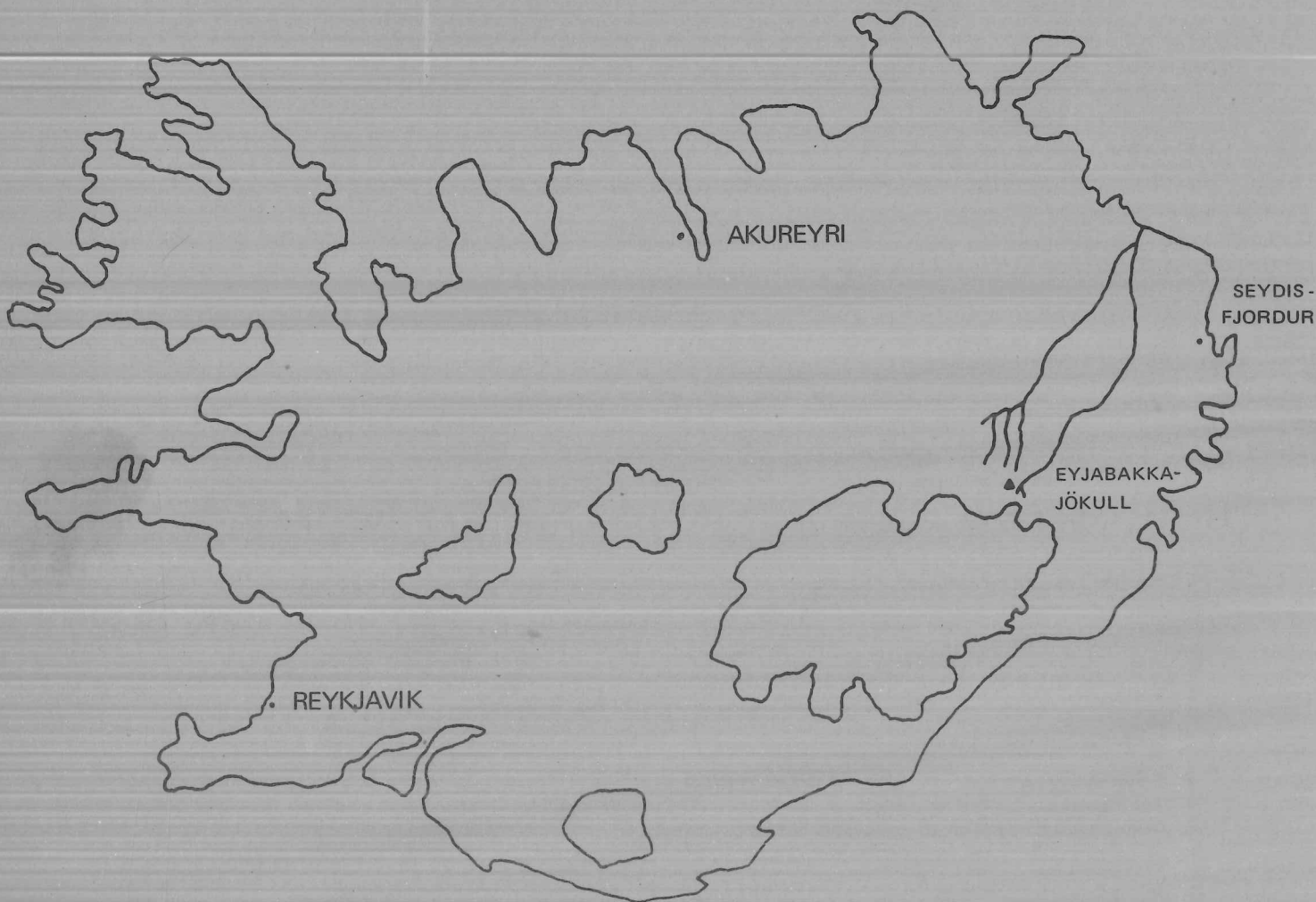


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Bothamley] ✓

UNIVERSITY OF NEWCASTLE UPON TYNE
EXPLORATION SOCIETY

Iceland

1979



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INTRODUCTION.

