



PATAGONIA '85

A joint Anglo-Chilean Venture
to an unexplored region of the Patagonian Ice-Cap



EXPEDITION REPORT

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THE ANGLO-CHILEAN PATAGONIAN EXPEDITION

GENERAL EXPEDITION REPORT

Abstract

An account of a joint Anglo-Chilean expedition to the Seno Andrew, terminal section of the Peel Fjord, XII Region, Chile. The expedition completed a programme of scientific and geographical exploration of the western edge of the Southern Patagonian Ice-cap, between 13th November and 28th December 1985.

Major Sponsors : **BRITISH AIRWAYS**

Patrons: Sir Vivian Fuchs F.R.S. (Ex-president of the Royal Geographical Society and Leader of the Transantarctic Expedition 1955-58).

Sr. Edmundo Pisano (Senior Botanist at the Patagonian Institute, Universidad de Magellanes, Punta Arenas, Chile).

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2.

SUMMARY

The Anglo-Chilean Patagonian Expedition carried out pioneering exploratory and scientific work in Seno Andrew, the north-east arm of the Peel Fjord, South Chile, during November-December 1985. The Expedition attempted an ascent of 2438 m Cerro Aguilera, an unclimbed peak on the western edge of the South Patagonian Ice-cap. An alternative sporting objective was a north-south traverse of the Ice-cap, between Seno Andrew and the Dickson Glacier, passing through a broken section of terrain which remains the key section to a complete traverse. Despite gaining access to the Ice-cap and obtaining original reconnaissance information, neither objective was completed due to the severe weather encountered.

A programme of scientific work based on the fjord edge was successfully completed, including a series of pioneering botanical collections. Preliminary results of biological and geological studies are presented here, with suggestions for future research in the region.

SUMARIO

La expedición Anglo-Chilena a la Patagonia llevó a cabo estudios pioneros de exploración e investigación científica en el Seno Andrew del Fiordo Peel en el Sur de Chile entre Noviembre y Diciembre de 1985. La expedición hizo la primera tentativa de escalar el Cerro Aguilera de 2.438 metros, un cerro sin acenso al lado oeste del Campo de Hielo Patagónico Sur. Otro objetivo alternativo en el área de andinismo era una travesía del Seno Andrew al Ventisquero Dickson pasando por terreno muy accidentado que todavía se considera de importancia clave para una eventual travesía completa del Campo de Hielo Sur. Apesar de haber alcanzado establecer un campamento en el hielo y de haber obtenido información de reconocimiento original, no fue posible realizar ninguno de estos objetivos debido a las condiciones climáticas adversas.

Fue realizado con éxito un programa de investigación científica efectuado desde el campamento base en la orilla del fiordo, que incluía una serie de colecciones botánicas pioneras. Se presentan en este informe los resultados preliminares de los estudios biológicos y geológicos, junto con recomendaciones para investigación futura en la región.

3.

PERSONNEL

From the U.K.

Matthew Hickman (22)

Leader, third year student of Modern Languages at Trinity Hall, Cambridge University. Cambridge Ecuador Geological Expedition 1984, mountaineering experience in the Chilean and Ecuadorean Andes, ski-mountaineering experience in the Chilean Andes and the French Alps (BMC Ski-Mountaineering Course 1985). President of the Cambridge University Explorers and Travellers Club 1984-1985. Spanish speaker and resident in Santiago since 1982.

Andrew Jeram (21)

Joint-Leader, formerly at Magdalene College, Cambridge, and presently doing post-graduate studies in Geological Sciences at Manchester University. Cambridge Ecuador Geological Expedition 1984 and the Cambridge Spitzbergen Expedition 1983.

Bruce Herrod (27)

Logistics Officer, Darwin College, Cambridge, working as a research geophysicist at the British Antarctic Survey, Cambridge. Royal Holloway College Meteorological Expedition to Svalbard in 1978, plus three seasons fieldwork in Antarctica with the British Antarctic Survey.

Adrian Newton (22)

Scientific Officer, formerly at Clare College, Cambridge, and presently doing post-graduate studies in Forest Ecology at Trinity Hall, Cambridge. Extensive fieldwork experience in Europe.

Nigel Harvey (24)

Formerly an instructor at the Centro de Educacion al Aire Libre, Lagunillas, Chile. Extensive mountaineering experience in the Central Cordillera of the Chilean Andes. Kayaking Expedition in the Chilean Archipelago in 1984-1985. Spanish speaker, resident in Santiago with extensive local knowledge of Chilean Patagonia.

Colin Nicol (36)

Former Meteorological Officer with the British Antarctic Survey. Extensive field experience with the Survey in Antarctica and South Georgia spanning ten years and including spells as Base Commander at Halley Bay.

Sue Penn (27)

Graduated in Botany from Nottingham University. Field Scientist with the Nature Conservancy Council.

From Chile

Francisco Medina S. (24)

Climbing instructor with the Club Andino Italiano, Santiago. Formerly an instructor at the Centro de Educacion al Aire Libre (CEAL), Lagunillas.

Dionis Isamitt D. (36)

Expedition Doctor, Hospital del Torax, Santiago. Member of the Sociedad Chilena de Exploracion. Previous Expedition experience in Southern Central Chile.

Edmundo Pisano V. (67)

Senior Botanical Researcher at the Patagonian Institute, Punta Arenas. Wide experience of the flora and terrain of Patagonia and Tierra Del Fuego.

Cabo 1 Juan Miranda C. (31)

Seconded to the expedition by the Chilean Navy to supervise the handling of the "Zodiac" rubber inflatable boat loaned by the Navy, and to ensure radio contact with the Naval Authorities on the Thomson UHF radio also loaned by the Navy.

"The Land of Tempest"

Thus the British explorer, Eric Shipton, titled the accounts of his various expeditions to the Southern Patagonian Ice-cap, and thus it is remembered by all who have ventured onto it or sought shelter in the forests that flank it.

The Southern Patagonian Ice-cap is a vast ice plateau which stretches for for 450 kilometres down the western coast of South America where the Andean Mountain ranges runs out into the Straits of Magellan. It is situated approximately between latitudes $48^{\circ}15'$ and $51^{\circ}41'S$, and $75^{\circ}05'$ and $73^{\circ}51'W$ of Greenwich, and encompasses an area of approximately 14,000 square kilometres. Nine tenths of this area is under Chilean jurisdiction while the remainder falls in Argentine territory. The exact definition of the border poses a problem which has yet to be solved by the respective governments, although a number of the highest peaks are recognised by both parties as divisory points. Political niceties however fall rapidly into the background when the traveller comes face to face with the enormity of the Patagonian landscape where Nature alone reigns supreme.

The exact geographical denomination of the Patagonian Ice-Cap is a matter of some discussion. The Swedish geologist Percy Quensel was the first to describe the nature of the glaciation as "inlandsis". This glacio-geographical term gave rise to the use of the word "continental" to describe the Patagonian Ice-cap; and thus in Argentina the Ice-cap is referred to as the "Hielo Continental Patagonico". This term however was first questioned by Dr. Hans Steffen working for the 'Comision Chilena de Limites' at the turn of the century, and from this point therefore the Chilean maps referred to it as the "Hielo Patagonico Sur" - distinguishing it from it's smaller brother to the North, the "Hielo Patagonico Norte", also in Chilean territory. Most of the glaciers flowing from the Patagonian Ice-cap are in retreat, with the noticeable exceptions of the Pio XI and Mariano Moreno (Bismarck) Glaciers. They are by and large very steep, very crevassed and very fast-flowing.

The height of the Ice-cap varies between 1200 metres and 2000 metres, averaging in the region of 1500 metres. Although the heights of the highest mountains are not comparable to those in the central Andes or those in the Himalaya - the highest, Cerro Murallon is 3,600 metres high - they rise from sea level on the western side and a few hundred metres above sea level on the eastern side, and form some of the most spectacular and impressive mountain landscapes in the world. A few of these mountain groups such as the Fitzroy-Torre group on the eastern flank and the Torres del Paine National Park to the South, are familiar to tourists and travellers in Argentina and Chile; posters adorn the walls of every self-respecting travel agent; climbers and mountaineers from all over the world cherish the ambition to visit either of these mountain groups; and yet the vast expanse of ice, punctured by towering spires of rock, whole ranges of unexplored mountains and valleys, remain unknown to all but a few.

It has remained so little known principally by virtue of the extreme harshness of it's climate which, combined with the challenging topography, has made travel for any distance on the Ice-cap virtually impossible. Until Eric Shipton completed his successful North-South traverse over 280 kilometres in 1961, exploration had been limited to brief excursions in periods of good weather. Nevertheless it is still only under very hazardous conditions that travel over any distance can be contemplated.

Reliable meteorological data are hard to come by, but in an average month perhaps a maximum of two or three clear days can be expected. The majority of the time a thick low-lying mist covers the Ice-cap where the moist winds from the Pacific are cooled by the low air temperatures over the ice, bringing visibility down very low and creating serious navigational problems. Patagonian storms occur with monotonous regularity and are normally of savage

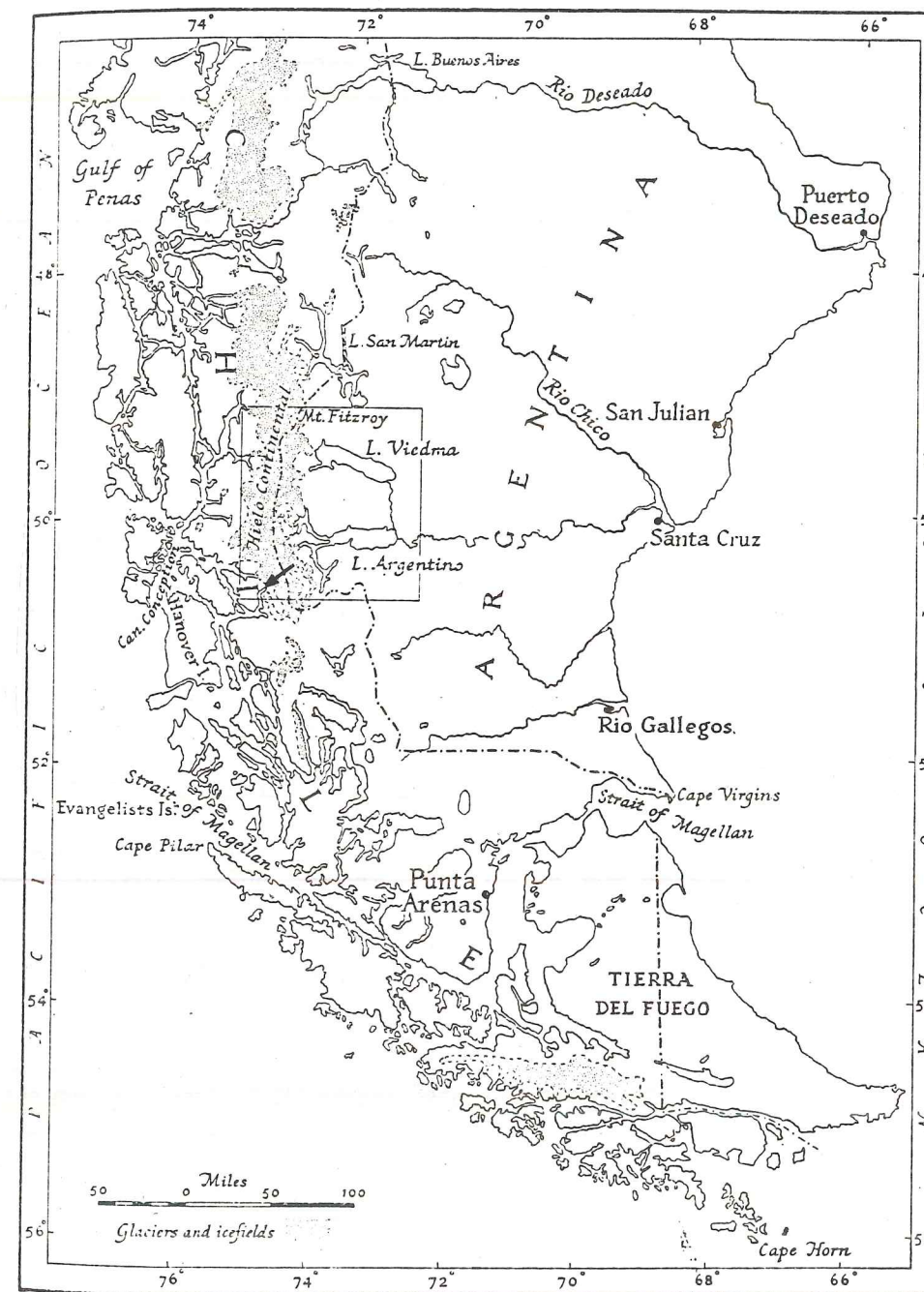


Figure 1. Map of Southern South America. Reproduced with permission of the Royal Geographical Society. Arrow denotes position of Seno Andrew.

ferocity with winds gusting up to 200 kilometres per hour with driving snow. Humidity can be a great problem particularly during the summer months when the temperatures on the Ice-cap can rise above 0 degrees centigrade and rain sometimes replaces the snow. Temperatures are seldom dangerously low even in winter when the main obstacles as far as expeditions are concerned is the shortage of daylight hours. The best months seem to be November-December and March-April; the mid-summer months - January and February - are characterised by very high winds.

The issue of the direction of the prevailing winds on the Ice-cap is a matter of contention about which there exists no unanimous answer. Mateo Martinic, of the Patagonian Institute, whose interest in the exploration of the Patagonian Ice-cap has the unofficial historian of the region, maintains that the prevailing winds are from the South while the experience of many, including Eduardo Garcia and the French Expedition of 1982, which is the only one to date to attempt a crossing from South to North, suggest that the prevailing winds come from the North/North-West. The latter case was unquestionably the experience of Patagonia '85.

Although by no means scientifically established it is a widely held belief that the climatic conditions in the Southern section of the Southern Patagonian Ice-cap, that is to say from 50 degrees South and below, are significantly more rigorous than those in the Northern section.

SENO ANDREW

Seno Andrew of the Fiordo Peel is situated in the region of the Patagonian channels of the Province of Ultima Esperanza ("Last Hope") the Magallanes region. The Northernmost point of the Seno Andrew and the mouth of the Peel Fjord, of which it is an extension, lie between the latitudes 56°26'S to 51°S and longitudes 71°34'W to 74°04'W.

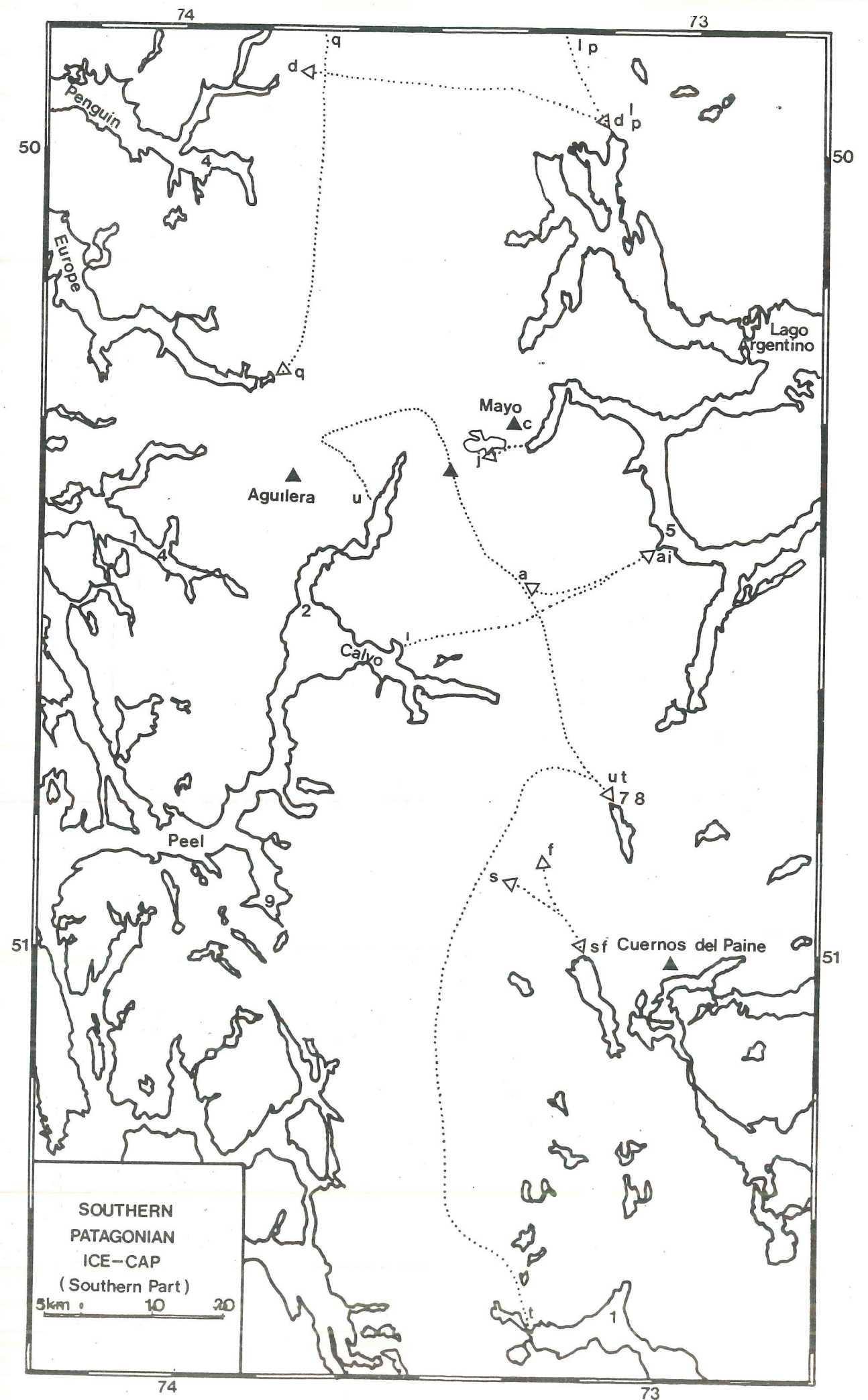
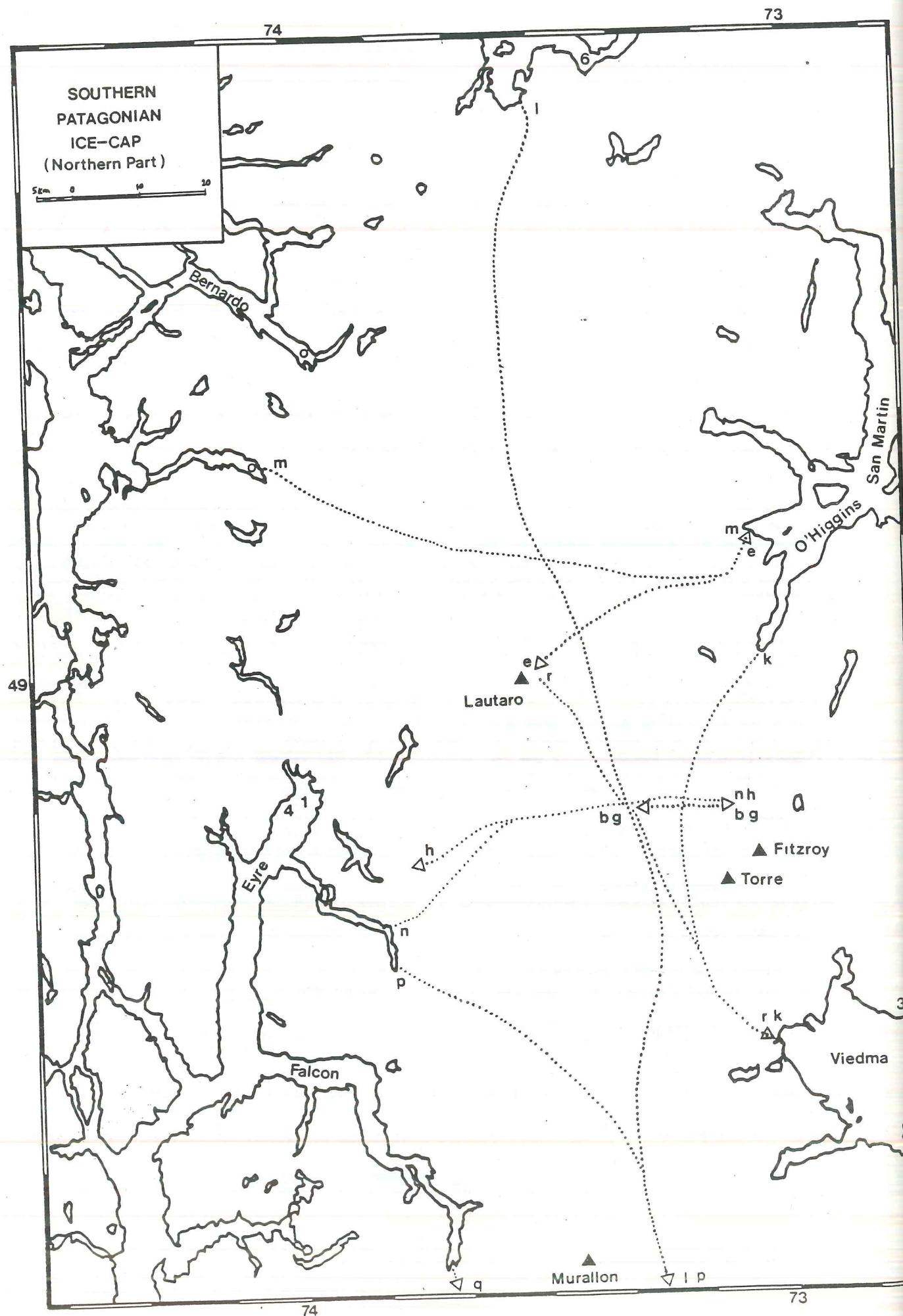
The fjord penetrates into the western foothills of the Southern Patagonian Ice-cap, Seno Andrew being 185 kilometres from the Pacific Ocean. It is separated from the Pacific Ocean firstly by the mountainous Wilcock Peninsula, with various peaks of over 1000 metres and, further to the West, by islands of the archipelagos which are lower and unglaciated.

The fact that it represents an oceanic intrusion within the environment of the Ice-cap means that its climate, especially that of the Seno Andrew, differs markedly from that predominating in the channels to the West. The high regions of the Wilcock Peninsula represent a barrier which softens the effects of the winds which come mainly from the West, while at the same time ensuring that the fjord finds itself in a rain shadow, since the winds coming from the anti-cyclones of the Pacific deposit their moisture in the form of rain or snowfalls as they rise over the mountains which flank it to the West. Its overall position does not protect it from the colder winds coming from the South which occasionally reach hurricane strength. This, combined with the cooling effect of the air mass coming off the Ice-cap which surrounds it, and the cooling of the water as a result of the large volumes of ice which are carved off regularly from the various glaciers flowing off the Ice-cap, mean that the temperatures are lower than those which characterise the region of the channels. Although this is largely supposition, meteorological data were collected whilst in the field which largely confirm this interpretation.

As a consequence of its interior position and difficult access, Seno Andrew remains virtually unexplored (See Appendix I). H. W. Tilman, who crossed the Ice-cap from a base-camp in the adjacent Calvo Fjord, came closest when the crew of his boat 'Mischief' attempted to sail through the narrows at the mouth of the fjord, becoming grounded on rock shoals in the process. Apart from possible visits by fishermen and the indigenous Indians, the only other visitor to the fjord itself is Eduardo Garcia, a Chilean mountaineer who made two visits to the fjord in the 1960's. Although he failed to gain access to the Ice-cap itself, he penetrated to the end of the fjord with the use of a rubber dinghy, and with his companion, remains the only

person to do so.

As an unexplored area, Seno Andrew offered several advantages as the choice of base for an expedition. Besides the potential for original scientific research, the interior position of the fjord provided relatively easy access to the Ice-cap itself, and a possible route to an unclimbed peak, Cerro Aguilera, lying adjacent to the fjord. The section of the Ice-cap at the end of Seno Andrew remains the key section to a complete traverse of the Ice-cap. From aerial photographs the area appears as highly dissected and deeply crevassed, with at least one sheer ice-clad cliff of perhaps 400 m in height. No ground reconnaissance for the section exists; Shipton failed in his attempt to gain access from the Argentine side during his first expedition to Patagonia in 1959. Knowledge of the nature of the terrain may have persuaded him to abandon his later attempt at a complete North-South traverse of the Ice-cap some 30 miles to the North.



Figures 3. and 5. Routes of previous expeditions. See page 12 for key.

KEY

EXPLORATION (1557-1910)

1. Ladrillero 1557
2. Cortes de Ojea 1557
3. Viedma 1782
4. Fitzroy 1830
5. Moreno 1876; Rogers 1879
6. Michell 1898
7. Nordenskjöld 1896
8. Hauthal 1899
9. Quensel 1908

PRINCIPAL ROUTES (1914-1985)

- a). Reichert 1914
- b). Kolliker 1916; Agostini 1935
- c). Agostini 1930
- d). Agostini 1931
- e). Reichert 1933; Shipton 1959-1960; Dickinson 1974
- f). Wilumsen; Floegel 1948
- g). Gianolini; Mercer 1949
- h). Huerta 1952
- i). Tilman 1956
- j). Shipton 1958
- k). Corbella 1959
- l). Shipton 1960-61; McSweeney 1980
- m). Lucero 1962
- n). Garcia 1963-64
- o). Mercer 1967-68
- p). Sakagami 1969
- q). Takeuch 1971
- r). Dickinson 1974
- s). McSweeney 1976
- t). Hemon 1982
- u). Patagonia '85 1985 : Proposed route

n.b. The precise details of the routes followed are not guaranteed.

5.

PLANNING STAGE

The Idea

The exact date of the birth of Patagonia '85 is lost in a muddle of vague dreams, but the leader of the expedition, Matthew Hickman, will readily admit that when the determination to convert those vague dreams into reality came to him his ignorance of the problems ahead was virtually complete. Perhaps the most powerful attraction was the discovery that there existed an enormous area of ice about which little was known and that no-one had ever travelled from the North of the country to the South of the country without either setting foot in Argentina, or in a boat or aeroplane.

Nevertheless the first expedition meeting took place under the chairmanship of Tom Owen Edmunds, then having just finished his term as President of the Oxford University Exploration Club, which effectively set the momentum going which eventually gave rise to "Patagonia '85".

