuri, with its erroneous height of 6755 metres, that first attracted us to this fascinating area of the Andes. It is therefore ironic but fitting that a secondary objective of the expedition was to research peak heights and names.

Although the wide diversity of published height values for many peaks is a source of intrigue and speculation, there is a natural desire to arrive at absolute peak values. However, this objective is (and some would say thankfully) unattainable without a modern, sophisticated triangulation network tied to an accurately heighted and measured baseline or through the application of GPS (Global Positioning System) technology.

The current Chilean 1:250,000 series mapping (1985) offers the most reliable height values, although certain important sheets, notably SG-19-15, Nevado Ojos del Salado, are still not available to the public. An elevation accuracy of ± 30 metres is claimed (thus giving a potential maximum variation of 60 metres). The 1:250,000 series (100 metre contour interval) is derived from 1:50,000 military mapping (50 metre contour interval) originated from 1961 aerial photography.

Many of the highest peaks of the Puna de Atacama lie well inside Argentina and Bolivia and are therefore not covered by Chilean mapping. Mapping available for these areas is of considerable vintage, and is usually of relatively small scale with peak heights of very dubious accuracy. However, a recently produced Argentinian 1:50,000 military map should improve this situation.

Peak heights on maps of 1:1,000,000 and smaller are largely unreliable as are values in the majority of standard reference books.

A Thommen TX altimeter-barometer (9000 metre reading) was carried to the summit of all peaks climbed and within a reasonable margin of error, confirmed the height values on the 1:250,000 Chilean map series (but see comments under Ojos del Salado).

Below, comments are made on height values and other useful information given for the peaks climbed and for a number of other peaks where extensive research has been undertaken. Happily a few mysteries remain unresolved! The peaks are dealt with from north to south.

Keen students of etymology may like to grapple with the difference between a 'volcan', a 'cerro', and a 'nevado'!

Cerro de Tocopuri - 5808m - 22° 26' south/67° 53' west

A prominent volcano on the main Andean chain due east of Calama on the border between Chile and Bolivia. To the south of the summit lies a large broken crater. This mountain is given the erroneous height of 6755m in several text books and on many maps.

Cerro Sairecabur - 5971m - 22° 43' south/67° 53' west

A high, if indistinctive volcano on the Chilean/Bolivian border to the north-east of San Pedro de Atacama on the main Andean chain. Sulphur is extracted to the north of the summit and the mine is accessed by a dirt track from San Pedro (four wheel drive vehicles only).

Volcan Licancabur - 5916m - 22o 50' south/67o 52' west

A classic symmetrical dark volcanic cone dominating the area and appearing to be higher than Cerro Sairecabur to the north. Licancabur straddles the Chilean/Bolivian border where it swings to the east. A small crater containing a frozen lake, indents its summit, which holds ruins dating from pre-Columbian Indian activity. A much more extensive ruin complex lies to the north of the col between Licancabur and Volcan Juriques to the east. The views from the summit of Licancabur are expansive and magnificent.

Cerro Zapaleri - 5652m - 22o 48' south/67o 10' west

A remote volcanic peak, swelling from a high desert plain defining the junction of Chile, Bolivia and Argentina. Definately one for the discerning peak bagger!

Cerro de Pili - 6046m - 23o 17' south/67o 37' west

A splendid, rarely climbed volcano, the highest in the mountain group to the east of the Salar de Atacama. On the east side of the summit crater a relatively recent collapse of the crater rim has created a great gash with a large rock tower and much loose rock. Pili is referred to as Cerro de Acamalachi on some maps.

Volcan Simbad - 5924m - 23o 21' south/67o 41' west

A massive, rarely climbed volcano, ten kilometres south-west of Cerro de Pili. Many maps show it as Volcan Aguas Calientes, although the name Simbad has local useage. The summit crater is a wide basin surrounded by rock towers ringing the crater rim and holding a remarkable circular pool of rose coloured ice.

Volcan Lascar - 5641m - 23o 21' south/67o 44' west

A complex, active volcano six kilometres to the west of Volcan Simbad. A permanent cloud of sulphurous gas drifts from the crater, visible at a distance of over fifty kilometres. The spot height of 5154m given on the 1:250,000 map applies to the base of the crater whilst the true summit lies to the south-west above a smaller, shallow crater. The vast main crater is nearly 500 metres deep and ringed by great, banded, multicoloured cliffs. A point on the south-east lip of the main crater appears to be of similar height to the main summit. A relatively recent lava flow runs out to the north-west for about five kilometres towards the pasture of Tumbre.