The expedition consisted of seven students from Newcastle University Exploration Society, who spent eight weeks in Eastern Iceland. The expedition was planned eighteen months in advance and help and advice was obtained from a large number of people and organisations prior to leaving Britain. Our destination was Eyjabakkajökull, a large ice lobe descending from the north-east of Vatnajökull ice cap. The main attractions of this area were its compact nature for scientific work and the compromise it provided between remoteness and accessibility, being 40 kms. from the nearest village. The valley is dominated by the highest free-standing peak in Iceland; Snæfell (1833 m.).

We have attempted to make this report as helpful as possible to other expeditions who plan similar trips to Iceland and specifically Eyjabakkajökull. For this reason the report has been divided into two parts. Part I comprises detailed scientific results, and Part II covers general information on the planning and execution of the expedition.

PART I.SCIENTIFIC WORK.INTRODUCTION.

Eyjabakkajokull is on the north-eastern edge of Vatnajokull. The ice lobe is 4 kms. wide and 10 kms. long. Although little work has been done in this area the glacier is known to have surged on several occasions, with a possible periodicity of 40 years. Major features of the pro-glacial area are shown on the map, with the main source of the melt-water channel being on the western side of the lobe. This flows around the ice margin, splitting into two channels, one flowing northwards through the moraines, the other flowing into a pro-glacial lake and then north down the valley. Running parallel to the ice front are a series of morainic ridges related to the glacier surges.

Scientific work carried out by the group included the study of different aspects of the outwash area. Two members worked on the morainic areas, trying to discover the modes of their formation, and another pair looked at outwash channel characteristics in the area. One member related the growth of a species of grass to temperature variations. A simple flora count based on quadrat sampling was taken across the moraines, from the flood plain to the ice front. A base map of scale 1:5,000 was produced to cover the main

PERSONNEL.

JAMES HAMMETT	(19) 2nd. year Geography/Surveying (B.Sc.).
Duty:	Co-Leader and Secretary.
Project:	Surveying.
KEITH BOTHAMLEY	(19) 2nd. year Geography (B.A.).
Duty:	Co-Leader, Travel, Insurance and Customs.
Project:	Fluvial Geomorphology; Flora.
CATHERINE LYONS	(20) 3rd. year Geography (B.Sc.).
Duty:	Packing.
Project:	Fluvial Geomorphology; Flora.
LOUISE GILBERT	(21) 3rd. year Geology (B.Sc.).
Duty:	Organisation in the Faroes.
Project:	Sedimentology; Fauna.
DAVID TRY	(19) 2nd. year Geophysics (B.Sc.).
Duty:	Equipment and Icelandic interpreter.
Project:	Geophysics; Surveying.
GILLIAN PERRY	(20) 2nd. year Plant Science (B.Sc.).
Duty:	Food.
Project:	Plant Biology.
DAVID PAYNE	(21) 3rd. year Geography (B.Sc.).
Duty:	Equipment.
Project:	Sedimentology; Meteorology.

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areas of study. The final member of the team was involved with the surveying and carried out a self-contained project on the exposed lavas in the Laugara Valley to the north.

Detailed accounts of the work carried out are given in the following pages.

SURVEY REPORT.

Jim Hammett

Dave Try

An area $3\frac{1}{2}$ kms. by $2\frac{1}{2}$ kms. was mapped, bounded to the south by the ice front and to the north by the 1890 push moraine, to a scale of 1 : 5,000 with a contour interval of 3 m. Ten triangulation stations were set up, a framework of a centre point polygon with an additional triangle, to which seven resection points were added to intensify control. A baseline between two stations was measured twice (591.649 m.) forward and back readings differing by 4 cms., using a thirty metre steel band.