In the light of our ignorance as regards the problems involved in mounting an expedition to the Southern Patagonian Ice-cap the first priority was to research the area as fully as possible, to identify reference sources and to identify regional experts. Our first major lead stemmed from press coverage of the French Expedition of 1982 which had stirred up considerable public interest even outside mountaineering circles. It was not until Boxing Day of the following year that we were eventually able to meet and discuss our plans with one of the members of the French Expedition, Marc Roquefère, who had remained behind to marry and settle in Chile, but their report was of significant use to us in the initial stages of the research.

Another key figure in this preliminary phase was Eduardo Garcia, who had participated in several expeditions to the Southern Patagonian Ice-cap including Eric Shipton's North-South traverse in 1960-61. Matthew Hickman met Eduardo Garcia in September of 1983 and remained in touch with him literally up until the eve of the expedition, when the other members of the expedition were able to benefit from his advice and knowledge.

In the early stages encouraging words were hard to find. Those that were encouraging therefore were all the more important. Our first meeting with our eventual patron, Sir Vivian Fuchs, was as early as November of 1983. Despite our initially only rather vague notions, Sir Vivian's encouragement was always valuable and, most importantly, was always positive throughout the two years of preparation. Unlike many patrons of undergraduate expeditions nowadays, Sir Vivian was always interested to know how our preparations were going and always ready to give relevant critical advice. We would like to think that Sir Vivian's confidence in our expedition grew as our plans and preparations developed because, when we most needed support, he was willing to give us energetic and active support which led to major financial help to the expedition. In a market which has become almost over-saturated with expeditions, the title of patron has become largely symbolic. This was not the case with our patron and we would like to extend special thanks to our patron for ensuring that it did not become so.

It became clear at an early stage that an expedition of the type imagined would present major logistical problems of access due to the remoteness of the region, particularly from the Northern and Western sides; access from Argentina to the East was ruled out for political reasons. We therefore needed significant logistical backing at an early stage if any plan was to develop. In September of 1984 the Chilean Navy were approached with a view to gaining their support. The proposal met an encouraging response from the first meeting although official approval was only given in January of 1985. There is little doubt that without this valuable support our expedition would not have been financially feasible, so once this major agreement was under our belt our planning moved into a more confident phase.

At this stage of the proceedings several plans were in the air amongst which was a North-South traverse covering the full 450 kilometres of the Southern Patagonian Ice-cap. It was by now becoming clear that this was too great an undertaking and we began to search for a more localised area of the Southern Patagonian Ice-cap. Cerro Aguilera was first mentioned by Eduardo Garcia in September of 1984 and so it is to him that we ultimately owe our eventual choice of location from which to conduct the expedition. The immediate attractions were firstly the fact that Cerro Aguilera was itself unclimbed, and secondly that the area between Seno Andrew and the Dickson glacier, 80 kilometres to the South was effectively unexplored except for Tilman's West-East crossing in 1956. Of particular interest was the narrow section between the end of the Peel Fjord and the Lago Argentino to the East, a distance of not more than 15 kilometres. Garcia described it as the "llave" - the "key" - to the Ice-cap, in terms of an eventual North-South crossing, due to the extreme topographical difficulties it presents; he was not wrong, as we were later to discover.

The expedition's original motives were largely sporting and exploratory, but it became clear, particularly once the North-South crossing had been ruled out, that the expedition would have to assume a more scientific identity. This was essentially for two reasons: firstly, from a purely mercenary point of view, there was the issue of finance to concern ourselves with. On a more virtuous note, the words of Nigel Winsor, Expedition Officer at the Expedition Advisory Centre went home forcefully: "An expedition is only of value when it contributes to the sum total of human knowledge". It was important to us that, should our sporting aims fall short, as was always very possible, that we should have some positive results to come away with. As a result we began to search into what might be the most relevant areas of study. Enquiries were made at the British Antarctic Survey and the Scott Polar Research Institute regarding glaciological projects. Geological reconnaissance mapping was considered as was, as was botanical and biological collection work.

We were extremely fortunate to have on our doorstep at Cambridge, Dr. Martin Holdgate, Chief Scientist at the Department of the Environment. Having read his account of the Royal Society Expedition to Wellington Island in the Patagonian Channels in 1958-59 we went along to see him in November of 1984. The information he was able to pass on to us, both in terms of an overall opinion on the nature of the project that could usefully be undertaken and in terms of directing us to the relevant experts in the botanical and biological fields, was critical and determined the course of the expedition.

The geological and glaciological projects were never totally abandoned, but as it became increasingly clear how difficult these projects would be to put into practice, we chose to avoid committing ourselves to any formal projects.

The Formation of a Team

By now the plans had developed to the extent where the formation of a team with the relevant experience and skills had become the top priority. The nucleus of the emerging group was formed by Matthew Hickman and Andrew Jeram, both of whom had participated in the Cambridge-Ecuador Geological Expedition in 1984. The latter had spent a season in Spitzbergen prior to that during which he had gained experience of manhauling and living in snow and ice conditions over a protracted period of time.

Bruce Herrod met the group in October of 1984, via the Cambridge University Explorers and Travellers Club. Bruce's experience with the British Antarctic Survey immediately added a badly needed dimension of practical field experience as well as broadening the expedition's outlook in search for suitable participants. Through him the expedition made contact with John Beatty, a self-styled "wilderness photographer" with experience in Greenland and Antarctica. For some time John Beatty was considered part of the group and a considerable amount of time and effort was spent sounding out the possibilities of making a fully-fledged 35 millimetre film of the

expedition. Offers were made by both the BBC and Channel 4 to help in the post-production phase of the project, but finance was lacking up front and the project was abandoned. John Beatty's withdrawal in July of 1985 meant that the team had to be significantly reshaped at a late stage with resultant problems in terms of insufficient briefing and preparation; but again, thanks to Bruce, we were fortunate to enlist the help of Colin Nicol in August of 1985 whose tremendous experience in South Georgia and Antarctica with the British Antarctic Survey were invaluable both in the logistical planning and in the field.

Having identified our field of study we were very keen to attract the participation of a specialist in botanical studies who would be able to take on the task of co-ordinating the botanical and biological programs. Andy Jeram was fortunate enough to awake the interest of Adrian Newton, who immediately immersed himself wholeheartedly in the preparations. It was not until as late as September 1985 that anyone was recruited to help Adrian in what really became the backbone of the expedition. This was partly due to fears of overmanning and partly due to the uncertainties over John Beatty's participation. A suitable candidate was eventually found in the form of Sue Penn, again through contacts in the British Antarctic Survey.

Thus our plans were sufficiently advanced by the end of the Michaelmas term to allow us to present our proposals to the Cambridge Expeditions Committee at the beginning of December. We were fortunate enough to have them approved and subsequently, in May of 1985 to be awarded the top margin award by the Cambridge Expeditions Fund.

This approval was an important psychological step, and the pace of developments began to quicken. Matthew Hickman returned to Chile over Christmas and the New Year and began the task of attracting Chilean participation in the project. Bi-national expeditions involving the host country are increasingly valuable for a variety of reasons; equally they present numerous administrative and cultural problems, which are discussed under a separate section ("Reflections on a bi-national expedition"). Whatever the pros and cons however Patagonia '85 was determined to take on a bi-national identity and to attract Chilean participation.

Contact was made with Pancho Medina through Rod Walker, an Englishman running an outdoor education centre (CEAL) near Santiago. In addition to his climbing experience, Pancho had a certain degree of exposure to the idiosyncracies of European behaviour with Rod Walker at CEAL and while participating in a Franco-Chilean expedition in the Torres del Paine National Park. Subsequently in May of 1985 Nigel Harvey was invited to join the expedition. Nigel's inclusion brought several advantages: having worked alongside Pancho at CEAL their climbing experience together and friendship promised to make a valuable partnership. Nigel's fluent Spanish would help to bind together two potentially uncommunicative groups. In addition, having worked on sheep farms near Punta Arenas, and having participated in a kayaking expedition in the Chilean archipelago his local knowledge was a valuable asset.

At the start of January 1985 Edmundo Pisano of the Patagonian Institute in Punta Arenas gave an indication that they would like to accept our invitation to participate in the expedition. Sr. Pisano also kindly accepted our request for him to act as the Chilean patron of the expedition.

Our original plan had been to aim to arrive in the field at the start of November in order to make the most of the optimum months from the point of view of weather conditions and in order to be out in time for Christmas. Following don Edmundo's advice however we altered the timing of the expedition at this stage so as to arrive in the field in the middle of November on the grounds that this was the earliest date we could expect to find any plants in flower.

Contact was made with Dr. Dionis Isamitt, through the Sociedad Chilena de Exploracion. The remoteness of our proposed area of study from any inhabited areas with medical facilities led us to conclude that the participation of a fully-qualified doctor would be advisable and Dionis' experience in the field made him an obvious candidate.

It was not until the end of July of 1985 that the Chilean Navy sprung a rather unexpected surprise on us by announcing that the zodiac inflatable boat which we were being lent would come complete with a boatman who would have to be suitably clothed and fed. Although this announcement threw us somewhat we quickly adjusted to the idea which presented several advantages. In addition to his duties as boatman and radio-operator he would be able to act in a supporting role at base-camp which, in theory anyway, would allow the botanists to get on with their work.

Patagonia '85 was, from its conception, an ambitious project. Perhaps one of its most ambitious aspects was the tremendous diversity or, some might say, disparity of those who participated in it. There were enormous differences in terms of age, experience, culture, language, education and motives. Therein lay both its strengths and its weaknesses. There were major doubts about the composition of the team throughout the year, right up to the eve of the expedition, a fact which made subsequent logistical planning and organization fiendishly difficult. Nevertheless the nucleus of the team was sufficiently strong and enthusiastic to make sure that plans went ahead.

Fund Raising

After Matthew Hickman's return to England in early January the expedition now had its objectives clear and the basis of a competent, experienced and enthusiastic team. This allowed us to move on to another urgent priority area - finance.

The first edition of the prospectus for Patagonia '85 was printed in February with a run of 500 copies and was targetted initially at funds and charities, many of which had deadlines at around this time. Two more editions of the prospectus were eventually produced: one in May with a run of 500 copies, and the third in September. The latter two editions were aimed essentially at private companies, particularly those known to give to expeditions. All three editions were different in small ways, up-dating information as regards finances, projects and team. By the standards of most undergraduate expedition prospectuses it was a high-cost production on four sides of glossy A4 size paper doubled to A5. The first two editions had five black and white pictures while the final edition had eight. The thinking behind the relative extravagance was that with a budget estimated at triple that of the average undergraduate expedition, we needed to reach significantly higher for the project to be feasible. We found that the effort spent in producing a high-quality prospectus definitely paid itself off and proved to be a very effective card in our hands. On the other hand we feel we wasted an awful lot of time and money sending relatively expensive prospectuses to companies simply lifted from business directories in the hope of gaining cash donations. This form of approach to fund-raising is only recommended if it is done using low-cost prospectuses.

A more satisfying way of raising funds took place on Sunday September 29th when twenty boys from the Dragon School, Oxford, monitored by a throng of masters and parents walked 16 kilometres in the Oxfordshire countryside in aid of Patagonia '85. Together they raised over £723 for us which was a marvellous response and by far the most heartening and encouraging way to raise finances. The walk was organised by Mr. Bev MacInnes in conjunction with Matthew Hickman - a former pupil at the school. Bruce Herrod and Matthew Hickman's parents and brother represented the expedition on the walk. The expedition would like to thank the many who helped and participated in the walk, especially to Sarah and Jeremy Nicholson who kindly allowed us to use their house at Wendover as the start and finish point. In return the expedition gave a backpack as first prize to William Cadogan, who raised the most sponsor money, and four runner-up prizes of expedition T-shirts.

Up until July with a bank balance of £7,615 we were well off by the standards of most undergraduate expeditions but well short of our revised budget estimates of £10,000. We were forced to consider cutting our numbers. Happily no such drastic decisions had ever to be taken for towards the end of July we received confirmation that British Airways had agreed to fly the British members from London to Brazil and back saving the expedition in the region of £3,000

and therefore guaranteeing the solvency of the expedition. This achievement was thanks largely to some timely lobbying by Sir Vivian and Lord Shackleton of Rio Tinto Zinc to whom we would like to offer a special thanks. It also meant that British Airways became our major sponsors and we now had the added responsibility of returning as much as we could in the form of publicity for them in their newly acquired South American market.

Our solvency was further sealed in August when the Chilean Air Force kindly agreed to provide air travel for the members of the expedition and, just as importantly, their freight, between Santiago and Punta Arenas, saving the expedition coffers an estimated extra £2,000.

The final phase of preparations is marked by Matthew Hickman's departure for Chile at the end of July. The weaknesses that this move implied in terms of delay in communication were broadly compensated by the consolidation of preparations in Chile. In addition to the more successful communication he was able to secure with the Chilean Navy and Air Force and with Edmundo Pisano at the Patagonian Institute, he was also fortunate enough to gain the patronage of the Chilean national airline - **Lan Chile** - to complete the final stretch of our journey between Brazil and Chile. This, with the exclusion of Chiprodal and ALMAC was the only all Chilean private enterprise to support the expedition.

Back in England it was shopping time, perhaps the most frenetic period of all, as everyone hurried to meet the shipping deadline. The freight finally left Liverpool on September 19th on the Eurosas container ship "Bo Jonson" through our shipping agents, the Pacific Steam Navigation Company who had very kindly negotiated next-to-free freightage with them. It arrived in Valparaiso just over a month later on October 21st, where Matthew Hickman and Nigel Harvey were there to meet it. It took a full ten days of the most frustrating bureaucratic manoeuvring before the freight was finally released from Customs and sent to Santiago (See note concerning Import Restrictions for expeditions to Chile). The process was also an expensive one, so much so that it cost us appreciably more to move the freight from Valparaiso to Santiago than it did to move it from Liverpool to Valparaiso!

SANTIAGO

The journey out from London to Santiago was a long one for the five British-based members of the team. It was to be even longer before they reached the field. It took 15 days from the moment they left London before they finally arrived in the field. They left Heathrow on October 31st on **British Airways** and arrived the following day in Sao Paulo, Brazil. The connection with Lan Chile was not ideal and involved a two day stop-over in Sao Paulo. Fortunately we had a friendly contact in the form of Miss Patricia Roachat and her family who opened their doors to us and offered us wonderful hospitality. A technical hitch in the Lan Chile flight led to the flight being postponed a further 12 hours but arrive it eventually did on Monday November 4th. During the following week the members of the expedition were accommodated at the residence of the British Ambassador Mr. J. K. Hickman and Mrs. Hickman and at the home of Mr. and Mrs. Julian Harvey, the British Council representatives in Santiago. The expedition would very much like to thank both Mr. and Mrs. Hickman and Mr. and Mrs. Harvey both for putting us up and for putting up with us in the confusion of that week as we frantically rushed around Santiago making last minute preparations and buying various items of equipment that had not been shipped from England; two tonnes of equipment were unpacked and strewn all over the Embassy garage, tents were erected among the rose beds; an official from the Chilean Ministry of Agriculture came to inspect our food ration boxes and ceremoniously confiscated twelve jars of "Gales" Mexican honey. Ski-bindings were fixed to skis, boots adjusted, visits to the Koflach representative in Santiago and last minute changing of boots. These and a variety of smaller crises and emergencies were squeezed into three days before the equipment was re-packed and taken to Cerrillos Airport to be weighed in preparation for Sunday's flight.

PUNTA ARENAS

On Sunday November 10th, nine of the eleven-strong team embarked on a Chilean Air Force 737 bound for Punta Arenas. We were met by no less than three people at the airport: don Edmundo Pisano from the Patagonian Institute, who had come with a bus from the Universidad de Magallanes, Cabo 2 Bernardo Barria from the Chilean Navy who had come with a lorry and Capitan Guillermo Navarro from the Chilean Air Force, who was also by coincidence a cousin of Pancho's, who had also come with a bus so we were certainly not short of transport. All our freight was squeezed into the Navy truck while the expedition plus rucksacks and personal equipment bundled into the Universidad de Magallanes' bus and we headed back to the Patagonian Institute. On unloading the lorry we discovered that we had left one of our largest wooden crates behind at the airport (the majority of our packing cases were fibre-board boxes) so at nine o'clock on a rainy grey Sunday evening three of us headed back in the Institute's pick-up truck to the airport and talked our way past the guards into the Air Force storage hangar where sure enough we found our missing crate.

After a night on the hard floor of the Patagonian Institute's Guest House we rose early the next morning and were at the airport by 7.30 am. Our reconnaissance flight was delayed somewhat before we were able to take off and it was not until about 11 am, after a two hour flight North from Punta Arenas that we found ourselves flying over the Fiordo Peel. Capitan Navarro and another pilot from the Chilean Air Force were at the controls of the Twin Otter, the raised wings of which gave us excellent vision below.

By the standards of Patagonian weather we were fortunate with the conditions on that day. The fjord itself was completely clear and the pilots were able to make three runs down the length of the Northernmost arm allowing us to observe the river valley we had chosen as the site for our base camp, the two glaciers up or between which we hoped to gain access to the Ice-cap. We were able to observe the degree of pack-ice in the fjord and assess the feasibility

of passing the narrows at the entrance of the Northern arm to the Peel Fjord (Angostura Mischief). We saw nothing of our Cerro Aguilera, nor of the area between the end of the Peel Fjord and the Dickson glacier, but after half an hour or so of twisting and wheeling in the turbulent skies above the Patagonian Ice-cap few of us were in much of a state to worry too much about it! We are proud to report however that amongst all those on the plane the only one to be sick was the flight assistant!

The following day was spent collecting together some of Edmundo's rather disparate equipment, last minute purchases amongst which figured 200 litres of paraffin and 400 litres of petrol for our two zodiac rubber inflatable boats. Unfortunately the institute's outboard engine normally used with that particular boat - an Avon "Gemini" - just happened to be missing a crucial part; fortunately we managed to get our hands on a 45 HP engine; unfortunately the engine ultimately proved to be way oversize for the size of the boat! The Navy's enormous "Zodiac", normally used for bearing large numbers of Chilean marines was already aboard the LPC Villarrica along with its two 55 HP engines. That afternoon Colin and Matthew set off for Puerto Natales in the Navy's truck loaded to bursting point with our gear which seemed to be permanently swelling as we went along. Puerto Natales is a small port of 17,000 people 254 kilometres North of Punta Arenas. The Chilean Navy's coastal patrol launch LPC "Villarrica" is based at Puerto Natales, in addition to which it was the nearest permanent settlement to the Peel Fjord, 200 nautical miles to the North, and as such was our stepping-off point.

Meanwhile, back in Punta Arenas, the remainder of the expedition entertained the local press at a press conference. They came on to Puerto Natales the following day - Wednesday 13th November - where for the first time, with the addition of Cabo 1 Juan Miranda to the group, we were all together.

SENO ANDREW

The "Villarrica" weighed anchor at 4.00 pm that day under the command of Teniente 2 Jorge Egaña Polhwein. We were also accompanied by the Port Captain Teniente 1 Pablo del Fierro. The launch was manned by a crew of five, all of whom were very helpful to us, loading and storing our equipment. The journey from Puerto Natales took us about 18 hours, doing a steady 12 knots. In those places where we were less protected from the Northerly winds and the heavy seas it brought with it, the launch pitched and rolled alarmingly causing much of our equipment, which was lashed down on the deck, to take a soaking, and one or two faces to turn a whiter shade of pale! We awoke on the morning of Thursday November 14th to the sight of brush-ice floating past the port-holes; as we approached the entrance to the Northern arm of the Peel Fjord, the blocks of ice grew larger and the spaces in between them smaller, until finally discretion took the better part of our captain's valour and we anchored in the lee of a small island in the narrows which we named Angostura "Mischief", in memory of the name of the boat in which H. W. Tilman arrived at the Calvo Fjord. His boat ran on to a rock shoal very near these narrows.

We immediately began work on putting together and loading our two inflatable boats. At about 2.15 pm the first group set off and two hours later landed on a beach at the mouth of the river valley we had chosen from the aerial photography as the sight for our base camp, eleven nautical miles (about 15 statute miles) further down the fjord. After recce-ing the area we all reached a unanimous decision for the location of our base camp, some 300 metres back from the beach in an area of low scrub and trees. Edmundo and Juan then set off back to the Villarrica while Bruce, Andy, Pancho and Matthew began the task of portering all the equipment landed to the selected site. As the light was failing the second group arrived. Now just Edmundo, Colin and Adrian remained on the Villarrica.

At four o'clock in the morning on the following day Juan, our boatman, awoke us as the tide was lapping around the sides of the mess tent in which all eight of us were sleeping. His watchfulness gave us a very valuable extra half hour in which we managed to move a large part of our equipment and belongings to higher ground before the tide reached its full extent.

We were well aware of the dangers of high tides even before arriving in Patagonia and it was for that reason that we had taken great care in our choice of campsite, making sure to consult Edmundo's experience and going to the trouble of portering two tonnes of equipment 300 metres back from the beach onto land which would need clearing before we could pitch a tent on it. As luck would have it that particular night just happened to coincide with a full moon and one of the highest spring tides of the year; after that night the tides, which we monitored carefully, never reached anything like the same levels, so we were genuinely fairly unlucky. Future expeditions take note: beware of full moons in spring !

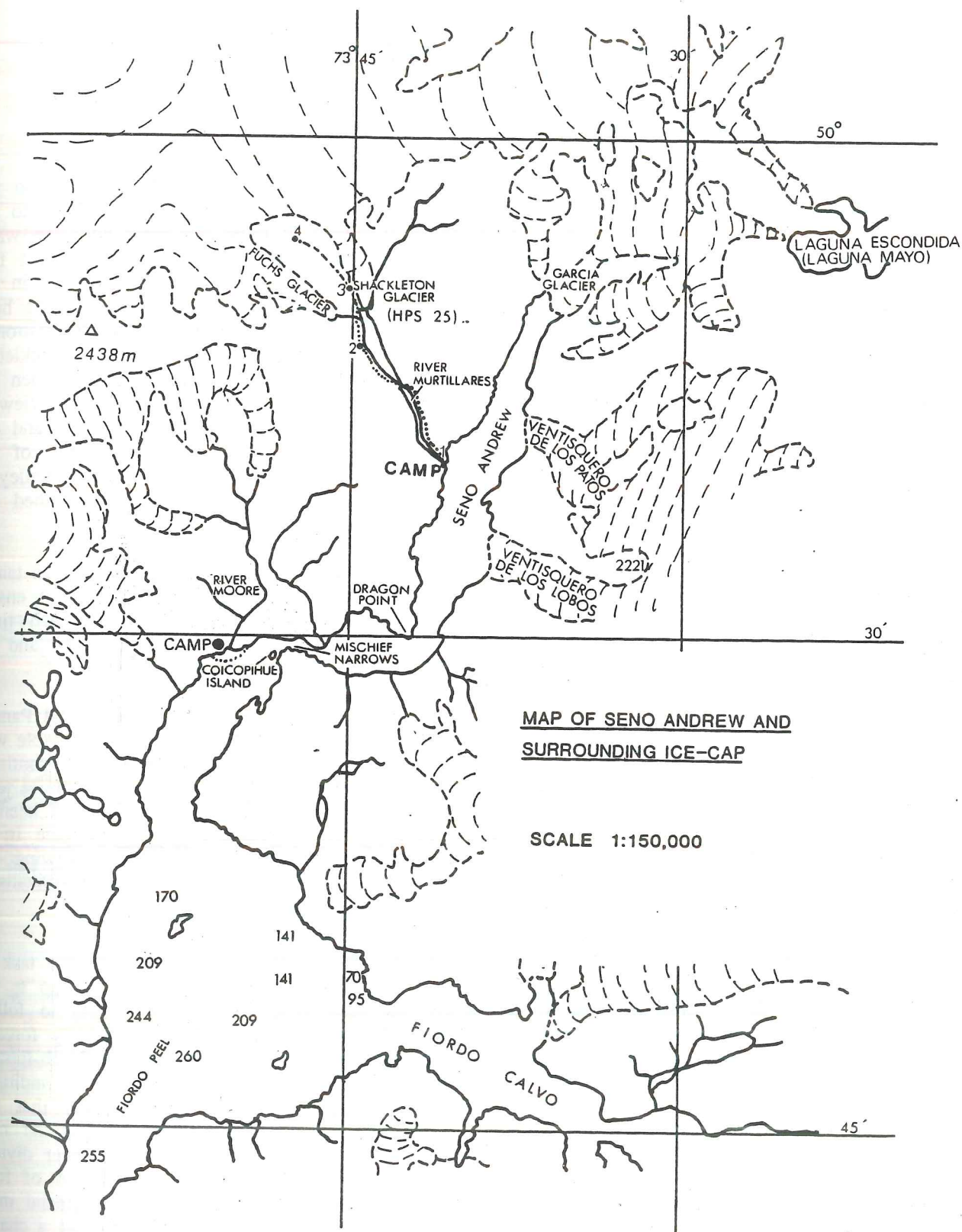
As soon as it was light we began the task of repositioning the camp. In view of our doubts about the tides we selected two sites - one ten metres back from our original site, which was slightly higher, and another some twenty metres away in a spot in the middle of the forest. "Machete man" Dionis took most of the burden of clearing the thick vegetation in the latter site, which involved cutting down a number of trees. Colin, Edmundo and Adrian arrived at midday from the Villarrica. The reinforcement brought some new spirit to eight very wet and tired expeditioners who had been working hard in the rain since 4 am, after only three hours sleep, and had not eaten much in the commotion of the previous two days. By the evening all the stores were ashore; the "Science tent" was established amidst the forest and the mess tent amongst the shrub. Six personal tents were scattered around these two nuclei.

The following day our two scouts - Pancho and Nigel - embarked on their first recce of the river valley while the rest of the group spent the day sorting, clearing, building racks above the ground for storage, digging latrines, pits for burning rubbish etc.

Nigel and Pancho returned after the first of many soul-destroying encounters with moss bog in the river valley. Their observations seemed to suggest however that the right hand bank of the river presented the easiest access; so the following day we rigged up a rope across the river to which we attached the smaller of our two inflatable boats which from that moment on came to be used as our ferry across the mouth of the river. We adopted Garcia's name for the river - "Rio Murtillares" - due to the abundance of the "murtilla" berry. A half day recce along the right hand bank showed us that, though not without difficulty, the right hand bank was the more hopeful of the two. Having said that however there was one stretch which was as difficult as any in the valley. It was only some 400 metres in distance but, the first time we tackled it, it took us getting on for the best part of an hour to get from one end to the other. Tall mounds of thick tussocky rush were interspersed with deep patches of muddy bog. The footing was treacherously deceptive and one continually found the rush disappearing from under one's feet and then the next moment you were up to your knees in watery bog. Climbing out of the bog with a 20 kilo pack on your back was not the easiest of tasks. On the rare occasions when your feet managed to take you from one piece of hard ground to another, you would find that the mound would begin to wobble beneath your feet, throwing you off your balance and sending you lurching from mound to mound before finishing up in another bog ! Quite apart from being physically testing the whole operation was completely infuriating !