Volcan Puntas Negras - 5852m - 23o 44' south/67o 31' west

An obscure volcano at the same latitude as the southern edge of the Salar de Atacama on the eastern edge of a vast area of lava. On some maps it is given a false height of 6500m. A higher peak, Cerro Miniques, 5910m, lies twenty four kilometres to the west-south-west.

Cerro Falso Azufre - 5850m - 26o 48' south/68o 22' west

Cerro Dos Conos - 5900m - 26o 48' south/68o 17' west

These two volcanoes lie to the north of the Portezuelo de San Francisco. Both have been credited with much greater heights (6790m and 6860m respectively) and on some maps the prefix Nevado, rather than Cerro, is used.

Nevado de Tres Cruces - 6356m - 27o 6' south/68o 47' west

A vast bulk of a mountain dominating the skyline to the south-east of the Salar de Maricunga. As the name suggests, it has three main tops sitting astride the Chilean/Argentinian border. The highest top was originally thought to be 6630m and was first ascended by a Polish expedition in 1937.

Nevado Ojos del Salado - 6885m(6893m) - 27o 06' south/68o 32' west

This retiring giant of a mountain, east of Capiapo, astride the Chilean/Argentinian border, has been the subject of endless debate and curiosity. It was first identified as Peak 'e' by the Argentinian-Chilean boundary commission at the turn of the last century, but it was only after the Polish ascent in February 1937 that it was given the name Ojos del Salado (eyes of the salt plain). This name had previously been attributed to a much lower foreground peak. The Polish ascent had been to the highest point on the crater rim (cairn built) and it was to this point that the legendary Austrian mountaineer, Matthias Rebitsch, climbed in February 1956. He attempted to ascend a rock tower, detached from the crater rim, which he considered to be the mountain's highest point, but failed due to cold and wind. However, the rock tower was climbed only four days later by a Chilean party led by Captain Rene Gajardo.

The height of Ojos del Salado has been the subject of much speculation, but the value of 6885 metres, produced by H Adams Carter's American Alpine Club survey expedition of 1956, is still the most reliable published value. A recent Chilean value of 6893m is often quoted, and a height of 23240(7084m) is shown on current ONCs (Operational Navigational Charts). My altimeter in fact, only registered 6810m on the summit (after resetting it to a value of 5750m at the Refugio Cesar Tejos Echeverria), but as dramatic weather changes were in progress at the time, this reading can be regarded as of little value. Recent Argentinian military mapping is said to record a height of 6862m, a figure fairly close to some earlier Chilean values. The outlying western top is at a height of c6720m.

Ojos del Salado is without doubt the world's highest active volcano, with smoking fumaroles at a height of c6500m in the wide crater to the south-west of the summit. A small upper crater lies at a height of c6700m immediately below the summit cliffs. Until definitive heighting proves otherwise, it can also be regarded as the second highest peak in the western hemisphere (after Aconcagua).

Ojos del Salado is now desecrated by two refugios and a connecting track, and receives a number of ascents every year (almost always during the summer months). However, although under ideal conditions it is readily accessible and without technical difficulty, apart from the final tower, it still remains a remote, high mountain with the possibility of serious storms at any time of the year. Those who underestimate this Atacama giant do so at their peril!

Nevado Pissis - 6779m - 27o 46' south/68o 46' west

Another of the Atacama giants, Pissis, a massive twin-topped volcano, lies well inside Argentina nearly eighty kilometres to the south-south-west of Ojos del Salado. It was first climbed by the adventurous Poles in February 1937 and has had only a handful of ascents since then. Unlike Ojos del Salado, a remarkable consistency of heighting has existed - until recently!

In 1986 Johan Reinhard's Anglo American expedition climbed Pissis, but were unable to confirm earlier altimeter readings, suggesting that it was in fact higher than Ojos del Salado. The recent Argentinian military mapping, already referred to, gives Pissis a height of 6882m which brings it into contention as the second highest mountain in the western hemisphere.

Cerro Bonete - c6750m - 28o 00' south/68o 45' west

Without doubt the most intriguing volcano in the Puna de Atacama and indeed one of the most mysterious peaks in the whole Andean chain. On much early mapping, two quite separate peaks are depicted and named Cerro Bonete Grande and Cerro Bonete Chico. Heights attributed vary, but values up to 6872m and 6850m respectively are given.