The detail of moraines, lakes, rivers and contours were mapped by tacheometry and the ice front was mapped by intersection. Stakes were placed in stable positions along the ice front. The heights of the triangulation stations were established by levelling from the only spot height in the area; 671 m., and a secure benchmark was built here so that future use could be made of the height control network. Plastic tubing of 1 cm. diameter and 0.3 m. long were buried into the ground at each station, and yellow and red painted flags were attached to ranging rods and bamboo canes buried next to the tubing. These could be seen well, even in the worst weather conditions.

Stereopairs of air photographs (1967; available from Landmaelingar Islands) at a scale of 1 : 50,000 were

extremely useful during the planning stages of the survey as well as for general use during the expedition. Existing maps were of little or no use due to the positional changes in the ice front and river courses, the photographs also suffered from this problem. The control framework was adjusted by a semi-rigorous method, and resections were calculated by the Tienstra method.

Great difficulties were encountered by the fluctuating river conditions with stations flooded and swept away. The baseline had to be re-measured and control readings from some triangulation stations repeated. It was not feasible to place triangulation stations on the ice front, as was at first hoped. The area of the map encompasses almost all of the sites that were studied by other members of the expedition.

Total days survey breakdown:

Recce	3 days
Baseline	1 day
Control	6 days
Tacheometry detail	8 days
Leveling	3 days
Days lost due to bad weather	7 days
Total survey days	28 days

Equipment used:

Wild 1" theodolite, automatic level, 2 m. tacheometry staff, 30 m. steel band.

The six air photographs cost £13.10.

Maps used on the expedition:

The maps were obtained through Mr. D. Phillips and included;

- 1 : 750,000 (Touring Club of Iceland)
- 1 : 250,000 (Sheet 8)
- 1 : 50,000 (Sheet 96 - 'poor')

Plus the 1 : 50,000 Snæfell sheet (6121 111 AMS series C762), prepared by the U.S. Army map service in 1949 from air photography in 1945/46.

The Icelandic maps are available from the Icelandic Mapping Agency; Landmaelinger Islands, Reykjavik.

SEDIMENTOLOGY

Vatnajökull has a number of temperate (wet-based) surging glacial outlets, the main ones being Brúarjökull, Dyngjujökull, Tungnárjökull and Eyjabakkajökull. The latter is seen to be temperate by the subglacial emergence of meltwater streams from the ice, even though the surrounding ground is underlain by permafrost. The presence of basal meltwater is therefore possible; this being a likely prerequisite for a surging regime, by lowering basal shear stresses.

It has been suggested that this surging behaviour is periodic in nature, for example Brúarjökull, with an observed cycle of 70-100 years (Thorarinsson 1969). In the case of Eyjabakkajökull, there is no concrete evidence on a surging periodicity to date.

Surging glaciers tend to have a high debris content, possibly because they are wet-based, and this gives a dirty appearance, especially at the margins. Eyjabakkajökull has a large number of dirt cones on its marginal surface, and the ice is a dark grey/black in colour, being easily mistaken for moraine or rock outcrops on first sight.

As with all Icelandic glaciers, Eyjabakkajökull lies behind a large extent of morainic topography, with terminal moraines marking the greatest advance of the ice between the late 17th and early 20th centuries (Clapperton 1975). The glacier is known to have surged in 1890 and 1972-73, with advances of 0.6 and 2 km respectively (Clapperton 1975).