Bruce and Colin in the meantime had a very tough time trying to find a way onto the left hand ridge of the valley; their experiences led us to rule out that possibility fairly categorically and so the following day we began our first day's portage along the right hand bank.

At this point our narrative must be divided into two parts, each corresponding to the two distinct priorities of our group. In practice the two groups were never completely separated. They were always in daily radio communication and a number of decisions were taken which took into account the interests of both groups. For the sake of clarity however the narrative is now divided into two sections: Mountaineering Report and Scientific Report.



The Approach

On the first day of portage it took us seven hours of carrying before we reached the point where the valley divided into two. On the way we had had to cross the river back to the left hand bank. With a rope tied to his waist Nigel managed to cross the river with the water level just above his knees and flowing quickly; it was still early in the spring and at that time we had little idea how important that rope was later to become to our movements in the valley. At the end of the valley it divided into two, one bearing off to the left at the head of which was a glacier which we named Ventisquero Fuchs, after Sir Vivian Fuchs, our patron^Δ, and one to the right with another glacier at its head which we named Ventisquero Shackleton, after Lord Edward Shackleton, son of Sir Ernest Shackleton the Antarctic explorer. When we reached this point we climbed a rocky gorge from the top of which we were given a good view of the left-hand valley. It did not bode well - the valley bottom was thickly forested and the sides were extremely steep where the retreating glacier had eroded away the walls of the valley. In disappointment we carried our loads, weighing some 20 kilos, back down the valley to a clearing about fifteen minutes walk from the main river crossing where we established our first food depot.

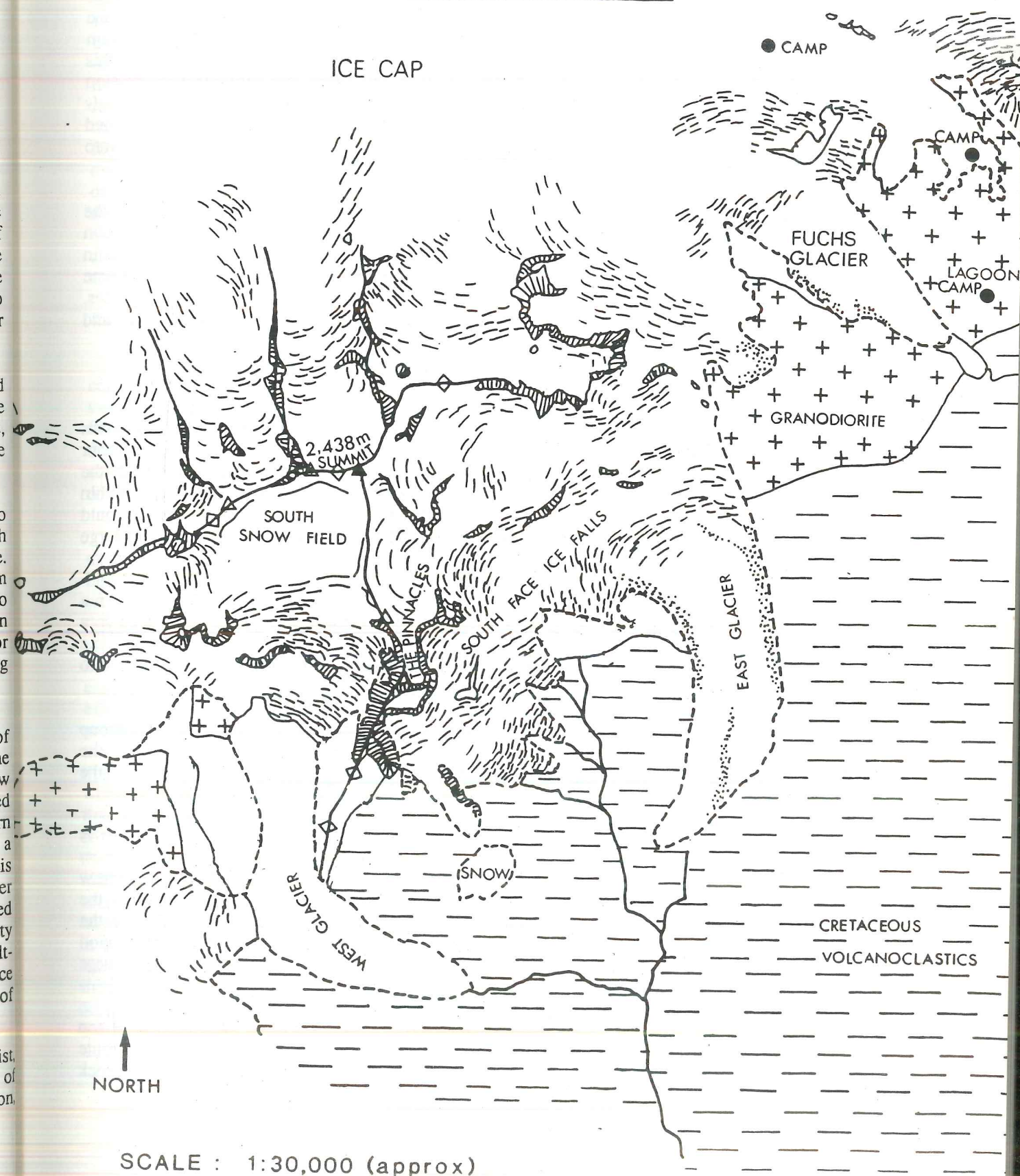
The portage from Base Camp to the first depot gradually improved as the route was tamed by successive trampling, machete clearing and marking with fluorescent tapes in order to ensure not only that we shouldn't get lost, but that we should follow the same route each time, thereby improving it. It was now taking us just two hours to walk between Base Camp and the main river crossing, a stretch which had been previously taking us a good three hours.

The first pair - Nigel and Matthew - left Base Camp on November 22nd; Bruce and Pancho followed on the 23rd. Colin came on alone on the 24th because Andy was having some trouble with a bruised knee ligament and there was some doubt about whether he would be able to continue. But on the 26th Dionis felt Andy could carry on and so he joined the rest of the climbing team who were then together as an independent unit for the first time. The original plan had been to calculate on the assumption of having a team of six with the capability to participate in an eventual traverse/climb. This was always intended to be a flexible number, allowing for possible injuries, as was nearly the case with Andy, or for the possibility of rationalising the composition of the eventual team.

Having established our first depot Nigel and Pancho were then entrusted with the task of finding a way onto the Ice-cap while the remainder worked on portering equipment up to the depot. One of the possibilities was to climb the left hand ridge of the valley and to follow that ridge to the foot of Aguilera. This was soon ruled out partly due to the heavily forested slopes, which we had quickly learned to respect, and partly because the South/South-Eastern face of Aguilera did not look too promising and so their attention was switched to finding a route up the ridge between the Fuchs and Shackleton glaciers. The main problem that this involved was crossing the river which flowed from the Fuchs glacier before joining the river from the Shackleton glacier. Originally we followed a complicated route where the river divided into a delta-like spread of minor affluents. This route however took us in the region of forty minutes, at the end of which one was left extremely cold after wading through icy glacial melt-water which left one completely numb, so once the whole of the climbing team had had a chance to assess the problem we decided to rig up a line between two tripods at the narrowest point of

^Δ There existed no names for these glaciers other than those given by the french glaciologist, Louis Lliboutry, who, in his glaciological study of the region classified the more easterly of the two as HPS 25. We suggested the names Ventisquero Fuchs and Ventisquero Shackleton, Ventisquero Fuchs being the more westerly and Shackleton being the more easterly (HPS 25).

MAP OF THE SUMMIT CERRO AGUILERA



the river, over which we might transport our gear in order to minimise the number of long icy crossings we each had to make loaded down with our gear. The system worked to perfection and saved us much time and energy.

Having moved all our supplies and equipment from the first depot over the tripod crossing at the gorge, we carried on up the ridge and established a third camp half way up the ridge between the gorge and the snowline, by the side of a small lagoon with beautiful views over the Fuchs glacier towards Cerro Aguilera. Our task was then to move our supplies and equipment from the depot at the gorge up the ridge to a depot on the edge of the Ice-cap. The terrain of this section was steep and slippery in places. A belt of thick tall forest ran through a depression half way up the ridge, which caused problems especially with some of the more awkward loads such as skis and sledge parts. Above it the trees disappeared giving way to low bushes and making relatively easy going. The final hour was up a steep snow slope which levelled out into a rocky outcrop where we made our depot, which we termed the "top depot".

In the same way as we completed the evacuation of Base Camp, we evacuated Camp 2, the lagoon camp, in phases. Two pairs - Pancho and Matthew, and Nigel and Andy - left the lagoon camp on November 29th and established a third camp, half an hour's walk beyond the top depot in a rocky hollow above which we planned to load our sledges and begin manhauling. In the meantime Colin and Bruce were assembling our two 'Nansen' sledges which we had portered up in pieces. Once we had cleared the tree-line the ash sledges could be assembled using screws, glue and leather lashings, and portered up in one piece.

Reconnaissance of Cerro Aguilera

The following day dawned brilliantly clear and cloudless, so Pancho and Nigel donned their skis and set off to reconnoitre a possible route up the Cerro Aguilera. They returned after four hours, thrilled by the spectacular views they had had but definitely subdued about the possibilities of finding a route up Aguilera that was within our technical abilities and within a certain margin of safety. The North-East and North faces, which we had previously hoped would provide the easiest route to the summit, were categorically ruled out due to a series of large hanging glaciers.

Nigel Harvey concluded the following: "Our best approach from the East would have been a traverse to the South with a slight drop in altitude and from there a climb up a snow face to a ridge running North-South to the summit. However the traverse would mean crossing between some very avalanche-prone faces, not only of snow, but also rock falls seem common, probably due to the crumbly volcanic rock of the mountain itself."

After discussing the problems involved in such a route and the risks involved, the group came to a unanimous conclusion that we were better off to abandon our first objective - the ascent of Cerro Aguilera - and switch our attention wholeheartedly to the traverse to the Dickson Glacier.

Before leaving the issue of the best possible route up the Cerro Aguilera however it is worth adding this observation made by Nigel Harvey: "The best route to the summit was seen on leaving the Fiordo Andrew. The valley west of the river valley at the mouth of the Seno Andrew (which drains into the River Moore) seemed to be the most feasible with easy access to the snow-line by means of a ridge, (not a glacier), which leads one to quite a high point on the same North-South ridge (referred to in the previous passage). From there it would be a question of climbing the southern face of the hill; this may well prove difficult due to the large number of cornices and snow mushrooms on the southern slopes."

This much is certain: Cerro Aguilera is a challenging peak worthy of the attention of top calibre climbers. There exists no obvious or easy route that we were able to observe. Any route will involve a high degree of danger due to the risks of avalanche, dropping cornices, rock falls and snow mushrooms.

The Traverse

Having agreed on our new objectives we used the remainder of the day to move our supplies up from the top depot to the third camp and so, by the following day, December 1st, after twelve days of portage, plus two of reconnaissance work we were finally in a position to load up our two sledges with something in the region of 500 kilos of supplies and equipment. The first stretch of our journey was up a steep slope of snow made heavy and slushy by the period of good weather, so all six of us hooked our traces on to one sledge which we hauled to the top of the snow slope, arriving after about two hours at a rounded dome from which we would then have to go down onto the Ice-cap. We covered approximately one kilometre; all the while the runners of our sledge sunk deep into the soft snow and required a considerable effort to move them at all. We then returned down the slope to collect the second sledge. To our dismay we found after a while that it was clearly overloaded; as we rounded a steep corner it turned over, so after that we were forced to unload half of it and leave it by a rock, returning later on with an empty sledge to pick up a third load. At 7.30 pm we finally pitched camp on the snow dome at an altitude of approximately 1,300 metres. It had taken six people a full and exhausting day to move themselves and their supplies and equipment just one kilometre. It was a chastening experience. As the sun set a wind whipped up and the weather seemed to close in around us. We were not to see the sun again for the next two weeks.

The Calm Before...

After our first wet day in the Fiordo Peel, we had experienced remarkably good weather, certainly by Patagonian standards. We had several days of hot cloudless weather, when we were sweating with our loads through the forest. Tee-shirts and shorts were more in evidence than fibre pile or Gore-Tex and sun protection cream was always at the top of our rucksacks. The two days before our first day's sledging were wonderfully clear and we were given spectacular views across the Ice-cap. For the first time we were able to sit down with our aerial photographs to compare this vertical perspective with a new horizontal perspective.

We knew enough about the Patagonian weather however to know that the more clear days we experienced in the valley was likely to mean the less clear days we experienced on the Ice-cap. Perversely our good fortune in the valley was our bad fortune on the Ice-cap. In the valley bad weather can be a nuisance but it can never stop you in your tracks. On the Ice-cap however if the weather closes in your movements are at the mercy of the elements.

Visibility is the main problem; without a certain level of visibility any attempt to move, especially when hitched up to a 250 kilo sledge, is dangerous. The completely disorientating effect of a white-out can only be understood once it has been experienced. In the valley you are by and large below the clouds; on the Ice-cap there is a tendency to sit in them. Wind is the second most important factor. In the valley you are protected from the strongest of winds that whip across the Ice-cap; there are always rocks and trees to shelter your campsite, whereas on the Ice-cap, and particularly on the exposed snow dome where we had established our first sledging camp, you cannot hide from the wind. Wind combines with the third main complicating factor - snow - to complete the picture. In the valley it rains; rain is a pain in the neck - it gets into everything - but it does not hinder your movements. Snow, as we were quickly to discover has an annoying tendency to accumulate in places you don't want it to accumulate. The longer you stay in one place the more snow accumulates and the more energy it takes to prevent it from burying you, not to mention the energy required to dig yourselves out in order to move. Deep snow is difficult to walk in, slushy snow makes your sledge stick; icy snow makes it run away with you. When rain falls to the ground it normally stays there; when snow falls to the ground it only stays there if there is no wind which isn't a common occurrence on the Southern Patagonian Ice-cap. Even if it has stopped snowing, a moderate wind can blind you with snow whipped up off the surface.

Given all these factors we would definitely have been better off if the gods had thrown

everything at us while we were in the valley, instead of waiting for us to position ourselves in the worst spot on the Ice-cap before doing so, the latter of which, as the reader will probably have by now guessed is exactly what they did.

...The Storm

The first night, in hindsight, was a light blow, but it was enough to prevent us from moving the following day. Instead we brought the sledges alongside the tents on the windward side and built a snow wall along the windward side. The wind soon aided our efforts by piling large amounts of drift snow up against our wall, cementing the sledges inside a wall of ice. Within two days the wind had completely relevelled the surface of the dome and our little group of tents appeared to be submerging gradually in a hole that became deeper every day.

There were three pairs occupying three "Mountain Super Nova" tents - Pancho and Matthew, Colin and Bruce, and Nigel and Andy. Cooking was organised by tent, each tent having a stove and cooking equipment and allotting their rations independently of the others.

On the second day the wind dropped marginally but it began to snow harder and the visibility was down to zero. In the evening the weather calmed and for the first time we moved around freely and began to think of moving the next day. It turned out to be the calm before the most violent storm that any of us had experienced in our lives. The wind pounded against our tents all night long with deafening ferocity, even though by now we were well protected by the snow wall. It felt as if the tent would split from head to tail at any moment. Seldom had we been made to feel so small and helpless in all our lives. Most of us slept little that night. At the height of the storm, Colin and Bruce, who had experienced more than a few storms between them in Antarctica and South Georgia, roped together fully clothed inside their sleeping bags, having collected together all their belongings inside their bivvy bags, with knives at the ready should they have to cut their way out of their tents. The storm we experienced was probably no worse than the average Patagonian storm, but we must certainly have experienced winds of 150 kilometres per hour gusting up to 200 kilometres per hour.

More important than the psychological impact of the storm was the trail of damage it left to our tents. Nigel and Andy's tent which was in the most exposed position to the wind, had filled with snow between the inner tent and the fly sheet, via the ventilation flap in the fly sheet; the pressure this had created had torn a foot long rip in the fly sheet. Pancho and Matthew's tent had a smaller rip in the fly sheet near the vaillance and Bruce and Colin's tent had a rip in the fly sheet near the ventilation flap when Bruce had opened the zip during the storm to look out. The smaller rips could wait, but Nigel and Andy's tent needed repairing before we could go on and that would demand a period of dry weather in which the tent could be taken down.

The Lie-Up

By day four the task of clearing the tents of drift snow had become a more delicate and demanding affair; as the wall grew higher our movements became more and more cramped. The continued wetness combined with cold temperatures made the tent fabric brittle and weak and little tears and rips began to appear in every tent. We worked in shifts to clear the tents, but always seemed to be fighting a losing battle as the snow drifted in as fast as you could shovel it away. On several occasions we awoke in the early morning to find that the walls of the tent, normally on the windward side, had doubled inwards under the weight of the snow and threatened to collapse the whole tent.

During the fifth day of our enforced lie-up our hopes brightened as the weather seemed to clear. We seemed to be sitting in a thin band of cloud. The sun's heat filtered through and warmed up our tents like ovens, but outside it continued to snow. Any hopes were cast aside as the weather worsened again during the night and on into the sixth day.

Decisions

On the seventh day of lie-up, December 8th, the team reached a key make or break decision. We awoke to find glimpses of blue sky between the whiteness; occasionally we would catch sight of the mountain, or the fjord. A gusting wind still carried snow drift across the surface of the dome, but it was the most promising weather in a week. Some of the members of the team were keen to continue and others were not. This difference of opinion brought to a head the feelings of each member of the team faced with certain circumstances and certain realities most of which were unanimously recognised by all, although the reactions of each individual faced with these problems were not necessarily the same. Those problems were essentially as follows:

Logistical Problems

1. We had too much equipment which was responsible for slowing down our progress.
2. Despite the excess of weight we did not have enough food to complete a long and complicated crossing within a reasonable margin of safety. The traverse was abandoned with 21 days food rations remaining.
3. The food rations were felt by some to be lacking in calories for the energy required. Particularly sorely felt was the lack of chocolate in the lunchtime rations (See "Food Report").
4. The tents were not capable of standing up to the conditions and were too damaged to continue safely.
5. The primus stoves were presenting problems, suggesting perhaps that there was water in the paraffin.
6. The sledges were designed for travel over large expanses of relatively flat ice terrain. They were altogether too large and cumbersome for the highly broken Patagonian terrain.

Personnel Problems

1. All the members of the group would recognise that Patagonia '85 was not made up of climbers of great experience. None had attempted any expedition of such a challenging nature, or in such difficult conditions. The overall lack of experience was no great revelation to the members of the team; what differed between the members was their judgement of how this experience was likely to affect the team's chance of successfully completing the traverse within a reasonable margin of safety.
2. Lack of briefing. There existed among certain members of the team a lack of awareness of the nature of the problems that would have to be faced, particularly in terms of the weather, if a crossing were to be undertaken. This stemmed as much from fundamental ignorance concerning the region as it did from the perception of the dangers and the judgement of what constituted a reasonable margin of safety. Thus there arose a difference of opinion in the very fundamental question of what constitutes bad weather on the Southern Patagonian Ice-cap.

The latter two problems were more of a background nature. The more tangible logistical problems, coupled to the fact that we had not moved from our camp for 8 days, aggravated these background problems to the extent that they came to the fore and became the key issues.

The term "campamento movil" - mobile camp, which Juan had used during our first radio schedule from the Ice-cap, had by now become an old joke. Before abandoning the crossing we studied in detail the possible remaining combinations in terms of the team. We discussed the possibility of continuing with a four man team and a three man team. More attractive was the possibility of a three man team which would allow us considerable economies in terms of equipment - just one tent, just one sledging box, proportionally less paraffin etc.. We even got as far as repacking our equipment, but at the last minute the risks were too high and the determination was lacking.

We considered a variety of alternative plans: a traverse around behind Aguilera to look at

the North-West face, a reconnaissance of the Laguna Escondida and the first stages of the planned traverse to the Dickson glacier. These plans however were further thwarted by the weather which continued to keep us shut up inside our tents, increasingly damp and increasingly rusty at the joints.

Meanwhile down at Base Camp the botanical work was going well enough to prompt suggestions that we might cut short our planned stay. The Chileans were particularly keen to get home in time for Christmas and were pressurising Sue and Adrian to accept an early retreat. Having abandoned our crossing attempt we had no pressing motive to remain on the Ice-cap and so the idea of retreating in time for Christmas was an attractive one, particularly for those with family in Santiago.

The Retreat

So our date of departure was brought forward and a request was made to the Chilean Navy to rendez-vous with us at the mouth of the northern arm of the fjord on December 23rd. Getting off the Ice-cap with all our equipment was likely to be a time-consuming affair so on December 11th two pairs - Bruce and Colin, and Pancho and Andy - left our tentative foothold on the Southern Patagonian Ice-cap and set off down the mountain with one of the sledges. Matthew and Nigel decided to stay a maximum of two more days on the Ice-cap in the hope that the weather would give them at least one clear day in which to do a reconnaissance trip of the area. They were not in luck; the weather continued with zero visibility. Nevertheless they made the most of their time to practise navigation in white-out conditions, crevasse rescue and parachute-powered tobogganing!

Having had no luck with the weather Nigel and Matthew packed up on the 14th in the middle of a snowstorm and set off down the slope. They had a near miss when a "dead-man" slipped out while they were belaying the sledge with the result that the sledge was sent careering downwards dragging both Nigel and Matthew with it. After sliding 50 or 60 metres they managed to bring the sledge to a halt and thus avoided what might have been a disastrous accident.

Between 14th and 18th December we portered all our equipment and surplus food supplies down from the snowline to Base Camp, using four intermediate camps: one at the snowline, one at the Lagoon Camp, one on the left hand bank of the river at the main crossing and one on the right hand bank. We were working in two separate groups - Pancho and Andy, and Nigel and Matthew in one group and Bruce and Colin in the other. Each member was carrying on average two loads each, making a total of 12 loads. The summer meltwater, combined with the fact that it rained almost non-stop on the 17th and the 18th, had swelled the river alarmingly; crossing it now had become really quite hazardous. Bruce and Colin were the last to cross, when the river was at its highest, coming almost up to their chests.

The Botanical Party had by now evacuated Base Camp and established themselves in the river valley at the mouth of the northern arm of the Peel Fjord. From there Dionis and Juan returned on the 19th and collected the first load; Andy and Pancho moved back with them to the new Base Camp. They returned on the 20th to make two more journeys evacuating the stragglers of Patagonia '85 from the river valley that had been the centre of their world over the previous two weeks.

We made every effort to cover all traces of our passage through this river valley in all its untouched beauty. We burned and buried all our rubbish, removed all the ropes and tapes we had used to mark our route, and left, we hope, no visible remains of our presence which will not be covered by nature within a short space of time. It is the belief of this expedition that it is a fundamental duty of every expedition to ensure that they do not damage the environment in any way.

Conclusions

Having joined up again with the Botanical Party, our narratives join together again but before continuing there are certain conclusions that can be drawn from the experiences of the mountaineering party in the light of their failure to achieve any of their main priorities, and certain recommendations that can be made to future expeditions attempting the same or similar crossings:

The expedition was designed, from a logistical point of view, to adapt to a certain style of travel that has been tried and tested over decades in Antarctica. This style of travel is summed up by two words: slow and safe. It is slow because it involves carrying a maximum of potentially useful pieces of equipment, and a maximum margin of safety in terms of food supplies. This margin of safety allows the team to take less risks by travelling only on days of good visibility. Safety is the controlling factor.

Not only were our logistics designed on this style of travel, but the psychological approach of an important section of the mountaineering party was orientated towards this same style.

The main conclusion arrived at by the majority of the members of the mountaineering party was that this approach was incompatible with the nature of the task we were undertaking. The Patagonian weather simply does not allow you the luxury of travelling in perfect weather conditions on all days, unless your traverse is short enough and technically easy enough to complete the traverse within one or possibly two days. The crossing that we were attempting was a long one - 80 kilometres as the condor flies, but perhaps anything up to twice that distance in real terms - and is almost without doubt the most challenging stretch that exists on the Southern Patagonian Ice-cap from a technical point of view. We identified three areas from the aerial photography which we termed 'ice-falls'. The first two might be more accurately described as highly crevassed areas, but the third is a veritable ice-fall which drops perhaps 400 metres almost vertically. We strongly recommend any expedition attempting this crossing to study the aerial photography carefully, in particular the vertical shots from the Trimetrogon series taken by the USAF in 1944/45, which are of a lower scale and higher definition than the 1975 (Mark Hurd) or 1984 (SAF) series. (See Appendix II regarding aerial photography).

Although the expedition never progressed far enough to take a closer look at these obstacles, we did get a good view of the third ice-fall from the Fiordo Peel, which gave us the best visual impression of the difficulties involved in tackling it, difficulties which we had underestimated from our studies of the aerial photography which is often difficult to interpret. A few months later one of the members of the expedition had the good fortune to fly over the region in perfect weather conditions, during which he had the opportunity to take a good look at this ice-fall afterwards declaring it to be "impossible".

Even given perfect logistical preparation and a more experienced and technically competent team, we would not recommend attempting this ice-fall while carrying large amounts of supplies and equipment. It would seem that a food depot at the base of this ice-fall would be the ideal solution. A team travelling light and without sledges could tackle the ice-fall with a greater degree of safety, before completing the remaining 60 kilometres to the Dickson Glacier.

The French Expedition of 1982 came to the conclusion that the full North-South crossing of the Southern Patagonian Ice-cap is indeed possible. We would not disagree but would like to add that to attempt this crossing, as they did, from South to North is next to impossible, unless the logistical preparation and network of supply depots is so complete so as to allow the team to climb the third ice-fall unhindered by having to carry equipment. To attempt to carry sledges up that ice-fall is verging on suicidal.

The ice-fall is one section which would have to be negotiated in clear weather, but for the remainder of the crossing we stress that any expedition attempting to get anywhere on the

Southern Patagonian Ice-cap will have to be prepared to travel in the toughest weather conditions. Shipton's rule of thumb was that if the wind didn't knock you over when you got out of your tent then it was a travelling day !