Walter Penck, an intrepid explorer and geographer, claimed an ascent of Bonete Grande in 1913, but Vincente Cicchitti cast doubt on this claim when he climbed the peak in 1954.

As recently as 1971 the American Alpine Club Journal supported the existence of two quite separate Bonete peaks. After extensive research of mapping and literature relevant to this area, I am convinced that there is only one Bonete mountain mass, albeit a massive, broad specimen and that the highest point, near the southern end of the massif, just to the south of latitude 28o 00', should be referred to as Cerro Bonete. The names Bonete Grande and Bonete Chico should be dropped.

Johan Reinhard's afformentioned 1986 expedition traversed along the mountain's great north ridge over many false summits to eventually top out in an electric storm. Their altimeter registered close to 6800m! This was probably only the third ascent of Cerro Bonete. It must remain the most fascinating, and least visited of all the great volcanic mountains of the world.

BRITISH 1991 ANDEAN VOLCANOES EXPEDITION

ACCOUNTS

INCOME		EXPENDITURE	
Mount Everest		Travel UK	180
Foundation Grant	#500	Travel -	
		Transcontinental	1410
British Mountaineering		Travel Chile (Incl.	
Council Grant	#300	jeep/driver hire)	741
		Accommodation	115
Winston Churchill		Mountain Food	201
Travel Fellowship Award		Local Food	219
plus personal contributions	#3865	Equipment	798
		Medical	235
		Film	166
		Insurance	110
		Mapping	31
		Research Costs	115
		Report Publication	-
		Costs (estimate)	250
		Miscellaneous	94
Total	#4665	Total	#4665

Pound Sterling

Useful Addresses

British Mountaineering Council
Crawford House
Precinct Centre
Booth Street East
Manchester
M13 9RZ
Tel: 061 273 5835

Mount Everest Foundation and Expedition Advisory Centre
c/o Royal Geographical Society
1 Kensington Gore
London
SW7 2AR
Tel: 071 581 2057

Winston Churchill Memorial Trust
15 Queen's Gate Terrace
London
SW7 5PR
Tel: 071 584 9315

Federacion de Andinismo de Chile
Almirante Simpson 77
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Santiago
Chile
Tel: 010 56 2 222 0888

Special thanks to:

Professor Derek Fabian Professor John Coote Bob Reid	For their faith and support.
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John and Cynthia Phillips	For their hospitality and assistance in Chile.
Juan Andreas Marambio	For his help and company in Santiago.
Eduardo Yanjari & Ricardo Moreno	For their friendship in San Pedro de Atacama.
Juan Sota Ajuayo	For his skillful driving.
Hugo (the Copiapo driver)	For his determination and stimulating driving.
Abigail Little	For understanding her Dad's need to go to the mountains.
Maureen Prior	For typing this report from an assortment of hand-scribbled pages.
Patagonia	For equipment donations.
Kodak Ltd	For special terms.
Mainair Sports	For special terms.
VARIG	For generous baggage allowance.
MEF/BMC/WCMT	For generous grant assistance.
and to all family and friends	

Note: For medical acknowledgements please see the relevant section.

VOLCANOES CLIMBED

Volcan Licancabur	5916m	5th August 1991
Volcan Simbad	5924m	15th August 1991 *
Cerro de Pili	6046m	17th August 1991 *
Volcan Lascar	5641m	20th August 1991
Nevado Ojos del Salado	6885m	31st August 1991 *

*Probable first British ascents

CONCLUSION

The expedition was unable to tackle its primary objective (the Chilean-Argentinian crossing) due to the inaccessibility of the whole mountain group from late July to late August. However, a change of plan (and flexibility is the key to the expedition game) resulted in a very successful outcome with ascents during the month of August, of five major volcanoes including Nevado Ojos del Salado, 6885 metres.

Both members of the British 1991 Andean Volcanoes Expedition feel privileged to have seen the uniquely beautiful scenery of the Puna de Atacama, to have climbed some of the highest volcanoes in the world and to have enjoyed the hospitality and honesty of the Chilean people.

Graham E Little and Adrian W T Baker

POSTSCRIPT

As a direct result of discussions with John Phillips, President of the Federacion de Andinismo de Chile, it seems very likely that a joint Chilean/British expedition to climb Monte Sarmiento, c2300 metres, and surrounding peaks in Terra del Fuego, will be organized for 1993.



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