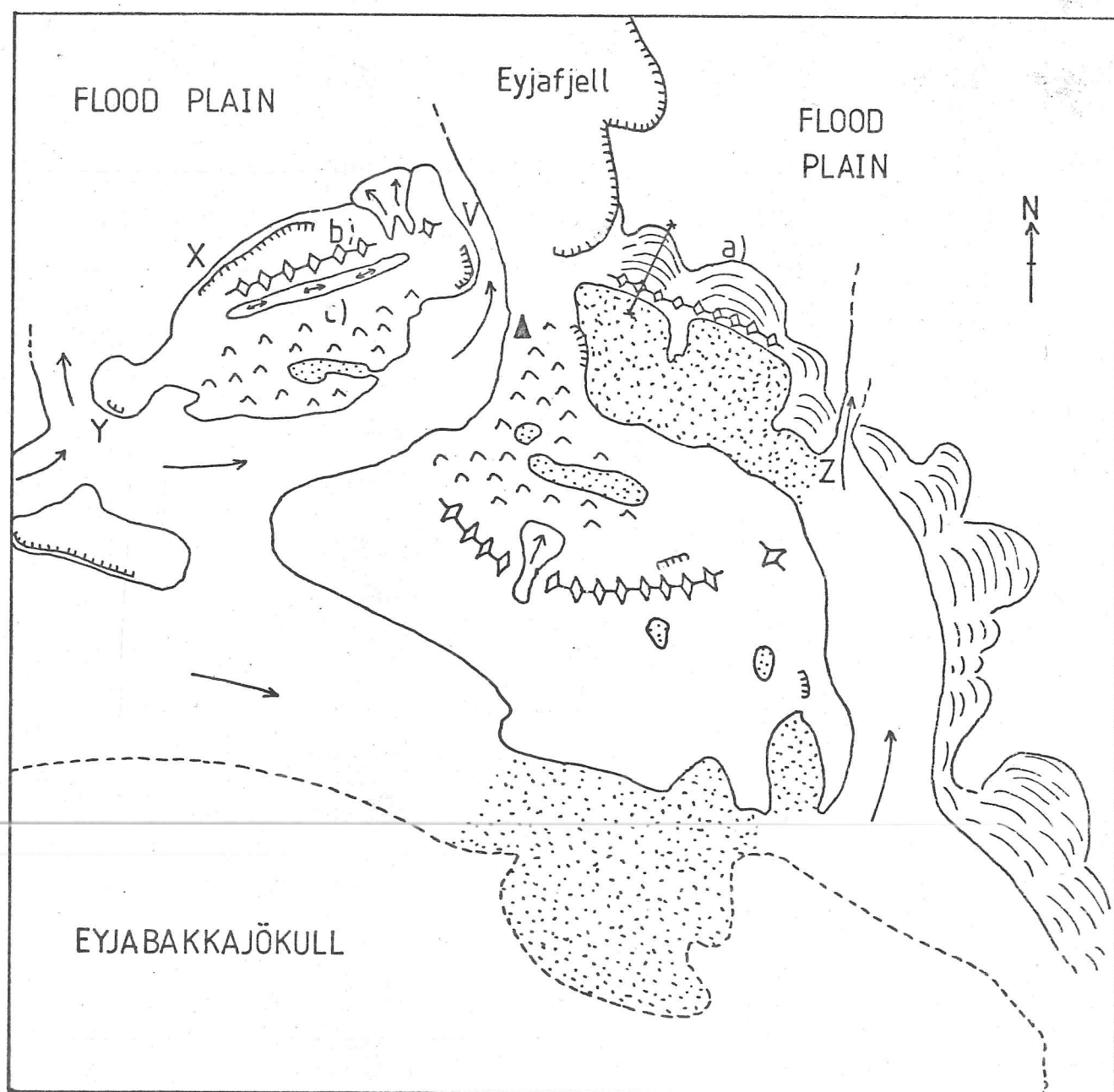
The area under study can be divided into the flat, open outwash plains, crossed by the meltwater channels, and the moraine covered ground. The latter group consists of two main landforms;

- 1) Areas of conical hummocks, with much visible ice coring.
- 2) Anticlinal ridges running parallel to the ice margin, up to 40m high.