It is also worth adding that it is psychologically very difficult for any team to remain motivated and cohesive after periods of more than a week cooped up inside their tents. Progress is a pre-requisite for the sustainment of a team's momentum. In this respect the leader's role is a critical one in terms of man-handling. Under such circumstances the psychological pressures exerted on the individuals in the team are intense. Every expedition always experiences tensions of this nature - the issue is to avoid allowing these tensions to subvert the overall aims of the group.

Of the few options that a leader has at his disposal in his task of handling the psychological balance of the team is the possibility of changing the combinations of the tent partners according to the way the psychological situation develops. In this respect our expedition proved inflexible. The system of having a certain amount of luxury items allotted to each tent, to be used as and when the respective pairs desired, meant that any changes of tent partners was liable to prejudice at least half the team in the matter which was closest to his heart - food. The food issue is not one to be underestimated; it is remarkable how in such circumstances food comes to be the central issue of everyone's life, the main topic of conversation, the mainstream of one's waking thoughts. We would also recommend therefore that any expedition of this nature should design its food rationing system in such a way as to allow maximum flexibility.

Adequate daily rations, both in terms of quality, quantity and calorie intake are critical to the morale of the team. Patagonia '85's rations were not ideal in a number of aspects, and could have been better if we had had more money to spend on them, but given the limitations the rations were perfectly adequate. The claim that we did not allot sufficient man-day rations is irrelevant in the light of the fact that we were already carrying more than the maximum sledge loads possible. Given that our experiences recommend speed for safety, we would equally stress that lightness is an essential factor, and one in which Patagonia '85 slipped up badly in the stage of logistical planning. We were quite simply far too heavy, and were carrying an excess of useless, or near useless, equipment. We strongly urge any expedition planning a long distance traverse over the Southern Patagonian Ice-cap to be thoroughly spartan in their approach to the equipment taken. Shipton and Tilman used to claim that they could plan an expedition on the back of an envelope. Shipton, in his zeal to economise on weight left a considerable supply of rations and climbing equipment behind on the Jorge Montt glacier at the start of his North-South traverse, to the great dismay of his Chilean companions who, when questioned of the whereabouts of anything that happened to be missing or mislaid during the weeks that followed, would always answer "Sheepton, he throw eet away !".

Patagonia '85 was an inexperienced and underprepared expedition attempting one of the most difficult sporting challenges that exists. It should not really be surprising that it fell at the first fence; at the same time it is fair to say that we were unlucky to be hit by a particularly violent and persistent period of bad weather at a time when we had barely set foot on the Ice-cap itself. It was not an encouraging start. Had we chosen our original date of arrival at the Fiordo Peel, November 1st, we would have been up on the Ice-cap by November 15th, in time for ten days out of the following fifteen of good weather on the Ice-cap, weather which even by the most demanding amongst us would have been considered as travelling weather; it might have been a very different story. We definitely recommend an arrival in early spring, perhaps even as early as mid-October, in order to be on the Ice-cap by the start of November. It's then a question of crossing your fingers and hoping that the Gods are with you, because if they aren't it's not much fun !

Introduction

The coastline of Magellanic Chile is characterised by an intricate system of islands and fjords, created by repeated glaciation - a process still continuing in the main spine of the Andes. Here glaciers plunge down from an ice-plateau at 1500 m to carve off icebergs into the ocean. Although generally in retreat, the glaciers of the Patagonian Ice-cap are amongst the steepest and fastest-moving in the world. In contrast to the rounded islands of the outer channels, the Central Andes are more alpine in character, with sharp peaks, steep valley sides and unconsolidated slopes.

The second main characteristic of the region is the climate. A track of cyclones follows the prevailing Westerly winds in from the Pacific, bringing continuous heavy rain, high humidity and frequent high winds. Precipitation is exceptionally high (eg. over 7000 mm per year recorded in the outer channels), and the temperatures uniformly low (mean annual temperature below 8°C) as a consequence of the proximity to the polar air mass.

These factors combine to make Western Patagonia a unique but inaccessible region. The rugged topography and fierce weather has limited scientific exploration to a handful of expeditions. Since Darwin visited the area in 1834, the principal botanical work has been carried out by Skottsberg (1908), who concentrated on the inner channels to the South; and by the Royal Society Expedition (1958-59), which visited the Isla Wellington. More recently a joint Anglo-Argentinian-Chilean programme has made a detailed botanical survey between latitudes 51°S and 52°S, including a pioneering study of the bryoflora of the Patagonian channels.

Other scientific research in the area has centred on the glaciology of the Ice-cap itself. Key investigations have been those of Mercer and Lliboutry, and more recently a long term research programme financed by the Japanese Ministry of Science.

Western Patagonia is of particular interest scientifically for a number of reasons:

- a). The present behaviour of the ice-sheet and glaciers, together with information on the history of glacial activity, provide an insight into landscape formation processes.
- b). As an area of active glaciation and vulcanism, the landscape is considered geologically recent. Organisms inhabiting the area can be considered in an evolutionary context, with biogeographic relationships between Southern Chile and other countries with a shared tectonic history being of particular interest.

Organisation of Scientific Programme

Fiordo Andrew was chosen principally to facilitate access to the Ice-cap and Cerro Aguilera. However the fjord remains unexplored scientifically, and lies some distance from where previous research has been centred: most of the previous botanical work has been carried out to the South and West. The interior position of the fjord also offered the possibility of investigating the glaciology of the Western edge of the Ice-cap.

Scientific projects to be undertaken were planned in consultation with researchers involved in previous work in the region, in the hope that results might be related directly to the information previously gathered from neighbouring areas. A summary of the work undertaken

is presented below; the complete results will be presented in a separate Scientific Report currently under preparation.

Biological Programme

As this was the pioneering study of the area, a series of collections formed the basis of the biological programme. In each case collections were made in response to requests made by specialists with a particular interest in the area. In addition, an effort was made to describe the composition and distribution of the plant communities present, and to relate these to ecological observations to extend previous phytogeographic work centred further South.

Botanical Collection

i). Vascular plants

Over 250 specimens were collected, representing 121 species from 47 families. Specimens were dried using plant presses and a dryer using propane gas. Identifications were made in the lab by reference to standard texts. Duplicate sets of the collection have been deposited at the Instituto de Patagonia, the Universidad de Concepcion and the University of Reading. A complete species list and a comparison with floras of areas studied further South will be published separately.

Although collecting was centred in the river valley, an attempt was made to sample alpine communities growing above the tree-line. No tall-herb communities (as described for Tierra del Fuego) were encountered; few species seemed to be limited to this high-altitude zone. *Huperzia* (= *Lycopodium*) *selago*, found at 1000 m, proved to be the first record for S. Chile outside Tierra del Fuego. Extensions to the known Northern limit of 13 other vascular species were made.

Overall, the scientific composition of the vascular flora of Seno Andrew differs markedly from that existing in the archipelago to the West and South-West. No species were found of the Valdivian phytogeographic region, which reach equivalent or more Southerly latitudes in the preandine archipelagic zone to the West. Also missing are numerous species of the South Patagonian-Fuegino region, whose presence in the archipelagic zone has been established by recent work further South.

The relatively depauperate flora of Seno Andrew may be due to the close proximity to the Ice-cap, with resultant lower temperatures relative to the archipelagic zone as a whole. A significant difference in floral composition was noted between Camp 1 and the camp established by the narrows at the fjord mouth (Site 2, see map) suggesting a further influence of the ice-sheet on a finer scale.

ii). Cryptogams

a). Bryophytes: South America has the worlds least-known bryoflora and thus a representative collection of bryophytes was a high priority. Forest and bog habitats were found to be very rich in both mosses and hepatics, although the epiphyte layer in the forest was dominated by ferns (*Hymenophyllum* sp.). About 120 specimens were collected; these have been deposited at the I.T.E. herbarium at Bush, Penicuik - the main herbarium for collections from this region.

b). Lichens: A collection of over 100 species of lichens was made, and deposited at the British Museum, which houses the collection made by P. James during Shipton's 1961 expedition to Patagonia.

Lichens were found most commonly growing epiphytically on trees, although an effort was made to collect from a full range of habitats including scree slopes above the tree-line. As with the bryophyte collection, it was hoped that the high-altitude species might be of particular interest from a phytogeographic standpoint.

c). Fungi: About 20 species of fungi were collected, and sent to Kew for identification. Fruiting bodies of ascomycetes and basidiomycetes were found to be common, particularly on fallen leaves. Of particular interest was the occurrence of *Cyttaria darwinii*, a tree-parasite forming fruiting bodies resembling an orange golf-ball up to 5 cm across. Despite the rubbery texture, this originally formed part of the diet of the native Indians.

iii). Living Plants

Three species of vascular plant were collected for the Botanic Gardens, Cambridge. *Luzuriaga marginata* and *Philesia magellanica*, both endemic to Southern Chile, were requested as part of a study into flower structure and pollination ecology. The latter species produces tubular red flowers and was observed being visited by humming birds; it is closely related to the Copihue (the national flower of Chile, now an endangered species).

iv). *Tetroncium magellanicum*

A sample of a range of flowering stages of *Tetroncium magellanicum* were preserved as material for an Anglo-American research programme into the evolutionary biology of the helobial monocotyledons. This species is restricted to Southern Chile and the subantarctic islands, growing commonly at the edge of bog pools.

Zoological Collection

An attempt was made to sample the invertebrate fauna using pitfall traps, malaise traps and sweep nets. Although limitations of time prevented anything approaching a representative collection, several thousand insects were collected. In addition a particular effort was made to collect Arachnids as these have been entirely neglected in previous investigations. The collection will be deposited at the British Museum after sorting.

It proved impracticable to collect animals larger than insects, although a mouse and a collection of toads were preserved in formalin. The latter may be of particular interest as previous reports have suggested an undescribed species may inhabit the channels. The collection was deposited with C. Venegas at the Instituto de Patagonia.

In addition a record of zoological observations was kept whilst in the field. Some 39 species of bird were seen, the number of seabirds being appreciably higher at Site 2 as a consequence of greater maritime influence and resultant larger populations of fish (-several species of Robalo [mullet] were caught).

Of particular interest were the Andean Condor (often seen circling above the valley and occasionally at very close quarters), and the Green-backed Firecrown (a humming bird seen frequently visiting red flowers, tents, balaclavas and climbing ropes). A possible sighting of the Buff-necked Goose will, if confirmed, be a surprising extension to the range of this species.

During the journey back to Punta Arenas we were privileged to see the Coscoroba Swan - a bird endemic to the region and very local in distribution - as well as Flamingoes and Darwins Rhea, both birds of the Pampas.

Few observations of mammalian life were made; most frequent sightings were of mice (one

captured eating food stores) and Andean fox (a large rufous-coloured wolf-like animal; traces seen regularly around camp). Of most interest was a probable sighting of huemul, an endemic species of deer - in fact a national symbol - now virtually extinct. In addition, evidence of puma, coypu and sea-otter were noted; pied dolphins and sealions were observed at Site 2.

Ecological Investigations

As a complementary study to the vascular plant collections, a series of ecological investigations were carried out:

- i). A description of the distribution and composition of the plant communities in the area. These descriptions will form the basis of a comparison with other phytosociological work carried out further South.
- ii). A series of preliminary investigations into vegetation dynamics were undertaken. In particular it was hoped to gain some insight into the factors influencing the composition and distribution of the plant communities.

This was accomplished by an analysis of age structure and regeneration in a series of forest canopy gaps of different age, together with basic edaphic measurements (soil depth and composition, aspect etc.). An analysis was also made of the hydrosere zonation around bog pools; virtually nothing is known about the dynamics of both forest and bog communities in the region, and much basic work remains to be done.

The results of these investigations will be published separately; however a general description of the vegetation is presented here as a background to the other studies.

Meteorological Investigations

A continuous record of meteorological observations was made in order to assess the climatic conditions of the area. Precipitation, temperature, windspeed and humidity were each measured twice-daily. The results are of particular interest as very little meteorological data are available for the region as a whole, particularly in the inner fjords. Data were also requested by the Japanese-funded Glacial Research Project, as information on climate is essential to the understanding of glacial processes. In addition, meteorological data are of major importance in the interpretation of vegetation pattern.

Maximum rainfall in a 12 hour period was 16 mm; most days were overcast with constant high humidity (over 85%). Temperatures were very rarely above 15°C, and usually around 10°C or less. Due to the sheltered position of the meteorological station high winds were rarely experienced, although at 1500 m the climbing party endured constant gales (over 120 knots) and driving snow. A particularly bad storm in the final week brought 120 knot winds and continuous rain for three days, even in the valley bottom. The same storm claimed the lives of six fishermen further West.

Whilst it is difficult to infer the climate from 5 weeks observations, some conclusions might be drawn from a comparison with the records from the nearest permanent meteorological stations for the same period. A full presentation of the data with such a comparison will be published separately. At this stage it is possible to state that our results compare closely with the findings of Garcia, who described the weather during his visit to the Fiordo Andrew as follows:

"In the beginning, it was awful. Then, it was horrible. At the end, it was terrible."

Glaciological Investigations

Glaciological research on the Patagonian Ice-cap centres on the characteristics of the glaciers themselves (eg. accumulation and water flow rates) and on analyses of glacial sedimentation and stratigraphy. Whilst the Fiordo Andrew offers free access to a large number of glaciers, three reaching sea level, a detailed analysis of local glaciation was beyond the scope of this team. Two projects were attempted:

- i). A photographic record of glacial termini was made, for comparison with the aerial photographs available for the area. A map and discussion of recent glacial history is under preparation.
- ii). A sample of tree cores was taken in support of the Glacial Research Project which is attempting to compile a standard dendrochronology for the area of the Patagonian Ice-cap. It is hoped that the sample taken will enhance the coverage of the present research programme, which is largely limited to more accessible sites, and the data stored in the international data bank in Arizona.

Geological Investigations

Despite the work of Dalziel in adjacent areas, the geology of the area surrounding the Fiordo Andrew is completely unknown. Previous reports suggested that Cerro Aguilera might be of volcanic origin, due to its isolation from peaks of similar height. It was hoped that evidence might be gathered to assess this observation, and some information on the local geological formation be obtained.

Unfortunately due to the highly altered nature of most of the rocks encountered and the general scarcity of suitable outcrops, mapping of the geological structure proved impossible. However a number of observations were made, strongly supporting the view that Aguilera is a volcano: pyroclastic rocks found on glaciers and in the river-bed at Site 2 were almost certainly of local origin. In addition the occurrence of mylonites supports the information from aerial photographs suggesting a major fault in the area.

Archaeological Artefacts

Indications of the presence of human influence were striking by their absence: no rubbish on the shoreline; no signs of fire or forest clearance. A separated sea-otter skull was interpreted as possible support for unconfirmed reports that fishermen occasionally enter the fjord. However the general conclusion was that the fjord has hardly ever been visited.

The most remarkable find was of the remains of a canoe, probably of Indian origin. Despite its poor state of preservation, the flattened and burnt appearance of the wood strongly suggests that it was originally hollowed out of a trunk of *Pilgerodendron uvifera*. Canoes made by the Alacaluf Indians, the indigenous tribe now virtually extinct, were originally made of bark; dug-out canoes without indication of nails or saw marks date from the time of early contact with Europeans (perhaps 200 years ago). No sign of wooden piles or the remains of settlements were discovered, perhaps indicating that the canoe was not of local origin. The Alacaluf were predominantly a fishing culture, spending much time plying the fjords in small family groups. Pure-blooded Alacalufs now probably number less than 50; the decline from a probable population of thousands is attributed to the introduction of diseases such as measles with European colonisation.

Conclusions and Recommendations

Conducting scientific work in Western Patagonia is extremely difficult. Besides the formidable problems of access and adverse weather, the terrain is also a major hindrance. Movement through the forest - especially when developed on slopes over 30° - is severely hampered by a ground layer of epiphyte-covered rotting logs, which are slippery and often collapse underfoot. In more open areas of forest dense development of shrubs (some spiny) make movement virtually impossible, although the bamboos which can make the forests of South Central Chile so impenetrable are thankfully absent.

Valley-bottom hummocky moss-bogs are similarly very difficult to traverse, the easiest routes being through the open heaths developed on alluvial gravels near drainage channels. Together these factors severely limit the scope of any research programme intending to cover a large area; most of the scientific work was carried out within three km of the base camp simply due to necessity. Even ascending a peak of 1000 m is a major task requiring several committed hours as a belt of forest has to be traversed. Descent down the sheer valley sides is extremely hazardous.

Drying samples in such a humid atmosphere has posed great problems to other expeditions to this region; fortunately most of the drying was accomplished during a spell of fine weather when specimens were left out in the sun. Although both paraffin and gas stoves were used, the latter were preferred as they needed less attention and could be left burning overnight. Problems with draughts were overcome by surrounding the drying apparatus with canvas sheets. It was found that particularly in the case of delicate hepatics, gradual drying was essential; specimens perhaps requiring several days of gentle heating.

Watertight aluminium cases and sealable polythene bags were used for storage of specimens when dried. For fieldwork - often carried out in continuous rain - 'Permatrace' was used successfully as waterproof notepaper (-available from drawing offices). Large numbers of sealable polythene bags (for specimen collecting), paper bags (for drying), and paper packets (for storage of delicate specimens), together with plant presses and drying papers, were essential items. Insects were preserved in sealable plastic tubes in alcohol of varying strength (70 - 90%).

Whilst a great deal of work was completed, 5 weeks in the field is a comparatively short time by European standards. Considerably more could have been achieved had another month been available to the participants. The choice of projects was dictated by the sources of funding; finance was raised to support each project individually. Given these restrictions, a number of recommendations are presented here:

- i). Despite inherent problems (for example differences in approach), a team including Chilean members is highly desirable - if only to ensure continuity with work previously undertaken. Full briefing of participants and the involvement of all members in planning and preparation is strongly recommended.
- ii). By the nature of the funding, the scientific projects were very diverse in nature. More intensive study of fewer aspects might have been profitable.
- iii). If a scientific team is to make the most of time spent in the field, a small support team to run the camp is extremely useful.
- iv). Clearly, any future work will depend upon the interests of the participants. There is a need for more intensive collecting, particularly of cryptogams and insects, where there is no shortage of interested specialists. Phytogeographically the region is well understood: future work should concentrate on investigating the factors influencing plant distribution.

Two aspects are of particular interest:

a). The relationship between moss/hepatic bogs, *Sphagnum* bogs and vascular cushion-plant bogs. Preliminary investigations suggest a dynamic relationship between the 3 types, perhaps reflecting seral stages in a succession. No information on the dynamics of these communities is available in the literature.

b). The vegetation dynamics of the forest, particularly as evidence suggests individual trees may grow to extreme old age (over 1000 years) despite the high degree of disturbance (landslides etc.).

The understanding of the ecology of these forests is a prerequisite for a management or conservation plan. The mass destruction of the temperate rain-forest elsewhere in Chile is a matter of very grave concern, especially as it has gone virtually unnoticed. One wonders how long the extreme inaccessibility of the forests in the inner channels will protect them from the fever of exploitation which has so far reduced the vast acreage of rain-forest in South Central Chile to a few montane localities.

c). Further work on glaciology, geology or even archaeology would be very worthwhile.

Despite the difficulties of working in this 'Land of Tempest', an expedition to Patagonia is recommended as a highly worthwhile venture, and is certainly within reach of a student team with ambition. The combination of forest adjacent to glacier; the sight of condors soaring over both forest and ice; the chattering of parakeets deep within the silent jungle: the overall impression is of deep timelessness. Imagining the Indians plying their canoes through this awesomely wild landscape impresses not only the true scale of its features, but the humble scale of man's impact. If increased knowledge of this area can help preserve one of the few virgin and truly primeval forests left in the world, then further expeditions to Patagonia are not only recommended but strongly urged.



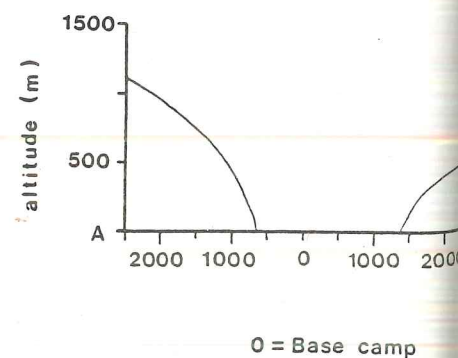
FOREST TYPES

- 1 Evergreen broadleaf
- 2 Evergreen needleleaf
- 3 Deciduous broadleaf
- 4 Stunted or sparse broadleaf

OTHER VEGETATION TYPE

- 5 Grassland
- 6 Heathland and rushbogs
- 7 Moss bogs
- 8 Alpine communities
- 9 Non or scarcely-vegetated areas

Relief profile of valley (to scale)



DESCRIPTION OF VEGETATION

The accompanying map outlines the mosaic of vegetation types found in the river valley where Base Camp was situated. The resolution of the vegetation into different "types" is an arbitrary one, and is based as much on vegetation structure as composition. Areas intermediate in character were found, and thus the map serves merely as a guide to the range and distribution of vegetation types in the area, and not as a rigorous account. A full phytosociological analysis of the vegetation will be presented separately.

Type 1 : Evergreen broadleaf forest. Dominated by *Nothofagus betuloides*, forming a dense continuous cover with individuals reaching up to 40 m. *Drimys winteri* and *Embothrium coccineum* in wetter areas or gaps respectively.

Type 2 : Evergreen needleleaf forest. Patches of the Southern Cyprus *Pilgerodendron uvifera* growing amongst vascular cushion-bogs and occasional poorly-developed broadleaves.

Type 3 : Deciduous broadleaved forest. Dominated by *Nothofagus antarctica*, forming a low scrub cover at treeline.

Type 4 : Stunted or sparse broadleaved forest. Mosaic of shrub and poorly-developed tree cover on exposed or rocky sites.

Type 5 : Grassland. Small tussocks of *Agrostis* sp. and *Poa* sp. developed on gravels of river delta.

Type 6 : Heathland and rush bogs. Mosaic of rush bogs (dominated by *Marsippospermum grandiflorum*) and shrub cover (developed on sites with freer drainage). Heathland dominated by *Empetrum rubrum* and *Pernettya mucronata*, with occasional *Nothofagus* sp.

Type 7 : Moss bogs. Dominated by *Sphagnum* sp. and hepatics; fringing pools or forming shallow domes.

Type 8 : Alpine communities. Dominated by cushion-forming vascular plants (eg. *Pernettya pumila*) and bryophytes.

Type 9 : Non- or scarcely-vegetated areas. Higly-disturbed screes surrounding the two glaciers were completely unvegetated. The linear features pictured on the valley side are forest-free areas as a result of avalanche.

Our second base camp was positioned on a flat area of river silt deposit to the left of a river, which we named River Moore, in recognition of the help given to us by Professor David Moore of Reading University. The river basin drains the South/South West slopes of Cerro Aguilera and flows into the Fiordo Peel just before the Angostura Mischief. The great advantage of this spot was the abundance of fish and seafood in the more salty waters of this stretch of the fjord. The relatively fresh waters near our first base camp were apparently devoid of fish and seafood, much to the chagrin of Juan and Dionis. In this second base camp however we caught ample quantities of "robalo", similar to mullet, and "choros zapatos" - mussels.

We celebrated Christmas on the longest day of the year - December 21st. Mussels in a garlic sauce with rice was followed by Mrs. Harveys homemade Christmas pudding with brandy margarine! We even had a balloon with some rudimentary decorations with which we livened up the tree which happened to be growing outside our tent, and which bore a passing resemblance to the European Christmas tree.

On December 23rd we made our rendez-vous as planned with the LPC Villarrica, this time under the command of Teniente 1 Juan Pablo Heuser. The loading process was a quick one thanks to our proximity to the Villarrica, and thanks to the first fine day we had had in some time. Our departure was delayed only by Nigel, who decided to make the most of the warm weather to take a swim, taking with him most of the for'ard railings of the Villarrica, and a fully clothed Andy, who just happened to have the misfortune to be leaning against these same railings when Nigel decided to go swimming! The journey back was considerably quicker and more comfortable thanks to a following wind, and we skidded along at 15 knots. From Natales we headed back straight away to Punta Arenas. Colin and Bruce however made the most of the opportunity to take a few days' holiday in the Torres del Paine National Park.

We spent between Christmas Eve and December 28th in Punta Arenas, where once again we were accommodated at the Patagonian Institute. The next Air Force flight was not due to leave until the 28th. Pancho and Dionis however managed to beg, borrow or steal tickets back to Santiago on Christmas Eve, arriving as surprise Christmas presents to their families. Christmas Eve, the time when Christmas is celebrated in most Catholic countries, was spent first at the Seno Andrew's church, where we attended the carol service, then on to an Italian restaurant where we ate "lomo a lo pobre" and drank a Cousino Macul Don Luis or two and sang "Jerusalem" to the restaurant, before finishing up finally at the house of Mr. Johnny Englisch, an Anglo-Chilean Sheep farmer, where we were kindly invited to join in what was essentially a family occasion.

We made the most of what time we had in Punta Arenas to sell as much of our equipment as possible, particularly the bigger and heavier pieces of equipment - pick axes, spades, mess tins, fuel etc. We had also to repack all the equipment which had been hurriedly packed in the field, attempting in the process to dry some of the more important items.

We returned to Santiago on December 28th in time to celebrate a second Christmas and the New Year. Bruce and Colin followed later on under their own steam. Andy, Bruce and Colin returned as soon as they could due to commitments in England, but Sue and Adrian stayed on in Chile for three weeks travelling southwards as far as Puerto Montt and visiting on the way a number of botanical contacts in Concepcion and Valdivia.

We gave a last Press Conference organised by our sponsors - Lan Chile - at the Hotel Galeria in Santiago on Thursday 9th January which gave rise to a number of newspaper articles and two reports on National television. Thus, with this last formal occasion, our expedition disparate from the beginning, drifted off to their separate corners of the world, from which they have somehow glued together this account of their experiences, and with which they thank those who helped to make it all possible.



1. An aerial view looking south-east over the ridge at the end of the Seno Andrew, and Lago Argentino. The Laguna Escondida (or Mayo) is visible in the foreground. The glacier to the right is the Moreno glacier (Bismark). The proposed route ran along the ridge pictured bottom right (top left in picture below).



2. Seno Andrew from the air showing Ventisquero de los Patos (left-hand glacier) and Ventisquero de los Lobos (right-hand glacier).



3. Loading the "LPC Villarrica" at Puerto Natales.



4. Pancho at a press conference in Punta Arenas.



5. Ventisquero de los Lobos from about 1 km.



6. (Left to right) Juan, Colin, Bruce and Pancho on the Chilean Navy Zodiac with Ventisquero de los Lobos behind.



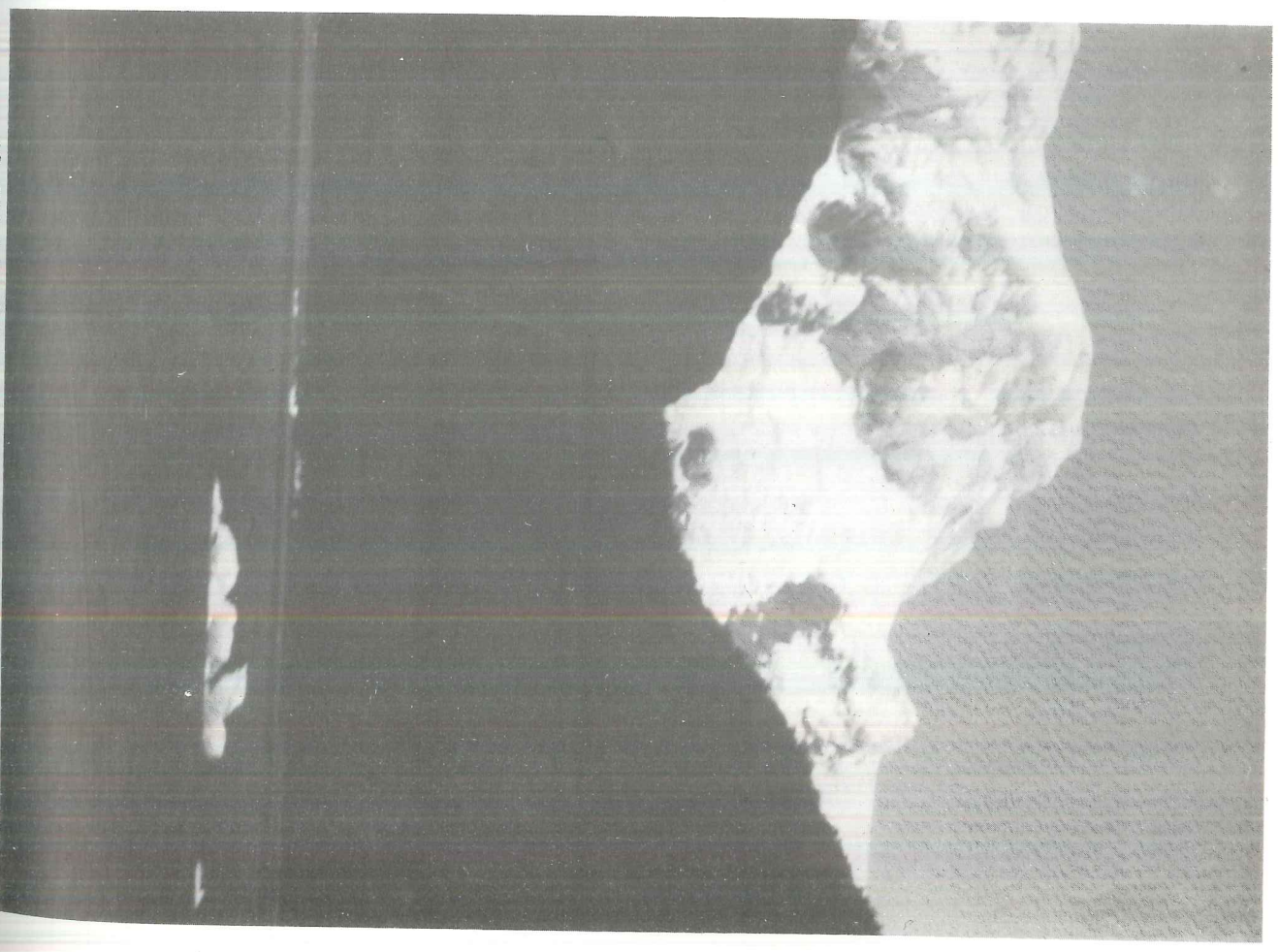
7. Remains of an Alacaluf canoe.



8. Accumulation of ice at low tide at the entrance to Seno Andrew.



9. Nigel and Matthew portering through the rainforest.



10. Third ice-fall seen from sea-level in Seno Andrew.



11. Portering the sledges.



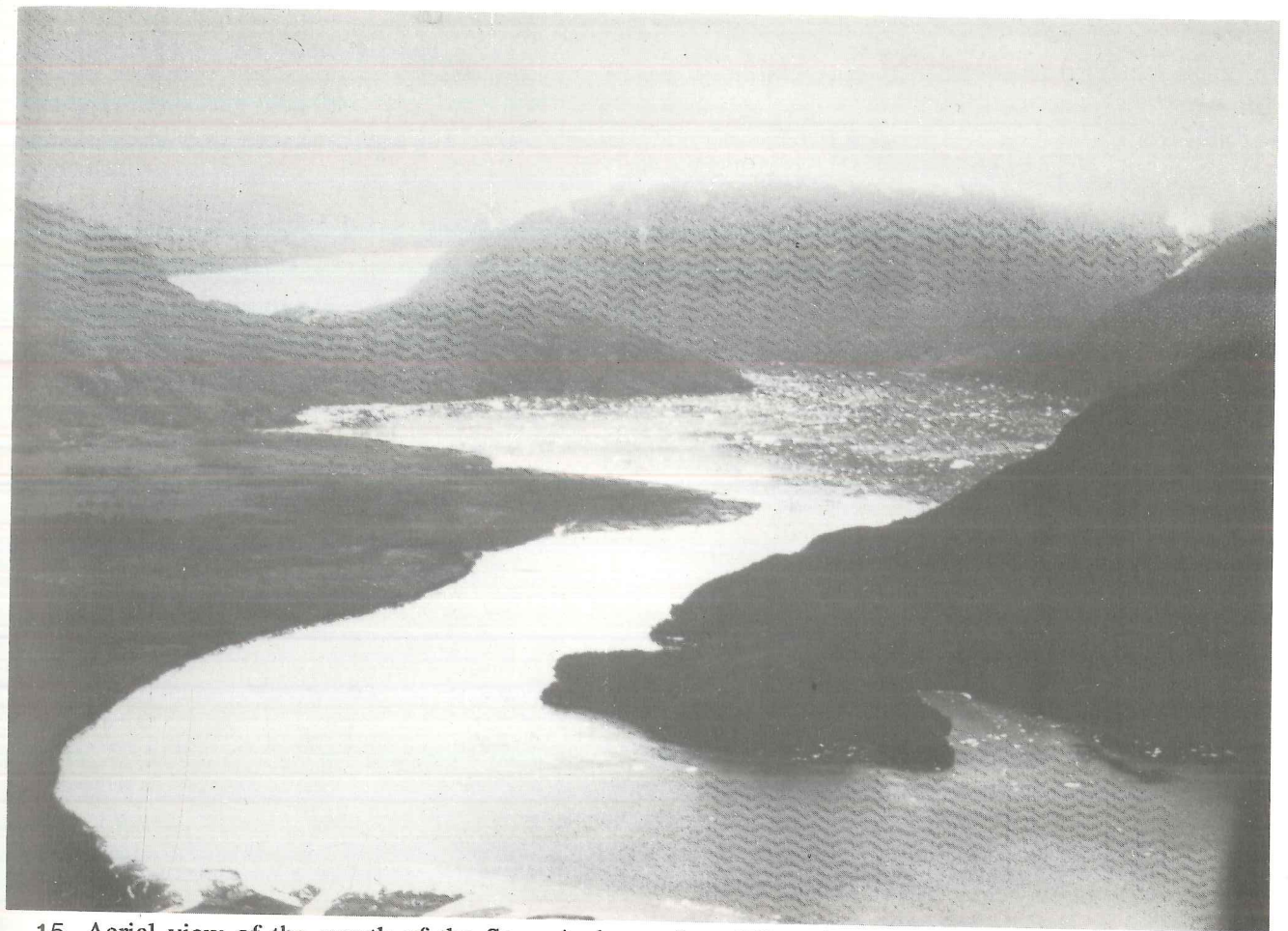
12. Sue and Adrian at base camp.



13. Aerial ropeway over the River Murtillares.



14. Andy Jeram crossing the River Murtillares.



15. Aerial view of the mouth of the Seno Andrew where Tilman's yacht "Mischief" was grounded.



16. Camp Three, last camp on dry land, overlooking the Shackleton glacier (Altitude approx. 1500 m).



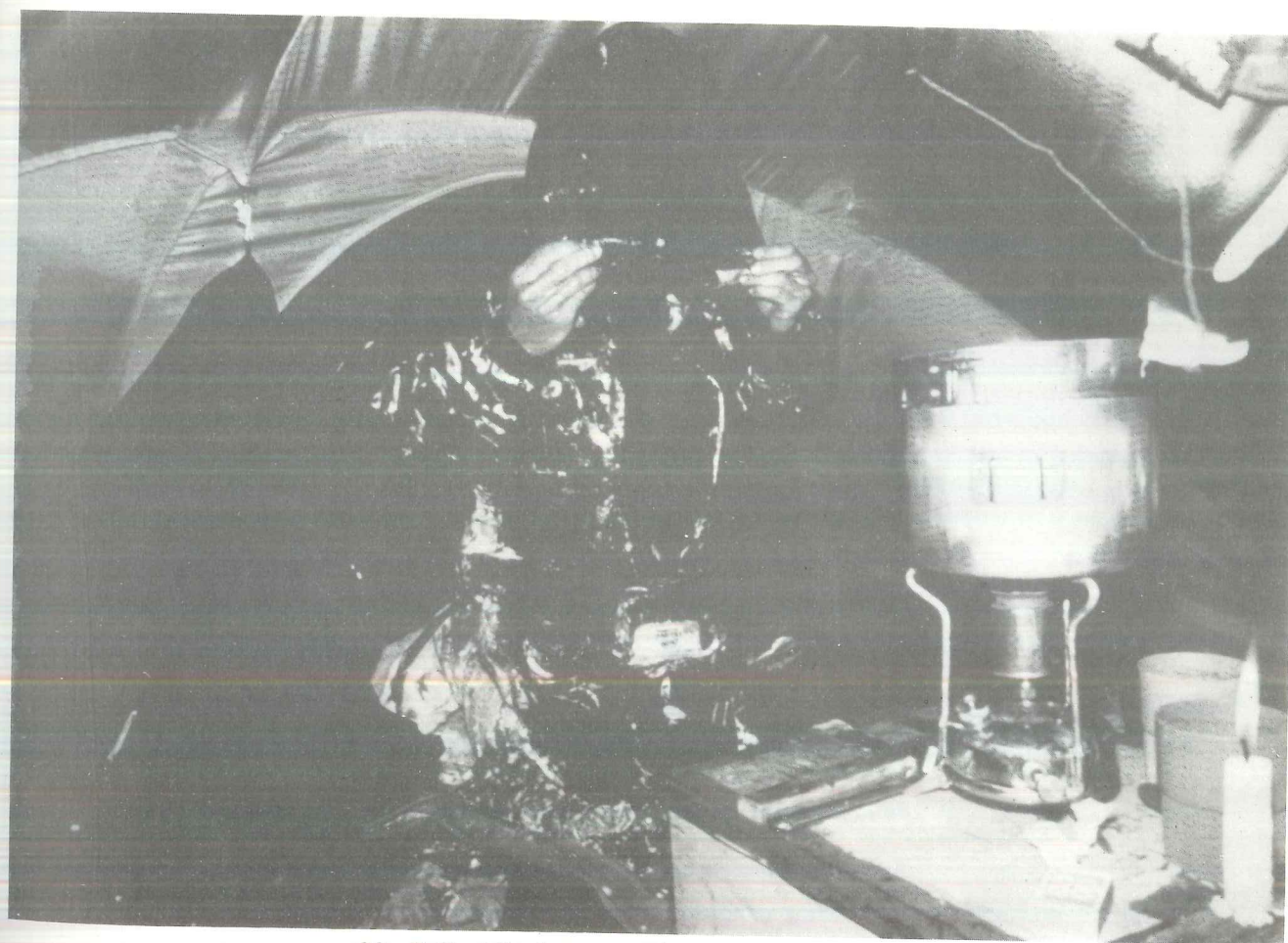
17. Pancho on the Ice-cap looking north towards the Altiplano Japon.



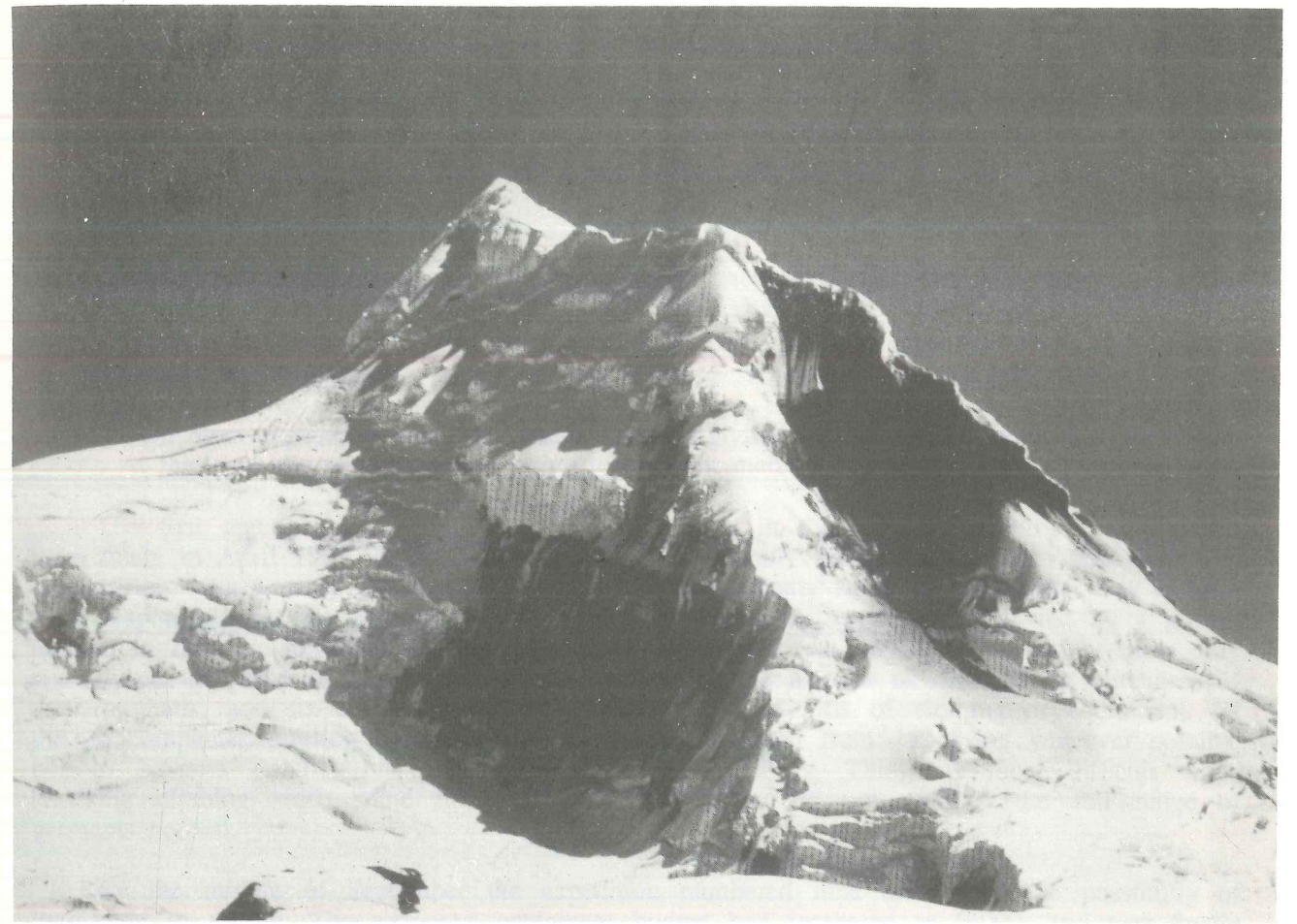
18. View east across the Ice-cap showing first stages of proposed route towards the peaks at the head of Seno Andrew. Nigel Harvey in foreground.



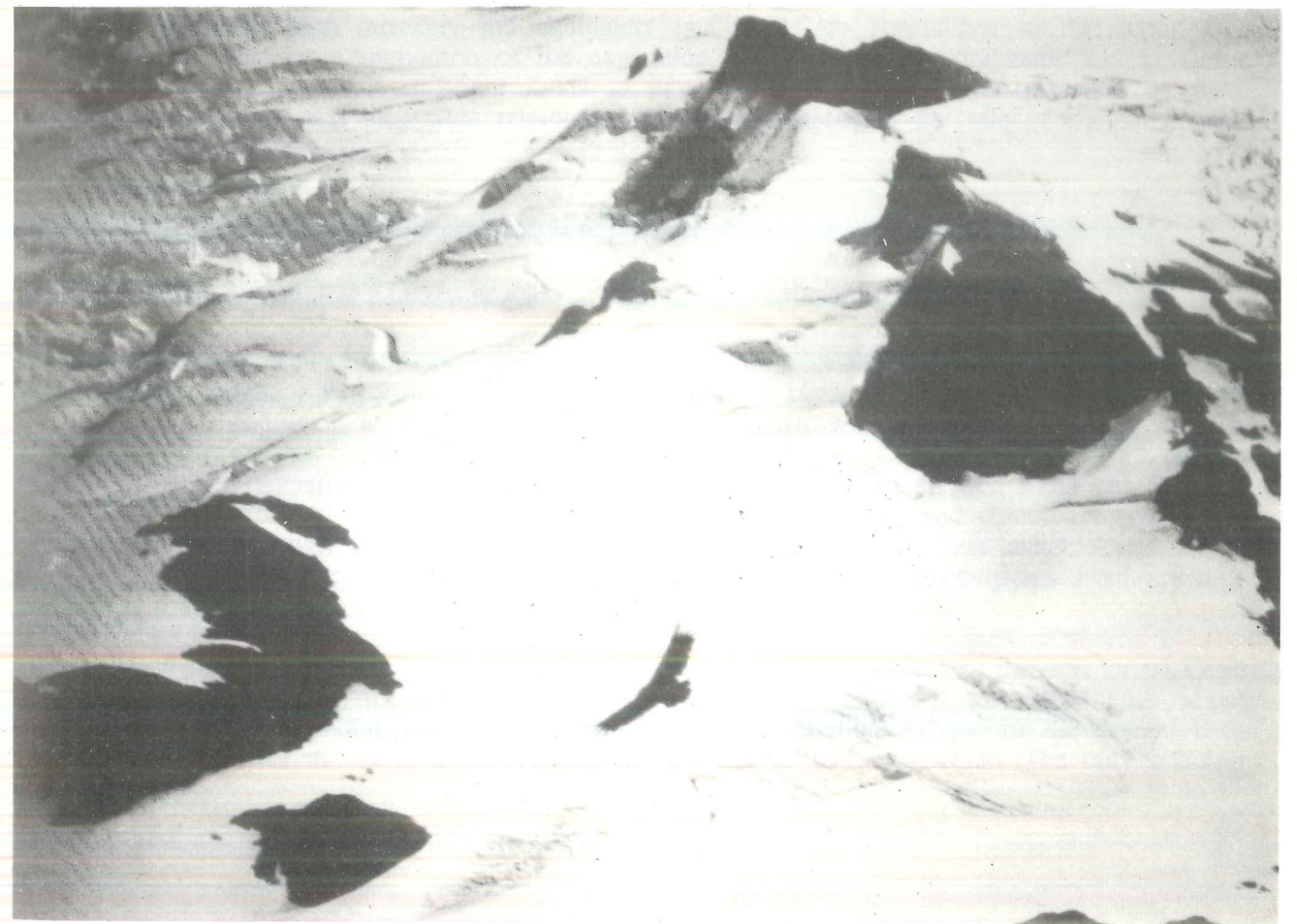
19. Camp on the Ice-cap.



20. Colin Nicol coming in from a snowstorm.



21. Cerro Aguilera (2438 m) from the north-east.



22. Condor above the Ice-cap.

a). EQUIPMENT REPORT

1. Sponsorship and funding.

In the first expedition plan the budget for supplying the expedition with equipment was £3000. At this time the team was only going to be eight men.

The first approaches to companies for sponsorship in the form of clothing or equipment were made in April 1985. In the first round of requests only six companies were approached by letter. There was a delay due to the withdrawal of John Beatty from the team, who was to have been responsible for the equipment. These few approaches in April were followed by a greater number in July. In all, some 28 companies were approached (see appendix X), and of these only six refused any kind of help. The others all offered some amount of discount on purchases of their products, and six offered sponsorship in the form of gifts of clothing or equipment. Of the 22 companies offering support we subsequently purchased from 15, trying wherever possible not to have a conflict of interests in the firms products. This was most difficult when choosing clothing since some firms offering us support did not produce the full range of garments needed.

By the middle of September the expedition numbered nine men, with the possibility of increasing to eleven. The proposed equipment budget had increased to £4000, and was finally about £4500. This higher figure was partially because of the policy adopted by Bruce and Colin. The personal equipment and clothing owned by members of the expedition varied considerably. In view of the extreme conditions which the expedition might encounter we chose to clothe and equip the expedition from scratch regardless of what the team members already had. The lists of clothing issued to each member, and equipment purchased, are appended to this report (see appendix X). This large proportion of the expedition budget spent on equipment was in fact a loan, since there were not sufficient funds to pay for it. The money was provided by those collecting the items, and they were reimbursed from the proceeds of the sale of equipment after the expedition had returned.

2. Evaluation of equipment.

i). ALLCORD Ltd. Ropes and Hardware

The expedition purchased six 9 mm x 45 m part colour kermantle ropes, made by Cousin. This considerable length was considered necessary in case we chose to leave some lengths on the mountain, or destroyed any whilst lowering sledges down steep ice. We had not initially purchased any general cordage for use at base camp thinking it could be obtained more cheaply in Chile. It was actually more expensive in Santiago than if we had shipped some out from the U.K. Our total stock of rope when completed included a further two used climbing ropes, plus a length of 19 mm hauser laid nylon for lowering drums of fuel off trucks and launches, and 200 m of 7 mm polypropylene cord. The latter was used for a multitude of purposes from spanning rivers as a safety line, to lashing down sledge loads.

The 9 mm climbing ropes were not all used due to the abandonment of the attempt on Cerro Aguilera, and eventually the sledge traverse as well. Some were used for safety lines across rivers, we had five crossing points roped for much of the duration. Others for the descent back into the valley once the decision to retreat from the Ice-cap had been made. The only criticism

in our choice of rope was levelled at these 9 mm ropes which grew very heavy in the wet. We would recommend 'everdry' ropes to the participants of similar expeditions.

Our purchase of hardware consisted of ice-axes and hammers, ice screws, crampons, 'footfangs', and aluminium carabiners, made by Camp. In the course of events the axes and hammers were mainly used as dead-men for the tent guys and the screws were not used at all. The carabiners were put to good use when we rigged an aerial runway across a fast-flowing river to haul all the food and equipment across. Many of the carabiners corroded badly in the damp, and some of the screw-gates seized, thus we would want to test several different metals before recommending these crabs to other rain-forest expeditioners. The nature of our expedition was such that we would not have undertaken any technical ice climbing and could have saved a few more grammes weight by taking crampons other than footfangs.

ii). BERGHAUS

Every member of the expedition was issued with a pair of Yeti gaiters. These were initially used for the landings from the inflatable boats. During the following months the gaiters were worn every day. Movement through the forest often involved stream crossings and the gaiters meant the difference between permanently wet feet and moderately damp ones. With rain every day but six we could hardly have expected to keep completely dry.

The party attempting to cross the Ice-cap also had Yeti gaiters. These have been tested in snow over many years, but unfortunately two weeks of carrying equipment up through the forest and up a rock ridge to the snow was more than the gaiters could stand, which we obviously found disappointing. The common fault was the tearing of the rubber instep which receives a lot of punishment when being used on scree and rock. One possible modification might be some wire reinforcement to this part. It would be totally impracticable to keep removing the gaiters on a mixed snow and rock route. Those of us that had separate boots and gaiters for skiing on the Ice-cap were more fortunate.

iii). EUROPA SPORT. Lowe Products

LOWE RUCKSACS

The expedition purchased two sizes of rucksack. For the scientific team in the forest we chose the 'Fitzroy', and for the climbing party 'Expedition' sacs. Both models proved adequate and were used for carrying loads of up to 35 kg most of the time, and about 45 kg on some occasions. The 'Expedition' were subjected to considerably greater strain and wear than the 'Fitzroy'. Only one of the 'Expedition' sacs failed, when stitching tore slightly on a shoulder strap. There was a general complaint from all of the members of the climbing party, however, and that was the lack of an extension hood. If the sac is filled to its 85 Ltr. capacity the hood will not cover the contents.

LOWE-PRO CAMERA BAGS

Several members of the expedition purchased these bags. They received a considerable amount of rough treatment, and proved themselves to be more than adequate.

iv). MOUNTAIN EQUIPMENT

ONE-PIECE SUITS

The expedition had six one-piece suits made for members of the Ice-cap crossing party. These were considered preferable to the separate jacket and trousers because of the expected wind and blowing snow; they have been used by others on high mountain climbs and crossing the Greenland Ice-cap. Most of the members of the team had mixed feelings about the suits: they contain the heat well when it is windy, but have limitations in the changeable climate that we

experienced. There were times when it would have been more convenient to be able to remove a jacket than strip off a whole suit. There were also faults in the design and manufacture of the suits, ie.:

- 1). No zip opener was installed at the crutch position. To urinate the wearer had to remove his safety harness and unzip the top half of his suit from his neck down to his crutch. This was time consuming, inconvenient, and caused him to lose body heat.
- 2). We requested pocket openings to be positioned half-way down the trunk to enable the wearer to gain access to the contents of pockets inside the suit. These should have had zip closers as well as Velcro. The position of those provided were too low and they were obstructed by the waist belt of the harness.
- 3). The map pocket did not have taped seams and the contents often got wet.
- 4). The hoods contain a draw string which is set back from the wired edge. The string runs through a tube which is stitched right through the material and not taped. In rain this means a wet head.
- 5). The cuffs of both arms and legs did not have sufficient protection, and frayed within two weeks.
- 6). It is necessary to wear a belt with these suits when not wearing a climbing harness. The trunk has to be manufactured long enough to allow the wearer to reach above him. This means for walking the crutch is half-way between his thighs. It is essential that loops are stitched on to hold a waist belt.