The hummocky ground is composed of amorphous shaped mounds and small hills of coarse frost-shattered pebbles and boulders (up to 50 cm diameter). Many of these structures show slumping due to the thawing of ice cores, with the actual cores being visible in a number of cases. Also in this area water-filled kettle-holes abound, where the core has melted away and the hill has subsequently collapsed. During the warmest days of the study period small debris-laden mudflows could be seen creeping down-slope away from the black ice of the cores. On average these hummocks are between 2 and 8m high. One exception is a 15m conical hill W.N.W. of base camp. The slopes of this hill reach angles of at least 60 degrees, and it is therefore suspected that this too is ice cored.

There are two main anticlinal ridges in the area. The outer, most northerly moraine can be divided into 3 units; (see Diag. 1)

- a) Small, concentric series of moraine ridges, each ridge about 4m across.
- b) A large ridge of morainic material, 40m in height with the top section consisting of small pebbles and sand.
- c) Areas of moraine lower than and to the south of b).



Diag. 1. Sketch map showing areas studied.

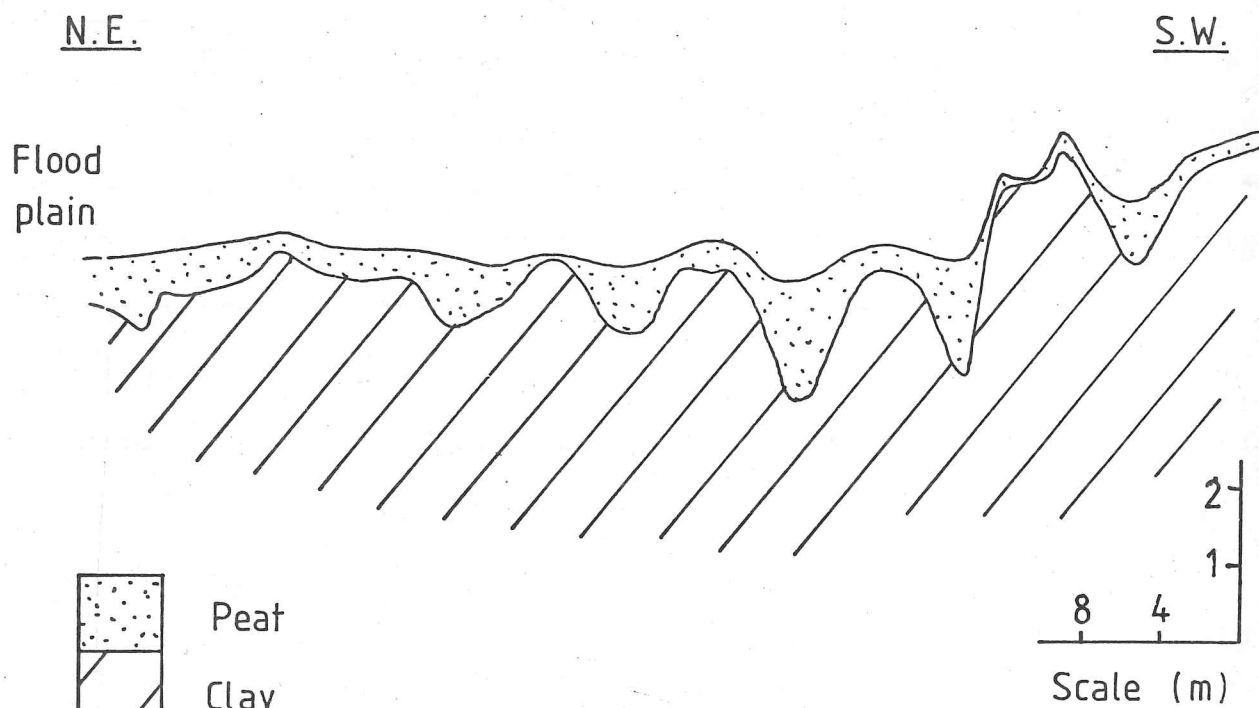
	Ice margins		i) Hummocky ground
	Rivers		a) Shock. ridges
	Lakes		b) Ridges
	Cliffs		c) Moraine
	Meltwater fan		Base camp
	Meltwater flow		Sections in moraines
	Line of cross-section		

Consisting of large, frost-shattered rocks, similar to those of the hummocky ground adjacent to this area.