This report appears highly critical, but in fact we were pleased to have the suits. We do, however, strongly recommend others to consider the combination of sallopettes and waist length jacket. This provides greater versatility, and ample protection to the trunk of the wearer.

TWO-PIECE SUITS

These were standard Mountain Equipment shell garments. Our only criticism is the lack of a fly zip, and slits to allow access to trouser pockets.

SLEEPING BAGS

The six members of the Ice-cap party had 'Cerro-Torre' bags, while the forest team had 'Fire-Birds'. The Cerro-Torre bags have a radiant barrier. Both models were adequate for the conditions experienced.

During the two months we were in the field the bags were continually used in very wet conditions. We were very pleased with them, and would be happy to recommend them to others going to a similar climate.

v). WILD COUNTRY ANTARCTICA

THE MOUNTAIN SUPA NOVA TENT

This is a very spacious tent for just two men, but was chosen in view of the fact that the Ice-cap team from the expedition expected to be living in them for 40 days, often confined to the tent by bad weather. With a large floor area, high roof, and inner tent held under tension by the poles, it was possible to cook inside without fear of setting the tent alight. Regrettably they did not prove suitable for our expedition, in spite of the space and comfort, for a number of reasons. Our main criticism is that the tent is not strong enough to withstand high wind speeds. This is particularly bad when you consider that it is sold as a mountain tent, and there are few mountainous areas of the world that do not experience strong winds. It appears that the Supa Nova was designed for normal British camp site use, and the mountain version simply had a valance sewn onto the bottom of the fly sheet. The following is a list of faults we found during the time we were using it both in the cold-temperate rain-forest and on the Ice-cap.

- 1). A large expanse of material on the sides of the tent is unsupported, allowing the inner and outer tent to flap together in any wind over 15 kts. Apart from causing noise, this sprinkles water onto the occupants during rain or snow fall.
- 2). The design of the tent requires an excessively large number of guy ropes to support it in a wind.
- 3). The vents at either end of the fly sheet are necessary, but require Velcro strips to allow them to be sealed in blowing snow.
- 4). The guy ropes to either side from the centre of the top rub against the tent fabric. This caused holes to be rubbed in strong winds.
- 5). The flap covering the entrance zip faces the wrong way if the nose of the tent is pitched into the wind.
- 6). The fly sheet is supported on a hoop in the inner tent over each door. Any condensation running down the inside of the fly sheet collects on the inner tent at this point and drips through the seam.
- 7). There are no reinforcing patches sewn onto the fly sheet at the points where the guy ropes are attached. The stitching is putting the fabric under great strain when the wind is strong.
- 8). There is no reinforcing at the point where the bottom of the ventilation hole meets the fly sheet. One of these tore during very strong winds.
- 9). The poles which cross at the centre of the top rub and wear each other away.

In hindsight we would have preferred to have taken a pyramid style tent, tried and tested over decades and highly praised by Eric Shipton. The traditional Antarctic Survey Pyramid tent is a heavy tent, but there is now a lighter weight version of this tent available on the market. There are also many advantages to be gained in terms of weight reduction by taking just one four man tent as opposed to two (or three) two man tents which, besides multiplying the number of tents, multiplies the accessories needed. ie. two sledging boxes, two stoves, two sets of cooking equipment, etc.. It is also much more efficient to have four people helping to pitch one tent than two people struggling with each tent.

GORETEX OVERMITTS

These were not worth taking. They had no waterproof properties since the palms were not waterproof and the seams were not taped.

GORETEX BIVIBAGS

These were used as sleeping bag covers for the duration of the expedition. They received a lot of hard wear and proved to be excellent. The zipped entrance is ideal for use in polar conditions where the bivibag may be the last resort if ones tent is destroyed in a storm.

THERMAL GLOVES & BALACLAVAS

The gloves and balaclavas were very much appreciated, they compact to fit in a small pocket and weigh next to nothing.

The members of the expedition are grateful for the sponsorship in the loan of a tent from Wild Country. We hope they find the criticisms of the tent design are constructive and helpful. We should point out that they were subjected to extreme weather.

vi). RACAL TACTICOM SQUADCALL SSB PACKSET TRA906

Frequency range	preset frequencies between 3-7 Mhz.
Power supply	3 x 6V batteries, Ever Ready PJ996
Antennas	8ft, whip, Dipole
Weight	7.5 kg including battery, handset, headphones & antennas
Size	9 in x 3.5 in x 13.5 in, not incl. attachments

Sealed	yes, with desiccator
Temperature	operational -10 to +55°C storage -40 to +70°C

These radio sets were lent to the expedition by Racal Tacticom. They are a type which have been successful in the Antarctic for a great many years. In practice their operational range is down to much lower temperatures than the makers claim, although it is sometimes necessary to keep the batteries warm before installing them if the temperature is below -25°C. On this Patagonian expedition we were not operating below -5°C, but had to be prepared for temperatures down as low as -15°C.

We took radios to allow the Ice-cap party to keep in contact with the scientific team in the forest. In addition, the Chilean Navy and Air Force had volunteered to assist in an emergency, and requested that we take some. They did not supply us with their preferred frequencies to operate on until we arrived in Punta Arenas. By this time it was too late to change the crystals, but the Navy lent a third radio for the forest party to maintain contact with the Navy Base, in Puerto Natales, from which their launch 'Villarica' operates. In practice the Navy sergeant who accompanied us had difficulty making contact with his base, using their own radio, and both teams used their squadcalls to maintain contact with the small Navy Base and Meteorological Station at Puerto Eden.

The original plan was for the sledging party to solely have contact with the forest, and all communication to the Navy to be passed through them. For this purpose two directional 'V' aerials were set up in the forest. One of these would be re-orientated as the sledging party moved. After the two parties separated the sledging party used the whip aerial with the intention of using the 'V' once we had established some distance between us and the valley where the scientists were based. In fact the first day we moved on to the Ice-cap, at a height of about 1300 m, we found that we could communicate with Puerto Eden on the whip, a distance of several 100 km to the North. We had also only planned to make contact once every 24 hrs thus not restricting the ability of the sledging party to travel when the weather permitted. The forest party would listen morning and evening on the following frequencies:

2100 hrs primary	3175 Mhz
2110 hrs secondary	4878 Mhz
0830 hrs	5051.5 Mhz, if no contact the previous night.

In practice, with the sledging party trapped in a 14 day blizzard soon after gaining the ice, we chatted with both the forest and Puerto Eden twice daily.

For the duration of the expedition, (excluding when a soldering came loose in transit and had to be repaired in Puerto Natales prior to leaving), the radios performed faultlessly. We would unquestionably recommend them for a similar expedition, unless a slightly smaller and lighter one can be obtained. When one has to carry radios as well as food and equipment for journeys such as ours every kg one can reduce the load by is welcomed. It is unfortunate that the 6V lithium battery packs used by the B.A.S. are specially manufactured for them; this reduced weight would have saved a few kilos.

vii). SKEEMASTER

6ft Nansen Manhaul sledge

The expedition purchased two Nansen sledges for the crossing of the Ice-cap. The crossing team was 6 men, and the total weight of equipment and food at the start of the crossing was expected to be approximately 600 kg. The possibility of taking three pulk sledges was discussed, but they presented problems in carrying through the forest; also there are no stockists of pulks in the U.K. The Nansens were purchased in their component pieces to aid transport to Patagonia, and carriage through the forest. Two members of the party had

experience of using this form of sledge both in the Antarctic and on the island of South Georgia; it was therefore considered a simple matter to assemble them above the forest from where they would easily be carried up to the snow line.

The sledge pieces were carried at the same time as loaded rucksacs, and effectively did not increase the number of loads to be carried up to the edge of the Ice-cap. It took two men just one short day to assemble the sledges, they were then carried up the last 1000ft in completed form. The loads were split between the two sledges for the first days hauling up onto a snow dome, just a few km from the top of the rock ridge. In fact the weight and appalling snow surfaces, together with the angle of slope made it necessary to split the load into three, even with 6 men on each sledge. That first day the team spent 9 hours in the traces, but by 7 in the evening had transported everything up to the top. That night the violent storms of Patagonia returned after a lull of several days. The sledges were not used again until the Ice-cap was abandoned two weeks later. For the descent one sledge was loaded with approximately 350 kg, rope brakes were fitted for part of the descent, but as the slope increased dead men were placed and the sledge lowered on climbing ropes. They were dismantled again for the return through the forest.

Both sledges withstood this expedition well. They were only used on two days, but spent two months in saturated condition both in the rain forest and on the Ice-cap, with no sign of deterioration. Both had polyethylene covered runners which received a few scratches in transit, but not too deep for repair.

Opinions were divided as to the adequacy of our choice of sledge. Some members of the team felt that, given the broken nature of the terrain, these sledges were altogether too cumbersome.

Use of Parachute

Although our tests were not exhaustive we found that the use of a parachute to pull the sledges (as used by Eric Jones and Leo Dickinson) was unsuccessful. For it to be effective the conditions must be just right: a steady, consistent, strong wind coming from behind the sledge pointing in the desired direction within about five degrees. These conditions are hard to come by in Patagonia; the winds tend to be gusty and erratic in direction. Directing the sledge as it is moving is difficult. All things considered we do not recommend it as a useful piece of equipment.

b). MEDICAL REPORT

We took an extensive medical kit, the basis of which was provided by the Cambridge Expeditions Medical Scheme, run by Dr. Tom Davies and Mr. Gurner at the Department of Community Medicine. This was supplemented by one or two medical requirements such as inflatable splints, and some additional drugs supplied by the expedition doctor, Dionis Isamitt.

The expedition suffered no major medical problems. In the first week Andy suffered from a bruised ligament in his knee, which was remedied by a period of rest and although painful sometimes, gave him no major problems during the remainder of the expedition.

Nigel experienced a minor case of snow blindness after going without sunglasses on an overcast day on the Ice-cap. He could hardly open his eyes the following morning. He was given some amethocaine (tetracaine) hydrochloride, which seemed to help, by the following day he was seeing normally again.

One of Pancho's teeth fell apart in the last week, and Dionis did a good job rebuilding it with "Cavit" stopper.

The lanolin cream proved very useful for chapped hands and feet, from which almost everyone suffered, and of course Lipsalve for chapped lips. We recommend that in such conditions, every member carry a tube of each.

The iodine and elastoplast were used on a number of minor cuts and abrasions, and the zinc oxide tape came in very handy for tent repairs.

After a particularly hot day, Electrosol tablets were administered as a precaution, although Bruce and Colin didn't think that they had sweated enough and declined the offer.

c). FOOD REPORT

Originally we planned an expedition composed of eight members who would be 'in the field' for six weeks. Of these eight, four would take part in the attempt to climb Cerro Aguilera and traverse the ice-cap, whilst the other four would comprise the scientific contingent, remaining at base camp and supporting the climbers. It was thus clear that the stores would have to be lightweight and suitable for mountain travel and sledging, with less exacting requirements for base camp. However, it was decided to use basically the same diet for both groups in order to keep the logistics simple, and if the base camp rations could also be kept lightweight, it would ease transportation problems a little.

The basic diet was developed from three sources: the well-tried Cambridge Spitzbergen ration scale; the British Antarctic Survey sledge ration (1984 specification); and Dr. Mike Hambry's Greenland Expedition rations.

The weight restriction dictated that most of the food-stuffs had to be dehydrated. This in turn necessitated the procuring of such stores in Britain, since they are unobtainable in Chile. It was also decided to pre-pack the sledging rations in 12-man/day ration boxes, as a consequence most of the food had to be obtained in Britain prior to departure.

By May of 1985 it had become clear that the team would now consist of ten members, and on top of this a further 10% contingency was needed. This had to be achieved within the original budget of £1000, set for an eight-man expedition.

In June a concerted appeal was made to the U.K. food manufacturers and retail industries, in an effort to find sponsors for the various requirements and to keep expenditure within the budget. Approximately 70 letters were written, from which 31 replies were forthcoming. Of these, 22 were able to pledge support for the expedition by either donating goods or offering them at reduced cost. This was a remarkable response; one for which we are extremely grateful. Some goods were obtained through the Cambridge University Explorers and Travellers Club Block Order Scheme. A number of food sponsors in Chile also donated goods. Most of the outstanding items were purchased at reduced cost from Pick 'n' Pack of Charlotte Street, Portsmouth.

Twenty 12-man/day ration boxes were packed in Portsmouth; most of the items needed to be individually weighed out and sealed in polythene freezer bags. Base camp rations were packed in bulk. Fibre-board boxes supplied by Thames Case Ltd. were used for all sledging and most base camp rations. They proved to be very robust, even when waterlogged, and withstood a lot of use.

In addition eight metal tins, supplied by Metal Box, were used for base camp food, doubling up as seats in the mess tent. The need to ensure absolute failsafe waterproofing of food boxes cannot be overstressed in the context of Patagonian weather. The basic 12 man/day ration is set out in full in Appendix VII.

The rations generally met the requirements well, providing approximately 3500-4000 Kcals per man/day (depending on the menu) whilst containing sufficient variety and not being unreasonably heavy or bulky. However, some measure of compromise was inevitable in view of the restrictions on budget. The most controversial cost-cutting policy was that of depending heavily on Textured Vegetable Protein (T.V.P.) as a substitute for more expensive freeze-dried meat in the standard protein / carbohydrate / vegetable formula for main meals. T.V.P. (mince grade and chunks) was used both as an extender and as a meal in its own right.

The main drawback is that T.V.P. requires some additional sauce to make it palatable. Gravy powder (donated by Food Ingredients Services Ltd.) was added in advance to all prepacked meals. Colmans of Norwich donated a quantity of sauce and casserole mixes. Herbs, spices, curry powder, tomato powder and powdered soups were all successfully used to this end, giving a great variety of possibilities and even scope for creativity. T.V.P., however, required some skill to cook well under canvas; but even with a minimal effort the results can be surprisingly good. Most of the T.V.P. used was donated by Direct Foods Ltd.

A second deviation from standard victualling practice was the omission of a daily chocolate ration. Cadbury's had offered to supply us with their excellent product, but unfortunately the consignment was delivered the day after the freight started its journey to Liverpool docks. A small quantity of chocolate was later donated by the Chilean agent for Rowntree-Mackintosh, and Rittersport; however the ration was still below the one bar per

man/day which was thought to be essential for sledging by some members. Fortunately, the generous donation of a large quantity of 'Nutella' by Ferrero Ltd. saved the food-officer's bacon (metaphorically of course!). In fact this chocolate-nut spread proved to be a very acceptable alternative, and gained something of a cult following amongst certain members of the expedition. The only drawback was the added weight of the glass containers.

Good robust biscuits of expedition specifications were simply unobtainable in Chile. The best available were savoury crackers manufactured by McKay, who gave us a 50% discount. Even these were not ideal, tending to crumble.

The basic rations were supplemented by tinned and fresh foods designed to be used at base camp. Three boxes of 'luxury' items were also made up for the ice-cap party (containing cheese, tinned fish etc.). In addition the best part of a sheep was purchased in Puerto Natales, which formed the basis of several meals. The lust for 'real food' forced Dionis into his hunter-gatherer mode, and various primitive attempts were made to acquire a goose for dinner, albeit in vain. Towards the end of the expedition, both fish and mussels were caught with success and featured prominently in our 'Christmas dinner'.

Due to the fine response from sponsors, the total expenditure on food did not exceed £400. Excess food in Britain was sold off, raising about £150 towards the cost of shipping and import duties. Excess food in Chile was donated to COANIL, a children's home in Puerto Natales administered by the Chilean Navy; and to Sister Margaret, an English nun working amongst the poor in Santiago.

The following is a list of those companies to whom we are indebted for so generously supporting the expedition:

In the U.K. : A1 Packagings (Southern) Ltd.,
Automatic Catering Supplies Ltd.,
Batchelor's Foods Ltd.,
C.P.C. (U.K.) Ltd.,
Cadbury Ltd.,
Colman's of Norwich,
Direct Foods Ltd.,
Edward Billington (Sugar) Ltd.,
Food Brokers Ltd. (agents for Ferrero),
Food Ingredients Services Ltd.,
Kavli Ltd.,
Kenco-Typhoo Catering Services,
Morning Foods Ltd.,
Peerlen Refinery,
Record Pasta,
Roche Ltd.,
Sieber Hegner Ltd.,
Thames Case Ltd.,
Wilkin & Sons Ltd.

In Chile: ALMAC,
Chiprodal S.A.I.C. (agents for Nestle and Maggi),
Lever Chile S.A. (Lipton Tea and Dorina Margarine),
McKay Biscuits (Soda Integral)

Cambridge Block Order Scheme:
Farley Health Ltd.,
Hona Ltd.,
Jordans Ltd.,
Metal Box Ltd.,
Tate and Lyle Ltd.,
Weetabix Ltd.,
Wrigleys Ltd.

d). INSURANCE

We took out insurance with the New Hampshire Insurance Company arranged through international brokers Alexander Stenhouse, prepared in conjunction with the Expedition Advisory Centre at the Royal Geographical Society.

The benefits and sums insured (in £) were as follows :

	Expedition Organisers	Insured Persons
Section A - Personal Accident	Nil	25,000
B - Medical Expenses	Nil	50,000
C - Equipment & Stores	12,000	Nil
D - Expedition Money	1,000	Nil
E - Cancellation	Nil	1,000
F - Liability	500,000	500,000
G - Baggage	Nil	1,000
H - Money	Nil	500

The premium was £905.37. Although the cost was high, we were forced to take out a premium to cover loaned equipment (radios). West Mercia Insurance Services and Devitt (Midlands) were also approached. The former were unable to help whilst the latter offered reduced cover at a premium of £692.00. No claims were made.

e). FINANCE

The budget for Patagonia '85 was originally projected at £12,890. The subdivisions were as shown below. It was rescheduled in October of 1985 and the subdivisions are also shown.

The support of British Airways, Lan Chile and the FACH took a considerable load off the total budget. Internal travel costs would have been considerably higher were it not for the help of the Air Force. Food costs were practically nil when the sale of excess food is taken into account. Although equipment appears within our projected budget of £4,500 in actual fact we spent a capital outlay of £8011.55, £4769.54 of which was later recovered in equipment sales. Administration was clearly the area where we misjudged our expenditure most, overspending by three times our projected sum. It should also be noted that despite being offered free freight by PSNC we still spent a considerable amount moving our stores out to Chile. Insurance proved to be extremely expensive, mainly because we needed to cover the possible costs of an emergency evacuation. There were no unexpected contingency costs. As of January 1987, the bank balance read £1466.25 which will be used in the administration and production of the General Report and Scientific Report.

	JANUARY 1985	OCTOBER 1985	EVENTUAL EXPENDITURE
Flights	3000	1500	-
Internal travel	2000	2000	739.12
Food	1000	1000	511.17
Equipment	3000	4500	3242.01
Administration	500	500	1610.76
Freight	1000	1000	830.90
Insurance	500	500	905.37
Medical	50	60	28.72
CUETC Levy	40	40	40.00
Report	500	500	-
Contingency	1500	1500	-
Total (in £)	12890	12900	7908.05

ACCOUNTS

EXPENDITURE

Item	Amount (in £)
Personal equipment	3,346.28
Equipment for ice-cap party	3,128.04
Base camp equipment	1,196.02
Insurance	905.37
Import/export taxes, fees, expenses, packing	628.91
Printing, prospectuses, paper	607.21
Food	511.17
Individual transport - petrol	400.08
- bus/rail fares	156.75
- toll roads etc.	7.35
Scientific equipment	341.21
Equipment transport	201.99
Secretarial expenses	192.30
Group transport	174.94
Stamps, telegrams	156.61
Photographic returns to sponsors	141.48
Stationery, envelopes	136.13
Phones	123.43
Presents	106.56
Aerial photography	65.17
CUETC Levy	40.00
Interest and account charges, statements	30.50
Photocopying	29.88
Medical	28.72
Cartography	10.55
Entertainment	6.00
Accommodation	4.94
TOTAL	12,677.59

INCOME

Source	Amount (in £)
Personal contributions :	
-U.K.-based members (6 x £400)	2,400.00
-Chilean-based members : Edmundo Pisano (50,915 pesos)	213.93
Nigel Harvey (30,000 pesos)	126.05
Pancho Medina (25,000 pesos)	105.04
Juan Miranda	-
Dionis Isamitt	-
Resale of Personal Equipment	2,185.78
Resale of Mountaineering Equipment	1,939.81
Dragon School Sponsored Walk	723.52
Royal Geographical Society :	
-Geographical Magazine award	600.00
-Rio Tinto Zinc award	350.00
Mount Everest Foundation	600.00
Sales of Excess Food	407.04
Resale of Base Camp Equipment	405.14
The Albert Reckitt Charitable Trust	400.00
Gino Watkins Fund	350.00
H. Walker Charitable Trust	300.00
Cambridge Expeditions Fund - supported by :	
Christian Salvesen and Sinclair	300.00
Transantarctic Association	250.00
Godinton Charitable Trust	250.00
Value of Unsold Equipment	230.00
British Mountaineering Council	200.00
Anonymous Donor	200.00
The Godman Fund	200.00
Balfour Browne Fund	150.00
J. and L.A. Cadbury Charitable Trust	150.00
Interest	122.59
Sale of Equipment & Logistics Donations	121.45
Cory Fund	100.00
Manchester Geographical Society	100.00
Botanical Society British Isles	75.00
Worts Travelling Scholarship	75.00
Mr. P. Andrews-Speed	50.00
The Nicholas Knatchbull Memorial Fund	50.00
Price Waterhouse	50.00
Welconstruct	40.00
Mr. C. Rochat	30.00
Burton Group PLC	25.00
Portsmouth Grammar School	20.00
Resale of Scientific Equipment	8.81
SUB TOTAL	13,917.16

INCOME IN CHILE

Source		Amount (in£)
Shell Chile	(US\$ 300)	230.36
Lever Chile	(50,000 pesos)	210.08
Empresas C.C.T. (B.A.T.)	(46,000 pesos)	193.28
Andean Mining and Chemicals	(10,000 pesos)	42.02
Interest	(4,965 pesos)	20.86
SUB TOTAL		696.60
TOTAL		14,614.06

11.

CONCLUSIONS

1. Cerro Aguilera

Due to its isolated position, few accounts of this mountain are available besides those of De Agostini, who photographed it from his vantage point on the Cerro Mayo in 1936. Aerial photographs, our primary source of guidance, failed to give an impression of the mountain's stature or of the nature of the peak. Although the expedition failed to achieve the first ascent, members of the team were able to investigate the mountain at close range and provide the first assessment of the mountain in terms of a route to the summit. The North face was found to be complicated by a series of hanging glaciers, and the summit itself is capped by ice-comices which present a severe avalanche risk. Any future attempt at an ascent might be better made from the South side, ascending a ridge directly from the fjord edge at the head of the Fiordo Peel. This route offers direct access to a col beneath the final spires and avoids the more circuitous route adopted by this expedition. Cerro Aguilera, rising as it does straight from sea level to its 2438 m height, still presents an impressive challenge, when both the difficulties of access and the difficulties of performing a technically severe climb in adverse conditions are considered.

2. Ice-cap Traverse

Despite the problem of access, a shallow-draught boat being essential for entry into the fjord, Seno Andrew provided an excellent base from which to gain access to the Ice-cap's western edge. As the glaciers are heavily crevassed, the route adopted via the river valley on the North side of the fjord is perhaps the only one feasible, largely avoiding ascent up sheer forest-covered valley sides.

From a base on the Ice-cap the proposed route running South in an arc around the head of the fjord appeared relatively unproblematic, the main obstacle to a traverse being the ice-fall on the South side of Seno Andrew. From sea level this appeared as a sheer ice-clad cliff some 400 m high. It is suggested that any attempt at a traverse would be best made in a North-South direction, possibly utilising a food-depot at the base of the cliff. Further reconnaissance expeditions may be advisable before a serious attempt is made.

3. Problems Encountered

As with any expedition to Western Patagonia, problems of access are a major obstacle. Due to the nature of the terrain, all equipment, supplies and personnel must be shipped in initially; this places constraints on the time available in the field. A small boat or dinghy is vital unless the Expedition is to be severely restricted in its scope; even then the amount of pack-ice in the fjords can pose a major problem, particularly during the spring melt with which our visit coincided.

The weather conditions for which the region is infamous are also a major factor in determining what can be achieved by an expedition team. In the event our visit coincided with a spell of relatively fine weather and base-camp in the fjord bottom was relatively sheltered from strong winds. However, once on the Ice-cap, members of the expedition were subjected to continuous storms, heavy snow-fall and low temperatures, severely restricting movement. Although described in detail by previous explorers, the team was unprepared for the extreme severity of the Patagonian weather; any future expedition must expect and allow for continuous adverse conditions on any ice-cap traverse.

The experience of this expedition strongly supports the design of small, lightweight expeditions, optimising flexibility and the ability to exploit brief periods of passable conditions, rather than the heavyweight equipment-orientated approach adopted in this case.

4. Scientific Work

Western Patagonia as a whole is tremendously understudied scientifically and Seno Andrew provided an excellent base from which to assess the effect of the close proximity of the Ice-cap on the vegetation and fauna. Although mobility is limited by the nature of the terrain, a great deal can be achieved in a relatively short space of time if the team members are prepared to work in poor weather conditions. It is suggested that future biological work concentrate on gathering more information on the dynamic processes affecting vegetation pattern, as well as an expansion of the basic collection and description that has been carried out to date. In addition further information on the meteorology, geology and glaciology of the region would be of great interest.

12.

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Comandante Fernando Le Dantec
Comandante Adolfo Paul Latorre
Capitan De Fragata Arturo Sierra Merino
Capitan Juan Castro
Contralmirante Rolando Vergara Gonzalez
Teniente 1 Pablo Del Fierro (Port Captain, Puerto Natales)
Teniente 2 Jorge Egaña Pohlwein (Captain of the LPC "Villarrica")
Teniente 1 Juan Pablo Heuser (Stand-in captain of the LPC "Villarrica")

The crew of the LPC "Villarrica" :

Cabo 1 Carlos Valdivia
Cabo 2 Juan Carlos Troncoso
Cabo 1 Angel Lara Varas
Cabo 2 Nicomedes Fuenzalida

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Cabo 2 Bernardo Barria

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General Ramon Vega
Capitan Guillermo Navarro
Coronel Leon Dufey Trekow

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From the British Embassy, Santiago :

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Mr. A. Brierley (Commercial Department)
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Dr. P. Lightowlers (I.T.E., Penicuik): Bryology
Dr. L. Lliboutry (Grenoble): Glaciology
Dr. J. Mercer (Ohio State University): Glaciology
Dr. D. Minter (Kew): Mycology
Dr. L. Mound (British Museum): Entomology
Dr. R. Naruse (Hokkaido University): Meteorology
Dr. T. Sweda (Nagoya University): Dendrochronology
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APPENDIX I

Previous Exploration of the Southern Patagonian Ice-cap

Although the exploration of the Patagonian Ice-cap has been relatively limited for an area of its size, the number of expeditions, both large and small, would demand more space than can be afforded by this summary. Those wishing to discover more detailed accounts of the various expeditions mentioned should consult Mateo Martinic's "Hielo Patagónico Sur" (Instituto de la Patagonia 1982) or at source.