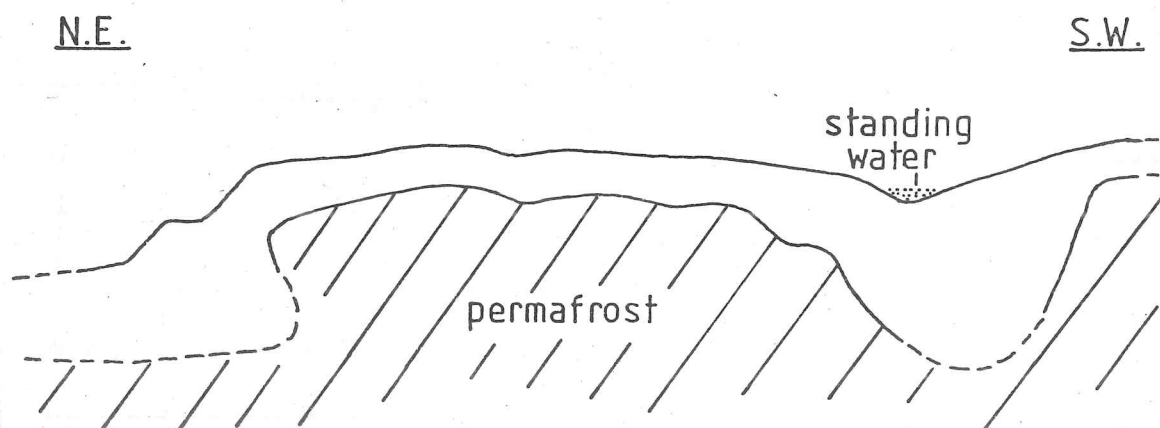
a) occur running parallel to the ice margin, from just south of Eyjafjell, south-east to the east side of the valley. To the west of Eyjafjell the area most likely to have contained these ridges has been removed by spring meltwaters. A study was made of these ridges just south-east of Eyjafjell, starting with a cross-section of the moraine. The depth of peat cover over the ridges and their composition was found by augering. The ridges were found to consist of a fine clay (yellow or grey depending on the state of oxidation), covered in a varying layer of peat, moss and grass. The true shape of the ridges can be seen in the cross-section, Diag. 2.

The flood plain and ridges were found to have permafrost at a depth of 20-200 cms. A cross section of this permafrost was also studied (see Diag. 3).

b) also runs parallel to the ice margin, immediately south of a), but continues to the east of Eyjafjell. To the south-west of Eyjafjell this area is being undercut by the meltwater channels. The clearest accessible exposure of this group was found in the cliff section cut by meltwater just N.N.W. of base camp. Here a general section through the moraine is seen to consist of an upper thick layer of clay with few visible horizons. Then an erosion surface, possibly representing the flow of a river channel (similar ripples can be seen in meltwater channels in the area). Below this are layers of cross-bedded sediments, of pebbles, sand and silt, very similar to those of the flood plain. In the upper beds of these pebbly horizons layers and chunks of moss turf or



Diag. 2. Cross-section of a) ridges (by auger).



Scale 1 cm : 0.5 m

Diag. 3. Cross-section of permafrost, a) ridge.

peat were found. (see cliff sections, Diag. 4). Above the clay is a thin layer of pebbly and sandy material, less than 1m thick.