The first non-native discovery of the existence of a range of ice-covered mountains was more the result of a navigational accident than a conscious search, when in 1587 Juan Fernandez Ladrillero and Francisco Cortes de Ojea, who had been sent in search of the western entrance to the Straits of Magellan, wandered accidentally into the Eyre and Peel Fjords respectively when their ships were separated by a violent storm.

It was not until 1830 that any subsequent contribution was made to the geographical knowledge of the western edge of the Ice-cap when a British hydrographic expedition under the command of Captain Philip Parker King completed a hydrographic survey of the Chilean fjords and channels. Of particular interest was the expedition commanded by Lieutenant James Kirke in H.M.S. Adelaide which reached the end of the fjord which was subsequently named after Sir George Eyre, and the charting of the St. Andrews fjord (Fiordo San Andrés).

On the eastern flank of the Ice-cap the only expedition which stands out was one led by Antonio de Viedma in 1782 which went in search of the source of the river Santa Cruz, a journey which took him to the lake which today bears his name, and which took him in sight of the now legendary Mount Fitzroy, which was named by Francisco Moreno after the British admiral in command of the H.M.S. Beagle which carried the young naturalist Charles Darwin on its voyage charting the coasts of South America.

With the Chilean occupation of the Straits of Magellan in 1873 there began a series of expeditions from both Chile and Argentina stimulated by the border dispute which had arisen between the two countries over the occupation of Patagonia. These aimed principally at establishing the limits of the range of mountains which flanked the Ice-cap and were carried out between 1876 and 1880 by Francisco P. Moreno, Ramon Lista and Carlos M. Moyano from Argentina, and Juan Tomas Rogers and Ramon Serrano from Chile. From the Pacific side the explorations of the Chilean Navy and in particular those of Captain Adolfo Rodríguez in the Baker Estuary contributed greatly to the knowledge of the region. Also in the Baker Estuary the work of Dr. Hans Steffen and Ricardo Michell in 1898 added to this knowledge.

From the turn of the century exploration became gradually less political and more scientifically motivated. The evidence of the existence of a mysterious volcano somewhere on the Ice-cap and the theory of the existence of a possible intercommunication between the Peel fjord and Lago Argentino were the principle motives behind this new interest.

The mythical existence of a volcano had been noted by a number of travellers, principally through the accounts of the Tehuelche Indians who displayed an almost reverential fear for this legendary mountain. Moreno (1876) was the first to link the myth with a reality, identifying as the volcano the mountain which the Indians called "Chaltén" and which he subsequently named "Fitzroy".

The proposal was not questioned until 1880 when Carlos Moyano refuted its volcanic structure, suggesting that the volcano must be situated to the north-west of Fitzroy in the interior of the Ice-cap. It took 81 years before Moyano's theory was eventually proved correct. The theory complemented evidence recorded by travellers in the channels to the west of the Ice-cap of the existence of a volcano on the western side. This volcano subsequently became known as "Humboldt" or "Reclus" although its exact position was never fixed with any certainty until 1961 when Eric Shipton 'rediscovered' the elusive volcano, identifying it as Cerro Lautaro.

In 1907 and 1909 the Swedish geologist Percy Quensel explored a mountain in the vicinity of the Amalia glacier, which he subsequently named "Mano del Diablo"; despite not being able to reach its summit he discovered signs of past volcanic activity. This same expedition included the work of the famous Swedish botanist Karl Skottsberg.

The theory of the supposed link between the Peel fjord and Lago Argentino was first raised by Moreno and subsequently vigorously upheld by the Italian geographer Clemente Onelli in 1895. The explorations of Tomás Rogers and Capitán Alberto Fuentes of the Chilean Navy proved conclusively that the two belonged to different drainage basins, but nevertheless there were many, particularly in Argentina, who continued to believe in this theory.

The First Explorations on the Ice-cap.

The first attempt to explore the interior of the Ice-cap was made by the Swedish explorer Otto Nordenskjöld in 1896, also convinced of the existence of an intercommunication between Chilean and Argentine waters, when he planned to cross between the Dickson glacier and the Peel fjord as part of a series of hydrographic studies he had been carrying out in the region. He was prevented by the severe difficulties of topography and climate. At more or less the same time the German geologist Rodolfo Hauthal attempted a similar crossing but was again forced to turn back before he had got very far.

The first successful excursion onto the Ice-cap was achieved by two Germans based in Buenos Aires, Dr. Federico Reichert and Dr. Cristóbal Hicken in 1914 when, after climbing up the left-hand side of the Moreno glacier they reached the point where the waters divide and looked across towards the Pacific. This success gave rise to a larger and more ambitious project under the auspices of the 'Sociedad Científica Alemana de Buenos Aires' in 1916, led by Alfredo Kolliker and Lutz Witte, which in addition to an extensive scientific program, succeeded in reaching the Cordon Moreno at a point which they named "Paso de los cuatro glaciares" ("Pass of the four glaciers"). This point was subsequently renamed by Agostini who identified that there were five glaciers - O'Higgins, Greve, Viedma, Chico and Pio XI - which meet at this point and not four as suggested by Kolliker.

The years between 1915 and 1944 belong almost entirely to an Italian Salesian priest by the name of Alfredo M. de Agostini, whose enthusiasm to complete the geographical knowledge of those vast expanses marked only on the existing maps with the word "unexplored" mark him out as perhaps the singlemost important figure in the exploration of the Southern Patagonian Ice-cap. His accounts of a lifetime of travels in Patagonia, published in 1945 under the title of "Andes Patagónicos" is a key work of reference for anyone with an interest in the Patagonian Ice-cap. His exploits include the following:

- 1928 - the exploration of the Falcon and Eyre fjords.
- 1930 - the first ascent of Cerro Mayo at the South-Western end of Lago Argentino.
- 1931 - an East-West crossing from the Upsala glacier to a mountain which he named "Torino" on the western edge of the ice-cap and back, discovering in the process two ranges of mountains which he named "Roma" and "Risopatron" and the altiplano "Italia".
- 1932 - reconnaissance of the area to the North-West of Cerro Fitzroy including the ascent of Cerro Electrico.
- 1935 - traverse beyond the Paso de los Cinco Glaciares, and the discovery of two more ranges which he named "Pio XI" and "Marconi".
- 1937 - reconnaissance of the area inland of the "Chico" glacier and the first ascent of Cerro

Milanesio.

1940 - reconnaissance of the O'Higgins glacier.

Agostini however was not the only one with to venture into the unknown during these years. In 1933 Dr. Federico Reichert returned to the Southern Patagonian Ice-cap with an expedition under the patronage of the Sociedad Argentina de Estudios Geograficos whose aim was to explore the area to the South-West of the Lago San Martin in the vicinity of the supposed location of the mysterious volcano. Having reached the ice plateau by way of the right hand edge of the O'Higgins glacier they walked in a South-Westerly direction under very severe climatic conditions, guided by the smell of sulphur, arriving finally at the foot of a mountain which in a brief clearing showed itself to be the volcano whose location had been shrouded in mystery for so long. Strangely, Reichert apparently made little effort to fix the location of this peak nor to name it, perhaps because they themselves had little idea of their location when they found the volcano. As a result their discovery went almost unnoticed, to the extent that Agostini, jealous perhaps of the intrusion of others on his hunting grounds, continued to search for the volcano. In 1961 Eric Shipton determined it's geographical location for once and for all, identifying it as Cerro Lautaro which had been seen during an inactive phase and named in 1952 by Major Emiliano Huerta.

1944-1986 - Exploration of the Ice-cap after the advent of aerial photography.

The motives of men such as Agostini and Reichert were neither purely scientific nor sporting, although both played an important part; they were more than anything geographical, for the ground they covered provided geographical information new to mankind about whole ranges of mountains, valleys and glaciers.

The survey of aerial photography carried out in 1944/1945 by the United States Air Force effectively put an end to that romantic period in the history of the exploration of the Patagonian Ice-cap. In the subsequent years expeditions were forced into assuming a more consciously scientific or sporting identity. Nevertheless the Patagonian Ice-cap continued to be a powerful magnet for those attracted by the mysteries veiled behind the seemingly eternal blanket of cloud and mist.

The following list is probably not exhaustive, nor does it attempt to cover the expeditions mentioned in any detail. It is intended principally as a source of reference:

1949 - Héctor Gianolini (Club Andino Bariloche) and John Mercer cross from the Rio Electrico to the Paso de los Cinco Glaciares and back.

1948 - Henning Wilumsen and José Floegel (Club Andino de Punta Arenas) cross the Grey glacier and climb two un-named peaks in the Cordon Barros Arana.

1952 - Lionel Terray and Guido Magnone climb Cerro Fitzroy.

1952 - 'Expedicion Argentina al Hielo Continental' organised by Dr. Bruno Guth and led by Major Emiliano Huerta cross from Lago Viedma via the Marconi and Moreno Passes to the 'portezuelo del primer cruce' in the Cordón Caupolicán overlooking the Exmouth fjord, during which they named the Altiplano and Cordón Caupolicán and Cerro Lautaro (which was later discovered to be the 'lost' volcano).

1952 - Creation of the Instituto Nacional del Hielo Continental in Buenos Aires.

1956 - H.W. Tilman and two companions cross the Ice-cap from West to East between the Calvo and Moreno glaciers and return via the same route haven taken a symbolic swim in the waters of Lago Argentino.

1958 - Chilean-Japanese expedition in the Cordon Barros Arana.

1959 - F.Egger and C.Maestri climb Cerro Torre (?). Egger died when returning from the summit and there was doubt expressed about whether or not they did actually reach the summit.

1959 - Polish expedition from the CAB explores the basins of the Dickson, Frias, and Cubo glaciers.

1959 - H.Corbella, J.Martcorena, and L.Costas cross between the Lago San Martin and the Lago Viedma.

1958 - Eric Shipton, John Mercer, Geoffrey Batt and Peter James explore the upper basin of the Viedma glacier and the Laguna Escondida (Lliboutry) or Mayo.

1959-1960 - Eric Shipton, Jack Ewer, Peter Bruchausen, Peter and Martha Miles and W. Ellery Anderson "rediscover" Reichert's volcano.

1960-1961 - Eric Shipton, Jack Ewer, Eduardo Garcia, and Cedomir Marangunic complete the first North-South traverse of the northern section of the Patagonian Ice-cap between the Jorge Montt glacier and the Upsala glacier covering 280 kilometres in 52 days, of which 43 were on the Ice-cap itself, climbing in the process Cerro Don Bosco and Cerro Murallón, the highest of the Patagonian Mountains (3600 metres). N.B. Eric Shipton's "Land of Tempest" is probably the most important key reference in English on travel on the Patagonian Ice-cap.

1961 - First winter expedition to the Southern Patagonian Ice-cap (CAB). Reconnaissance in the Fitzroy region.

1962 - Expedition of the Club Andino de Chile led by Claudio Lucero crosses between the Fiordo Témpano and the Lago O'Higgins.

1963-1964 - Expedition of the Sociedad Universitaria de Andinismo led by Eduardo Garcia crosses from the Exmouth fjord to the River Electrico and back.

1967-1968 - John Mercer who had been conducting a series of glaciological studies on the eastern edge of the Patagonian Ice-cap since 1963 explores the fjords Bernardo and Témpano.

1969 - Japanese Glacial Research Project is begun under the direction of Dr. Chotaro Nakasima in the area of the Pio XI glacier.

1969 - an expedition from the Rokko Gaukin Alpine Club (Japan) led by H. Sakagami completes a diagonal traverse over 80 kilometres in 61 days - the slowest crossing on record - between the Exmouth fjord and the Upsala glacier.

1971 - Expedition from the University of Johchi (Tokyo) led by Toshio Takeuchi completes a traverse between the Falcon and Europa fjords, covering 90 kilometres over an altiplano (elevated plateau) which they named "Japón".

1973 - A scientific expedition from the University of Sapporo (Japan) completes a series of biological studies on the south-eastern slopes of the Ice-cap to the west of the Grey and Tyndall glaciers.

1974 - Leo Dickinson, Eric Jones, Mick Coffey and Ernesto O'Reilly climb Cerro Lautaro and return via the Viedma glacier climbing on their way another mountain of volcanic origin which they named "Mimosa".

1975 - Geological Reconnaissance Survey undertaken jointly by the University of Columbia, the Instituto de Investigaciones Geologicas and the Empresa Nacional de Petroleo (ENAP) in the american research vessel "Hero" in the region of the Peel and Exmouth fjords.

1976 - An expedition led by Gerry MacSweeney (NZ) gains access onto the Ice-cap via the left hand moraine of the Grey glacier and climbs Cerros Centinela I, II, Cisnes and Blanco.

1979 - "Scottish expedition to Tierra del Fuego" crosses from the Exmouth fjord to the Rio Eléctrico via the Paso de los Cinco Glaciares.

1979-1980 - Gerry MacSweeney leads an expedition which repeats Shipton's North-South traverse.

1982 - French expedition led by Roger Hémon completes a traverse from the Balmaceda glacier at the end of the Ultima Esperanza fjord to the Dickson glacier covering 120 kilometres in 38 days.

Mention has been made only of those climbing expeditions which have included a significant traverse, or which, due to the importance of the mountains involved, such as Fitzroy, are of special interest. Numerous other purely climbing expeditions were undertaken by climbers of many different nationalities including ones to peaks in the interior of the Ice-cap. Special mention in this context should be made of the repeated exploits of the brothers Jorge and Pedro Skvarca from the Club Andino Bariloche.

APPENDIX II

CARTOGRAPHY AND AERIAL PHOTOGRAPHY

CARTOGRAPHY

1. CHILEAN

- a). Carta Preliminar, 1953. Scale : 1 : 250,000. Sheets : Cordillera del Paine (5073). Isla Madre de Dios (5075)

This is the largest scale topographical map that we were able to obtain. Basically it is inadequate for expedition purposes due to the high scale and a series of major inaccuracies. We know that a 1 : 100,000 map exists, based on a more recent aerial survey, but this is highly restricted owing to uncertainties over the border with Argentina. The maps contain a number of inaccuracies, for example, the relative positions of the glacier snouts which have changed dramatically in 33 years, leaving two large lakes at the snout of the Fuchs and Shackleton Glaciers. Cerro Mayo is placed in the wrong position, it should appear slightly to the north of the Laguna Escondida (Laguna Mayo), and not, as shown, to the south of the lagoon. Considering that it's peak is generally accepted as a boundary point, this is not an insignificant error.

- b). Mapa Geologico. Scale : 1 : 500,000. E.N.A.P./ Columbia University, 1978.

Geological mapping prior to Patagonia '85 visited sites only as far as the mouth of the Calvo Fjord.

- c). Naval Map (Instituto Hidrográfico De La Armada De Chile) No. 914 Canal Wide to Canal Sarmiento. Scale : 1 : 150,000.

2. FOREIGN

- a). Patagonia Australe. Scale 1 : 100,000. Alberto de Agostini. Torino, 1945.
- b). South American West Coast. Sheet 2, Patagonia, Magellan Strait to Gulf of Penas. Admiralty Hydrographic Office, London, 1896.
- c). West Coast of South America from Magellan Strait to Valparaiso. Imray, Laurie, Norie and Wilson Ltd., London.
- d). South America, provisional edition SM-1819. Scale : 1 : 1,000,000. American Geographical Society of New York, New York, 1956.
- e). World Aeronautical Chart. Scale : 1 : 1,000,000. U.S.A.F., 6th edition, 1959.
- f). U.S.A.F., Operational Navigation Chart. Scale : 1 : 1,000,000. U.S.A.F., 1st edition, 1965.
- g). Hielo Patagónico Sur, Parte Sur, Parte Norte. Scale : 1 : 500,000, Louis Llibouty, Nieves y Glaciares de Chile, Universidad de Chile, Santiago, 1956.
- h). Map of Andes Patagónicos. Sheet 3 (Hielo Patagónico Sur), compiled by Shuji Iwata. Scale : 1 : 300,000, Iwa to Yuki, No. 46, December 1st, 1975. Yama to Keikoku-sha Co. Ltd., Japan.

AERIAL PHOTOGRAPHY

1. Trimetrogon Series, U.S.A.F., 1944-45. Scale : 1 : 40,000
Flight lines : Rollo 410, 560, 556, 557
Photographs in the expedition's possession : Rollo 410 left 162, 165, 167, 170
vertical 166
Rollo 560 vertical 44

The Trimetrogon is the largest scale series, and despite being the oldest, is the best. The negatives of the oblique shots are fairly scratched and blurred. All the right-hand shots of the 560 flight line taken towards the Argentinian border are restricted, and despite considerable effort, we were not able to get our hands on any. Apparently the relevant negatives were cut out and are not stored at the I.G.M. There is, however, a complete set of these photographs at the Patagonian Institute. The vertical shots have the best snow/rock definition of any of the series. Of particularly good quality and interest for anyone attempting the "third ice fall" is shot no. 166 of flight line 410.

2. Mark Hurd Survey, U.S.A.F., 1974-75. Scale : approximately 1 : 55,000
Photographs in the expedition's possession : Roll 2, line 65, nos. 112, 113
Roll 1, line 66, nos. 36, 38
Roll 2, line 64, no. 208

Not a particularly good survey. The snow/rock definition is poor.

3. Servicio Aereo Fotogrametrico. Fuerza Aerea de Chile (F.A.C.H.), 1984.
Photographs in the expedition's possession : CH60 nos. 23459, 60
24047, 48, 49
24051, 52, 53
24060, 61, 62
24063, 64, 65
24067, 68

n.b. The Trimetrogon and Hurd Series can be obtained at the Instituto Geografico Militar, Nueva Santa Isabel 1640, Santiago. The F.A.C.H. survey is at the Servicio Aereo Fotogrametrico at Cerrillos Airport, Santiago.

APPENDIX III

OBTAINING PERMISSION

Obtaining permission from the Chilean authorities is not too difficult. A letter must be addressed to the Director de Fronteras at the Dirección de Fronteras y Límites which is part of the Ministry of Foreign Affairs in Bandera No. 52. The permission in our case came through fairly quickly.

Expeditions to the Southern Patagonian Ice-cap ought to be aware that one tenth of the total area of the Ice-cap is in Argentina and that the border between the two countries has not been properly settled. The exact definition of the border varies according to whether you are looking at an Argentinian or a Chilean map. Patagonia '85 was at all times in Chilean territory.

APPENDIX IV

NAMES GIVEN TO GEOGRAPHICAL LANDMARKS

After the expedition we made several recommendations to the Instituto Hidrográfico de la Armada in Valparaíso for possible names to give geographical landmarks which we felt needed naming. These names appear on the map on page 21.

Three of these names were reconfirmations of names given by Eduardo García when he visited Seno Andrew: Ventisquero de los Patos, Ventisquero de los Lobos and the River Murtillares. These were accepted by the Institute. García also named the third glacier in the fjord with the rather uninspiring name Ventisquero del Fondo, which literally means 'glacier at the end of the fjord'. We changed this name to Ventisquero García. This suggestion was accepted. This was one of only two suggestions to be accepted by the Institute. The other was Angostura Mischief or 'Mischief Narrows', after Major H. W. Tilman's yacht, the 'Mischief', in which Tilman arrived at the Calvo Fjord prior to the first undisputed crossing of the Southern Patagonian Ice-cap in 1955/56. The 'Mischief' ran aground on a rock shoal near the narrows which now bear its name.

The remaining seven suggestions were ignored and replaced by names of their own approval. We continue to use the names we suggested throughout this report.

The suggestions we made were as follows:

- Ventisquero Fuchs (glacier), named after Sir Vivian Fuchs, the expedition's patron.
- Ventisquero Shackleton (glacier), named after Lord Shackleton, son of the great Antarctic explorer, who gave valuable help to Patagonia '85.
- Isla Coi-copihue (island), named after a flower similar to the copihue flower, the national flower of Chile, which was found on this island.
- Rio Moore (river), named after Professor David Moore of Reading University, who gave valuable advice to the expedition in its planning phase.
- Angostura Mischief (narrows), named after Major H. W. Tilman's yacht, the 'Mischief'.
- Ventisquero García (glacier), named after Eduardo García.
- Punta Dragon (point), in honour of the Dragon School, Oxford, who kindly helped raise money for the expedition by organising a sponsored walk.

SENO ANDREW

There is a good deal of confusion concerning the correct name for the north-east arm of the Peel Fjord, otherwise known as Seno Andrew (Andrew's Sound)

In the Carta Preliminar 5073 (1 : 250,000) and the Carta Cerro Chaltel o Fitzroy 4900 7200 (1 : 500,000), and in the maps of the French glaciologist Louis Lliboutry, the north-east arm of the Peel Fjord is referred to as Seno Andrew.

The maps published by the Instituto Hidrográfico do not however include the name Andrew to denominate this section of the fjord.

It seems that the origin of the name Andrew is based on a peculiar geographical error on the part of Dr. Federico Reichert, the first man to penetrate into the interior of the Southern Patagonian Ice-cap. In 1914, Dr. Reichert and Dr. Cristobal Hicken climbed the left-hand margin of the Moreno (Bismarck) Glacier and subsequently reached a point (Paso Reichert) where they were able to look across the waters of the Pacific Ocean. In the expedition report, Reichert mentions that from this point a glacier led directly down to the Fiordo "San Andrés". Given the extremely schematic nature of the cartography in 1914 it is not surprising that Reichert was in

fact wrong. The Fiordo San Andrés, which was chartered by Captain Phillip Parker-King of the Royal Navy in 1830, runs from north-west to south-east at approximately the same latitude but somewhat to the west. Reichert was in fact looking at the north-east arm of the Peel Fjord, which had been named after Sir Robert Peel during the same hydrographic expedition. The Peel Fjord however was not properly explored by the British hydrographers so there are no strong grounds as far as we are aware for assuming that the name should refer to any of the arms of the fjord.

Somewhere along the line, a cartographer decided to preserve Reichert's error, while at the same time distinguishing the two fjords, simply by referring to one with the English name Andrew, and the other with the Spanish name Andrés. Ironically, the two names should really be the other way around, since Parker-King named the original fjord "St. Andrew", while Reichert referred to the latter as Andrés. It seems that this ingenious solution to the problem did not satisfy the Director of the Patagonian Institute, Mateo Martinic, who in 1981 recommended that the name Andrew be suppressed and that the name Peel be used along the whole extension of the fjord (some 68 kilometres). The Calvo, Amalia and Asia Fjords were given independent names but the north-east arm was not.

Geographically speaking this is an absurdity since of all the arms of the Peel Fjord, this is geographically the most independent. The name Seno Andrew is of historical interest; it is not liable to be confused with San Andrés, but most importantly it is so much an independent geographical feature that it cries out for its own name. We suggested to the Instituto Hidrográfico that the name Seno Andrew be conserved but our suggestion was rejected. Rather than continually having to refer to the 'North-east arm of the Peel Fjord' however, we prefer to conserve the name Seno Andrew which, for the purposes of this report we have used throughout.

APPENDIX V

Reflections on a Bi-national Expedition by Matthew Hickman

Desirable as they may be in theory, it is a conclusion of our experiences that bi-national expeditions can present serious difficulties stemming from cultural differences. This appendix intends to alert any prospective bi-national expedition to the possible problem areas.

Before analysing the disadvantages, it is worth balancing the issue by assessing the advantages. The British have a tradition of exploration, beginning with their colonial past, and evolving gradually into a tradition of scientific exploration that has infiltrated down to the level of undergraduate expeditions. This tradition, valuable as it is in helping to improve the excellence of scientific expeditions at all levels, has given the British a tendency to view the rest of the world as their research patch. The countries in which that research has been carried out have seldom benefitted from the results of that research. That tendency must change as under-developed countries develop their own capabilities of scientific research. Expeditions nowadays have the responsibility to ensure that they contribute to the best of their ability to the progress of knowledge in the countries which they visit. Bi-national expeditions are obviously the ideal way of fostering this principle of scientific cooperation. Bi-national expeditions are increasingly favoured by institutions such as the Royal Geographical Society. There can be little doubt that we scored good credibility points due to the fact that we were, in principle anyway, a bi-national expedition.

We hoped that, from a financial point of view, our bi-national status would help us not only in Britain but also in Chile. We hoped that the Chilean contingent would be able to help organisation financially and logistically within Chile. All the Chilean members excluding Juan were asked to help in this respect, and were supplied with prospectus' to this end. It was wishful thinking. The attitude of industry and commerce in Chile towards expeditions means that getting any backing is like getting blood out of a stone. Nor is there in Chile the wealth of funds and charities which support expeditions. As a result the Chilean members of our team were reluctant to seek any support on behalf of the expedition nor really seemed to know how to go about achieving it. Support was later received from Shell Chile, Lever Chile, Lan Chile, the Andean Chemical and Mining Company and Huckle-Mackay but these were not obtained by Chilean members.

The Expedition's Identity

One of the main problem areas when organising a bi-national expedition is in defining the expedition's identity. There seem to be two alternatives when organising such an expedition: the first is to involve both nationalities at all levels and all stages of the planning and logistical preparation. This involves a high degree of mutual trust, and would imply many administrative weaknesses in terms of communication delays, lack of proper consensus of opinion as a group. The risk is high; the expedition risks arriving in the country to find that half the logistical preparation has been unsatisfactorily prepared. The advantage is that both halves would identify with the overall aims of the group, having invested their own time and energy (and money) in the preparations.

The second alternative is to invite the participation of local members as little more than guests on your expedition. This involves carrying the burden of logistical efficiency oneself; it would also mean that the Chilean members felt no identity with the overall aims of the group and were made to feel precisely that - guests on someone else's expedition.