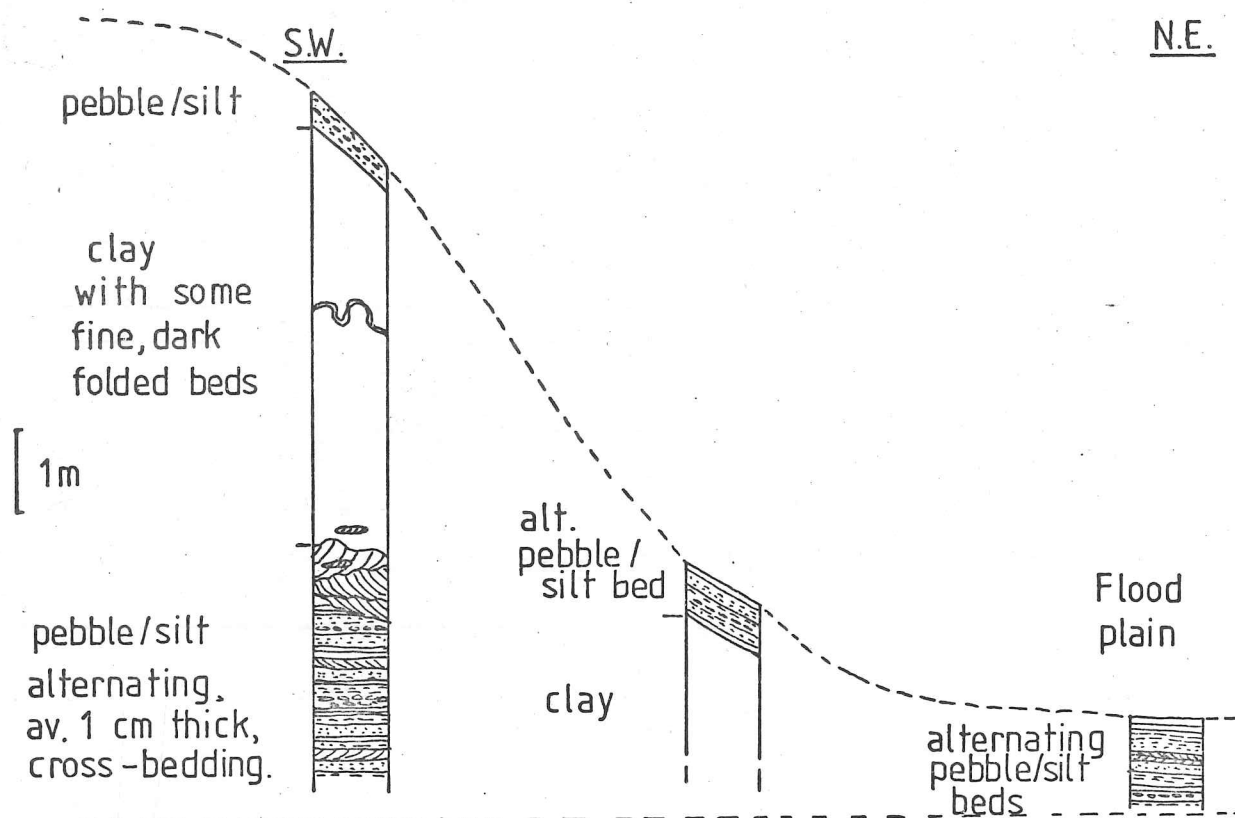
In the lower pebble/silt beds, in some small horizons in the clay and in the turf layers minor and major folding and thrusting can be seen. The strike of the folds runs into the cliff here (average 110°N), with average plunges of 30° to the east. The thrusts strike E.-W., with plunges of the thrust plane between 20 and 40° to the south. Similar structures were found also at exposures X,Y and Z. There is clearly a large element of compression here, with pressure from the south.

c) is the furthest south of these 3 units, seen mainly to the west of Eyjafjell. To the east of Eyjafjell these deposits have mostly been removed by the action of meltwater. Nowhere is a section found through this moraine. It is felt that this is a start of the hummocky ground, but reaching greater heights in places.