The first solution is the ideal solution, in theory anyway, but fraught with problems in practice. The secret to efficiency is rapid and frequent communication between the members of the group, and that requires that all the members of the group be in the same geographical location. For this reason we recommend the latter approach, unless the expedition's disparate members already know each other very well and trust each other's judgement completely.

Patagonia '85 fell rather between two stools in its perception of policy towards the Chilean members. On the one hand we followed the policy that the logistical preparation should be based in Cambridge, and yet on the other we tried hard to encourage the Chilean members to feel themselves part of the team, by inviting them to help in the task of financing the expedition. In the event they never felt themselves integrated enough to identify with the aims of the group, but conversely felt themselves in a position to influence group decisions.

In Patagonia '85 the cultural differences, which are necessarily inherent to any bi-national group took expression in three main areas: Food, Scientific Projects and Money.

a). Food

Once again it is the key question of food which comes to the fore as one of the main catalysts in the breakdown of communication. Three of the four Chileans were based at Base Camp, so we must focus our attention now on the Base Camp rations. These did not differ very significantly from the Mountaineering rations in content; the main difference was that they were not separated into man/day/portion rations. Weight was again a significant factor in view of the fact we were transporting 6 weeks supplies for 11 people, so there was a considerable proportion of de-hydrated food. All the food quantities had been carefully calculated (although not separated) on the basis of man/day ration quantities so as to avoid transporting excess (or insufficient) quantities.

This issue ties in closely with the issue of time spent in the field, which is discussed in the following section, but it is worth mentioning at this stage that it was this time factor, balanced against weight, that had imposed on us the adoption of a system of rationing. It is also worth remembering at this stage that, as it was, with 2.3 tonnes of equipment, excluding the two inflatable boats, three outboard engines, 400 litres of petrol and 200 of paraffin (perhaps another two tonnes ?) we were stretched to the limits of our logistical capabilities. The Villarrica was loaded to the gunwales when we sailed from Puerto Natales. It was simply not possible to carry any more supplies than we were carrying anyway.

Despite these limitations, the first difference in attitudes towards Base Camp rations was precisely the fact that it was rationed. The "Chilean" view was that there should have been enough food to satisfy everyone's needs as and when they desired. Dionis developed elaborate psychological theories about the influence of the Second World War and rationing on the English National Character. Second World War or not, it is certainly worth highlighting this feature as a major cultural difference. Self-discipline is not a quality which is valued in Latin America.

The second point to mention is simply the question of relative likes and dislikes. The Chileans were not happy with the quality of the rations. They didn't like the textured vegetable protein (who did ?), nor any of the de-hydrated food. Juan's face dropped half a mile when he discovered that we didn't have any 'porotos' (beans) ! National culinary tastes are not to be underestimated. We recommend that any bi-national expedition make an effort to cater for these likes and dislikes.

Behind these objections lay what can be seen as two fundamentally different approaches to the expedition. The English, who had been more intimately involved in the planning and logistical preparation, saw the expedition as a carefully planned logistical operation towards the achievement of certain goals, while the Chileans, who identified less with these goals, less with the hard work that had gone in to realising the whole affair, saw the expedition as more of an adventure. Thus they were very disappointed by the absence of fish and seafood at

the first Base Camp, but perked up considerably when we reached the second Base Camp which had a good supply of both.

These comments may seem relatively minor ones when viewed in isolation, but it is worth noting that they lead to more serious problems. It is also worth noting that in the psychological and physical conditions imposed on individuals in such circumstances it seems to be common that apparently petty subjects become the vehicles of expression of more profound differences.

After the Mountaineers had left the Botanists, the task of cooking fell for the first time on the shoulders of the Chileans. They found it difficult getting used to the idea of rationing themselves to certain levels per day in a particular food, and only wanted to eat certain selected items of which they approved. It seems that Sue and Adrian had great difficulty trying to communicate what was required. This lack of communication was certainly not exclusively the fault of the Chileans, but it had serious consequences for the organization at Base Camp. The Chileans finished up by avoiding cooking. Sue and Adrian found themselves returning late in the evening after a day in the field and having to cook supper. Thus the original idea of having support role members at Base Camp, allowing the botanists maximum work time, failed. Juan and Dionis were idle for most of the time while Sue and Adrian were worked off their feet all the time.

A large part of the fault must inevitably lie with the leader for not ensuring an adequate briefing of the roles of Dionis and Juan in particular. The expedition was conducted according to an essentially collective philosophy. That is to say no-one was ever ordered to do anything. It was assumed that people would help according to the collective desire to help. It is interesting to note that Juan, whose briefing from the Navy was to act as boatman and radio-operator, was reluctant to adopt any other role. Thus, in the first days, at a time when one might expect the maximum cooperation he politely refused our gentle hints to help with the portage of supplies and equipment for the Mountaineering Party to the first depot. Equally, Dionis was reluctant to act in any other capacity than that of Expedition Doctor.

Despite this apparently black picture of Anglo-Chilean relations at Base Camp it should be recorded that the Chilean members had nothing but praise for Sue and Adrian, and made a special point of expressing this praise to the leader once the two groups had joined together again at the second Base Camp.

This point highlights the lack of communication existing between the Chileans and the English. It also shows how the Englishman's ability to hide his emotions with stoicism might perhaps have backfired on him, because apparently the Chileans had no idea that their lack of cooperation was not appreciated. These differences of attitude did not arise through confrontation (mercifully) but simply through different cultural perspectives. These different cultural perspectives should not be underestimated by anyone planning a bi-national expedition. Communication, as always, is the key issue. People from similar cultural backgrounds can often communicate successfully without having to use words. An expedition composed of such diverse cultural and social groups as ours needs a tremendous amount of conscious communication in order that these groups work harmoniously. Prior briefings are also absolutely essential to avoid misunderstandings in the field.

Scientific Projects

We encountered differences as regards approach to scientific investigation which may be more a matter of personal style than cultural attitudes but which nevertheless must be mentioned. These differences were encountered even before we had got to the field. Edmundo Pisano wrote originally to us saying that he was interested in accompanying the expedition but only wanted to spend between ten days and two weeks in the field. We replied that we would far prefer to include him for either six weeks or not at all, on the grounds that it would leave the botanical party undermanned for four weeks. We added that we were however prepared to include him if he was able to organise his own evacuation ahead of time. He continued to talk

vaguely about leaving after two weeks, even as we were unloading our stores into the inflatables at the Fiordo Peel, but he never organised himself in time and found himself stuck with us for six weeks.

Edmundo Pisano considered two weeks in the field was sufficient to complete his work. In contrast, at the Royal Geographical Society interview we were questioned as to why, given all this time and effort, we were only going for six weeks. The two frames of mind could not be more different.

The fact that Edmundo Pisano was reluctant to spend more than two weeks in the field was obviously an extremely negative factor; it did not take long for his negative attitude to spread to the other Chileans who, like him, found themselves with too much time on their hands.

Collectively they began to put pressure on Adrian, as Base Camp leader, to encourage an early evacuation from the field. Once the Mountaineering Party had packed it in there was only one motive to keep us in the field: the botanical work. As Adrian pointed out one could quite easily spend six months in the field and still have work to do; having achieved a considerable amount of work, and bearing in mind the question of morale, which was clearly an important factor, he decided to recommend evacuation a week ahead of schedule.

In hindsight the early withdrawal did not in fact damage our botanical project significantly, but it was a shame that our aims should have been influenced by what were essentially negative motives.

Money

It is an integral part of the philosophy of exploration, certainly at the level of undergraduate expeditions, that if you want to have the experience of participating in an expedition to a remote part of the world you must be prepared to pay out of your own pocket for the privilege. Thus all of the British members contributed not only in money, but also in a great amount of time and trouble to the success of the expedition. Bruce took two months unpaid leave from the British Antarctic Survey; Andy and Adrian postponed the first few months of their Ph.D. projects.

Unfortunately we have to report that this attitude was not shared by our Chilean members, one of whom ultimately refused to pay his personal contribution and another of whom took a large amount of equipment on credit and then refused to pay.

Certain fairly obvious conclusions can also be drawn from this lesson. It is simply not practicable to run the finances of an expedition on mutual trust. Even if the expedition has the capital to spend in advance every member of the expedition should have to pay his full personal contribution before any money is spent on buying stores and equipment. The desire to extend credit to people on trust may be well-intentioned, but ultimately may create more problems than it solves. In this respect the leader of the expedition accepts full responsibility for not having established a more clearly defined policy to the payment of personal contributions.

APPENDIX VI

IMPORT/EXPORT REGULATIONS

Any expedition planning to ship out supplies and equipment should bear in mind the considerable bureaucratic and legal problems involved in the process, which involves considerable expense in terms of time, money and patience. It took us ten days of bureaucratic nit-picking before we were able to get our stores released from customs and sent to Santiago; and we spent getting on for £500 in getting our stores and equipment in and out of Chile.

PROCEDURES FOR TEMPORARY ADMISSION OF EQUIPMENT (ADMISION TEMPORAL)

A 'solicitud' must be made to the Servicio Nacional de Aduana in Valparaiso, accompanied by a detailed list of the items and their value (don't overstate) and a letter of guarantee from the British Embassy in Santiago. It is best to get yourself a good customs agent from the start. Legally you will need one at certain stages of the procedure. Be warned, our customs agent seemed determined to create certain additional problems so that we would have to pay him more to solve them. They will go to great lengths to make sure that you don't understand what is going on, so that you don't ask any awkward questions. Although in theory this temporary admission exempts you from any duties, be prepared to pay almacenaje (storage), documentacion (bureaucratic charges), derechos de aduana (customs tax), and of course the agent's commission, which in our case was charged as a percentage of the value of the goods being imported (0.5%). It seems that there is no way of avoiding the customs mafia; your best bet is to get good estimates from two or more different agents before you do anything. Once you have agreed on a price stress that this price is fixed whatever problems he might encounter on the way. This may encourage him not to 'find' problems.

We encountered two particularly annoying problems which arose as a result of inaccuracies on the bill of lading issued in Liverpool. The first was that the weight of the stores was inaccurately quoted on the bill of lading. If the weight on arrival is more than 5% out you are liable to a whole variety of exorbitant fines. This error had to be covered by a back-dated telegram from our shipping agents in England declaring that they had made an error in the weighing process. The second problem was that our boxes were all labelled with the address of the Patagonian Institute as the original plan had been to send them on by sea from Valparaiso to Punta Arenas. We had to go through elaborate bureaucratic procedures in order to establish ownership of the cargo.

PROCEDURES FOR THE IMPORTATION OF FOOD PRODUCTS

It is a dilemma to know whether it is worth advising future expeditions to avoid importing food. On the one hand, there are great advantages in terms of obtaining free or reduced cost food supplies in the U.K. on a charitable basis. Certain specialised food products, such as dehydrated foods are difficult to obtain in Chile. It is also difficult to obtain substantial food donations from food companies in Chile.

On the other hand, importing food presents serious problems. A whole separate bureaucratic procedure is needed for the importation of foods. In England, expeditions are used to being treated on a charitable basis, but in Chile they don't recognize that expeditions, even Anglo-Chilean ones, have the right to avoid taxation, so you must be prepared to pay a 20% import tax on all foods. Your food will also have to go through an inspection by the Servicio Agrícola y Ganadero (S.A.G.). At one stage we were told that all our dehydrated meat would have to be confiscated. In the event, the only food confiscated was 12 jars of Gales Mexican honey, which

were solemnly taken away to be destroyed. As significant as the financial implications of these restrictions was the problem of time. We were fortunate to have a good base at Santiago, but without this support it would have been very difficult to cope with the problems imposed by importing food.

PLANT IMPORT/EXPORT REGULATIONS

LIVE PLANTS

Live plant specimens must first be inspected by the Servicio Agrícola y Ganadero (S.A.G.) at their offices at the International Airport. You will then be issued with a "Certificado Fitosanitario Internacional" (approximately 10 U.S. dollars) which must then be "legalizado" (stamped) at the Ministerio de Relaciones Exteriores in Calle Bandera No. 52. If, as in our case, you are entering another country before arriving back in the U.K., you should get a certificado "legalizado" at the Consulate of the relevant country. An import licence should be obtained from the Ministry of Agriculture, Fisheries and Food in the U.K. Although the import licence may well allow you to import plants without a phytosanitary document, you will not be allowed to take the plants out of Chile without one.

APPENDIX VII

PRESS COVERAGE

In total, 12 articles appeared in magazines or newspapers. Ten of these were in Chile and two in an English regional newspaper (the Cambridge Evening News and the East Hampshire Post). Of the Chilean articles, three were in regional newspapers (two in the Prensa Austral, one in the Sunday supplement of 'El Magallanes'). Six were in newspapers of national distribution ('El Mercurio', 'La Segunda', 'Las Ultimas Noticias', 'La Tercera') and the remaining article was in a magazine of selected distribution (the Diners Club Magazine). A full article with colour photos will be appearing in this magazine in March 1987.

In addition to newspaper coverage, the expedition held two Press Conferences, the first was in Punta Arenas on November 12th 1985, organised and conducted by the University of Magallanes, at which journalists from National Television were present. A television report was shown on the regional news programme but, to the best of our knowledge, it was not shown on the national network.

On the expedition's return a press conference was held in the Hotel Galería in Santiago, on January 8th 1986, organised by Lan Chile, the expedition's major Chilean sponsors. Television reports appeared on Channel 7 and Channel 11.

APPENDIX VIII

CONTENTS OF 12 MAN/DAY RATION BOX

Weight : approximately 10.5 kg

	No. of meals
340g Batchelor's farmhouse casserole (extended with T.V.P. and gravy mix)	(5)
280g T.V.P. (mince grade) plus gravy mix	(4)
230g Batchelor's chicken (diced or mince)	(3)
500g Record spaghetti (wholemeal or plain)	(4)
230g Cadbury's Smash potato powder	(4)
450g Easy cook rice	(4)
230g Dried mixed veg.	(6)
170g Batchelor's dehydrated peas	(6)
230g Dehydrated onions	supplement
230g Knorr soups	(6-8)
340g Milk powder	
680g Mornflake porridge oats	
570g Muesli	
1000g Billington's golden granulated sugar	
160g Dried apple (diced or rings)	
340g Raisins	
450g Dates	
230g Peanuts	
3 x 150g Tubes of Primula cheese spread	
3 x 200g Jars of Nutella	
1 x 450g Jar of honey or jam or golden syrup	
12 Jordan's Original Crunchy bars	
12 Roche multivitamin tablets	
115g Coffee	
230g Drinking chocolate	
24 Tea bags	

This prepacked ration was completed with the following:

4 x 150g	Packets of McKay Soda Integral biscuits
4 x 125g	Tubs of margarine
	Salt

APPENDIX IX

MEDICAL LIST

2 x 38g tube	Suntan Cream
	Calamine Lotion
2 x 30g tube	Lanolin Cream
50	ALLERGIES
	Piriton
	APPLICATIONS
2 x 8ml	Betadine Antiseptic Paint
2 x 8fl ozs	Savlon Liquid
3 x 50	Electrosol Tablets
20 sticks	Lipsalve
1 x 50g tube	Loxexane
1 x 15g	Hydrocortistan
50	PAIN RELIEVERS
2 x 50	Aspirin Tablets
	Paracetamol Tablets
	STOMACH AND BOWEL DRUGS
1 tin	Gaviscon
2 x 25	Senokot
	ANTIDIARRHOEALS
1 x 100	Lomotil
2 x Course of 25	Metronidazole
1 x 60	Codeine Phosphate
	PENICILLIN
2 x 20	Ampicillin Capsules each 500mgm
4 x Course of 20	Trimethoprim 200mgm
4 x 60	Erythromycin 500mgm
	RASHES
1 x 12ozs	Prickly heat powder
3 x 2.5ozs	Fungicidal foot powder
3 tubes	Fungicidal foot cream
	SORE THROAT
2 x 20	Tablets (not antibiotic)
	EYES
2	Eye bath
2 x 1 dram tube	Brolene eye ointment
	TEETH
2 x 7g	Cavit
2 x small bottle	Tooth tincture
	MOUTH
2 x 6 satchels	Bocasan
	TRAVEL SICKNESS
2 x 12 tablets	Stugeron
	INSECTS
6 tubes	Insect repellent
1 drum	Dusting powder
	EMBROCATION CREAM
2 x 2ozs tube	Deep heat
	MISCELLANEOUS
2 x 100 tablets	Puritabs
2	Thermometers
2 pairs	Nurse's scissors

3 pkts (doz)	Safety pins (assorted sizes)
2 pairs	Tweezers for splinters
	DRESSINGS
2 x 3yds	Gauze
4 x 2 ozs	Wool
2 x 6	Cotton bandages (3 inch)
4 x 3yds	Crepe (3 inch)
2 x 3yds	Elastic adhesive (3 inch)
2	Triangular
10	Butterfly closures
4 x 1yd	Strip dressing (porous) (2.5 inch)
4 x 5yds	Zinc Oxide adhesive plaster (0.5 inch)
2	Wound dressing No.15 BPC
1	Shell dressing
	STRONG DRUGS
2 x 10	DF 118 tablets 30mgm
1 x 10	Mogadon 5mgm
1 x 20	Cloxacillin (Floxapen) 500mgm
2 x 20	Metaclopramide (Maxolon)
	OTHER
1 full arm	Readisplint
1 full leg	Readisplint

APPENDIX X

a). EQUIPMENT LIST

ICE-CAP PARTY

6	Superlite Half Rope 9 mm x 45 m
2	Everdry Beal Rope 8.8 x 50
1	Beal 11 mm Rope
1	Cousin Acc. Cord 100 m x 5 mm
6	Cousin Bootlaces Red 200 cm
1	Cousin Tape 100 m x 18 mm
2	Camp Alaska Crampons
1	Camp K2 Crampons & Straps
2	Camp Lowe Footfangs (& S. Teeth)
1	Camp Neoprene Straps
4	Camp Neoprene Straps (8 PCS)
10	Betaclimb Screwgate Karab 2800 kg
12	Microlite Snap-link Krab
1	Camp G. Eagle Axe 3000 50 cm
1	Camp G. Eagle Hammer 3000 50 cm
3	Mountain Super Novas & Poles
4	D.M.M. Deadman
2	Moorhouse Deadman
6	Adhesive Syn Sealskin
1	Glue for Skins
4	Ultra Tubular Ice Screws 17 cm
4	Salewa Warthog Ice Screws
6	Pitons
5	Pat. Littlejohn Harness
6	Troll Full Body Harness
8	Gear Racks
3	001 Optimus Camp Stove
1	Ranger Stove
3	Coleman Funnel
3	Sigg Bottle 1 litre plain
3	Sigg Bottle 0.6 litre plain
2	Clogg Ascendeurs
30	Sand/Snow Pegs 17"
4	Pifco Headlamp
2	Nansen Manhaul Sledges (6ft)
2	Kastle Randonnee Skis
3	Kastle Two Stage Ski Mount Poles
1	Emery Medium SL Bindings
1	Karhu Cable
1	Trak Alta 190 cm Cross Country Skis
1	Fischer Ultra Lite Skis & Tyrolia Randonnee Bindings
1	Parachute Canopy (2nd)
2	Ice Hammer
3	Camp Uno Ice Axe
3	Ice Axe
3	Emery Binding New Altitude Automatic LX

PERSONAL

2	Koflach Valuga 4000 Ski Mountaineering Boots
3	Koflach Ultra Extreme Mountaineering Boots
1	San Marco Ski Mountaineering Boots
5	Firebird Sleeping Bag (Qualofill)
6	Expedition Rucksack Cordura
4	Fitzroy II Cordura
6	Cerro Torre Sleeping Bags (Radiant Barrier, Qualofill)
4	Goretex Shell Jackets Mountain Equipment
4	Goretex Overtrousers Mountain Equipment
6	One-piece Goretex Windsuit Mountain Equipment
1	Goretex Waterproofs Top & Bottom Nevisport
6	Karrimat 4 Season 55 x 185
3	Alpine Gaiters Goretex
1	Yeti Trionic Gaiters Goretex
1	Yeti Super Gaiters Goretex
8	Yeti Strata Gaiters Goretex
1	Columbus Red M
1	Columbus Red L
4	Biva Navy M
3	Lonjon Navy L
12	Stitchsock Navy S/M
8	Stitchsock Navy M/L
7	Finger Gloves Wild Country
10	Balaclavas
9	Overmitts
6	Bivi Bag Goretex
11	North Cape Fibre Pile Jackets
6	Bolle Snow Goggles
5	Bolle Mountain Sunglasses

BASE CAMP AND EXPEDITION

3	Silva Compass Type 54 NL/SME
1	Silva Compass Type 27/SME
2	Silva Compass Type 4/360/SME
2	Machetes
4	Kit Bags Large
2	Kit Bags
3	Nester Sets
8	Tilley Mantles
4	Tilley Lamps
5	Can Openers
2	Rubber Torch
1	Eyelet Kit
1	Phazor Dome
1	Phoenix Freespirit
1	Ultimate Peapod
2	Small personal tents
1	14' x 14' Army Mess Tent
1	14' x 8' Army Mess Tent
1	14' x 14' Groundsheet
1	9' x 6' Groundsheet
2	Hammocks
2	Oven Trays
2	Camp Ovens

12	Radio Batteries
1	Ball of String
1	Petzl Zoom Headtorch
2	Sigg Fuel Bottles 1 litre
1	Sigg Fuel Bottle 0.5 litre
1	Liquid Nikwax
1	Nikwax
2	Optimus 5R Stoves
1	Gas Stove
2	Gas Bottles
1	Field Table
2	Field Chairs
1	Coleman Funnel
8	Pks HP2 Duracell 1300
17	Pks HP7 1500 Duracell
2	Seamers Palm
6	Sail Needles
1	S/Drive 3/16" 44"
1	Screwdriver
1	24' x 18' Poly Tarpaulin
1	14' x 11' Poly Tarpaulin
1	Ball Sisal Twine
10	Prs Cargo Gloves
	Glue
	Permatrace
	Plastic Bags
	Sealing Tape
2	Jerry Cans
3	Optimus Water Bottles
1	Rope
1	Water Container 5 litre
1	Fuel Pump
	Meths
	Cutlery, Bowls, Mugs
2	Spades
1	Large axe
1	Small axe
1	Bow Saw
1	Ice Saw
	Plastic Tubing
	Cooking Equipment
1	Pressure Cooker
2	Frying Pan
2	Large Pot
3	Fuel Drum 200 litre
400 ltrs	93 Octane Fuel
200 ltrs	Paraffin
3	Aluminium Cases
2	Squadcal Radios and accessories
200	Return Lables

SCIENTIFIC

1	Hand Net
1	Round Net 14" Complete
1	Extra Fine Spare Bag 14"
1	Net Handles (set)

4	Geological Chisel 5" x 3/8"
1	Geological Chisel 6" x 1/2"
1	Geological Chisel 8" x 3/4"
1	Geological Hammer
1	Adriana Hoffman Book
1	Flora of Tierra Del Fuego - Nelson, 1983
8	Quire Botanical Drying Paper
2	Packets Botanical Mounting Labels
2	Botanical Press Complete
24	Genus Covers
4	Clear Plastic Box 7" x 4.5"
100	Clear Poly Lid Cont 15mls
50	Clear Poly Lid Cont 90mls
100	Clear Poly Lid Cont 45mls
2	Hand Lens x 10 Compound
2	Pooter Glass
30	Silica Gel 3g
500	Transparent Envelopes Large
500	Transparent Envelopes Small
1	Scalpel & Blade
1	Rain Guage & Funnel
1	Thommen 9000 Altimeter
1	Anemometer
1	Whirling Hygrometer
1	Aluminium Map Container
1	Malaise Insect Net
1	Tape Measure (30 m)
1	Abney Level
1	Plant Dryer
1	Max / Min Thermometer
11	Life-Jackets (supplied by the Chilean Navy)
1	Tree Corer
	Plastic Tubing, Velcro, Pritt, Araldite, Notebooks, Biro's, Plastic Sheets, Tweezers, 2" Sealing Tape, Cloth Tape, Alcohol (70%), Cotton Wool, Stapler, Marker Pens.

b). COMPANIES APPROACHED FOR EQUIPMENT AND CLOTHING SPONSORSHIP

COMPANY NAME	RESPONSE
Spacecoat Garments	Offered jackets in 90deg. S style
Helly Hansen	Nil
Spall Sports	Advertising budget used up for 1985
Jessops	Preferential prices
Berghaus	Trade prices
Damart Thermolactyl	Gift of thermal underwear
Light Alloy	Discount on ex-demonstration cases
Snowdon Mouldings	Trade prices
Skeemaster	Trade price less 15%
Karrimor	Nil
Vango	Expedition rate
Camera Care Syst/Point five	30% discount plus special pricing
Buffalo	Offered seconds plus discount
Silva (U.K.)	Donated compasses plus 33% discount
Racal Tacticom	Loan of two radios
Pye Telecommunications	Would have helped but equip. not suit.

Troll Safety Equipment	Modified Harness & special prices
W.L. Gore & Ass.	Donated material for suits
Wild Country	Loan of tent plus 25% discount
Mountain Equipment	30% discount
North Cape	Donated jackets plus trade prices
Phoenix Mountaineering	Nil
Europa Sport	Cost price
Bolle (U.K.)	Donated glasses and goggles
Patagonia (U.S.A.)	Nil
Marconi Electronic Devices	Nil
Javlin	Nil
Allcord	Trade prices

c). CLOTHING ISSUED TO EACH TEAM MEMBER

Thermal vest and long-johns
 Fibre-pile jacket
 Balaclava head wear
 Polyester finger gloves
 Loop stitch socks
 Mitts
 Goretex overmitts, jacket and overtrousers (or one-piece suit)
 Hollofil sleeping bag
 Goretex gaiters

d). SUPPLIERS OF SOME OF THE EQUIPMENT AND CLOTHING

North Cape	Thermal vests, long-johns, mitts, jackets, socks.
Damart	Thermal vests, long-johns, gloves.
Mountain Equipment	Waterproofs, sleeping bags.
Berghaus	Gaiters.
Wild Country	Tents, harnesses, finger gloves, balaclavas, overmitts, bivi bags, light-weight krabs.
Europa Sport	Lowe rucksacs, camera bags, Emery ski bindings.
Racall Tacticom	Radios.
Field & Trek	Skis, assorted stoves, hardware.
Allcord	Crampons, ropes, ice-axes, krabs, tape and cord.
Watkins & Dncst.	Scientific equipment.
Tarpaulin & Tent	Large tents, tarps, camp ovens, pegs, sleeping mats, machetes, assorted O-n-S.

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