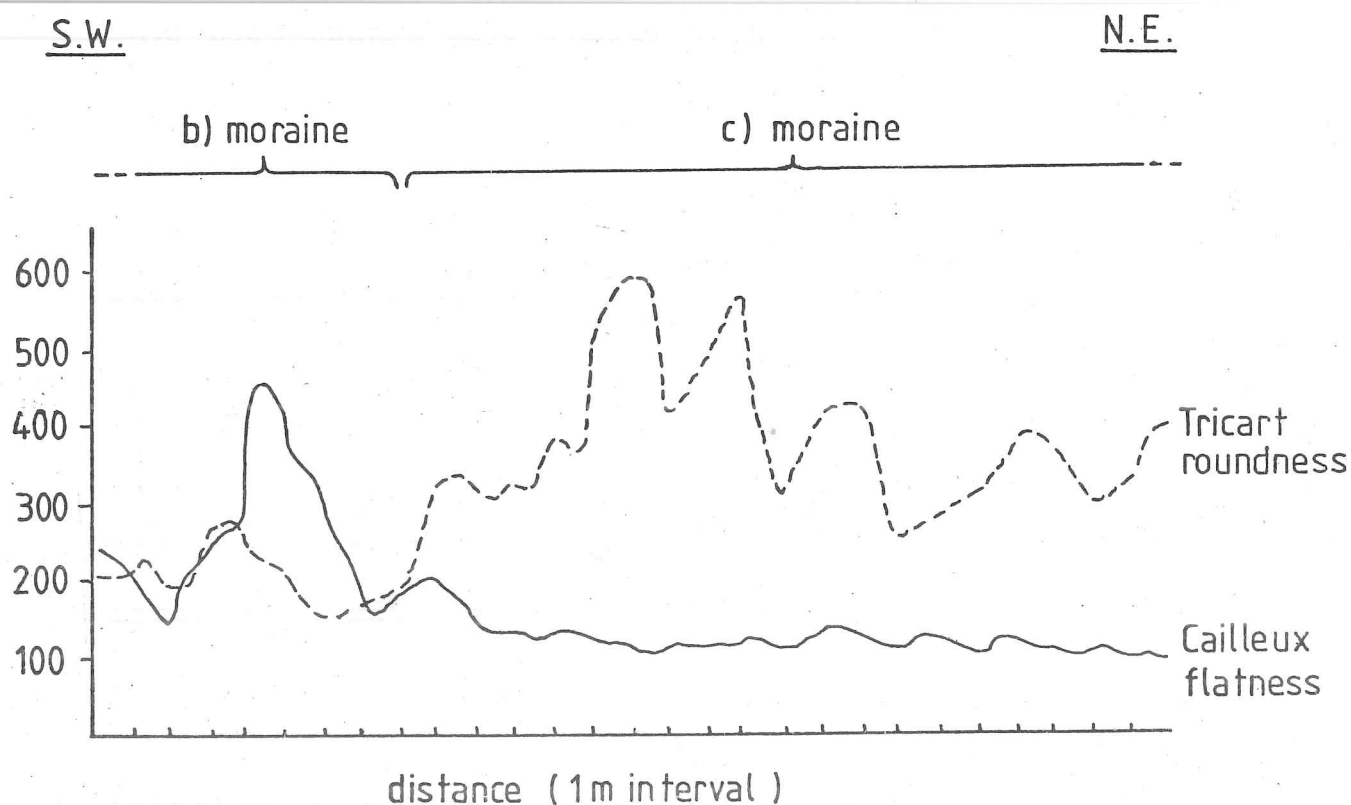
Between b) and c), west of base camp, a number of dry valleys run along the moraine, parallel to the crests. On occasions old meltwater channels breach b) and run northwards, forming alluvial fans at the base of this ridge.

East of base camp, a cross-section was measured running N.E.-S.W. across the moraines. A Cailleux test was carried out at 1m intervals along this section where sufficient pebbles were found. These tests for roundness and flatness, together with a Tricart flatness test, show up the changes from b) to c) across the area. (see Diag. 5).

It is thought that a) and b) moraines were formed at the



Diag.4. Generalised sections of flood plain deposits and b) moraine ridge at V' diag.1.



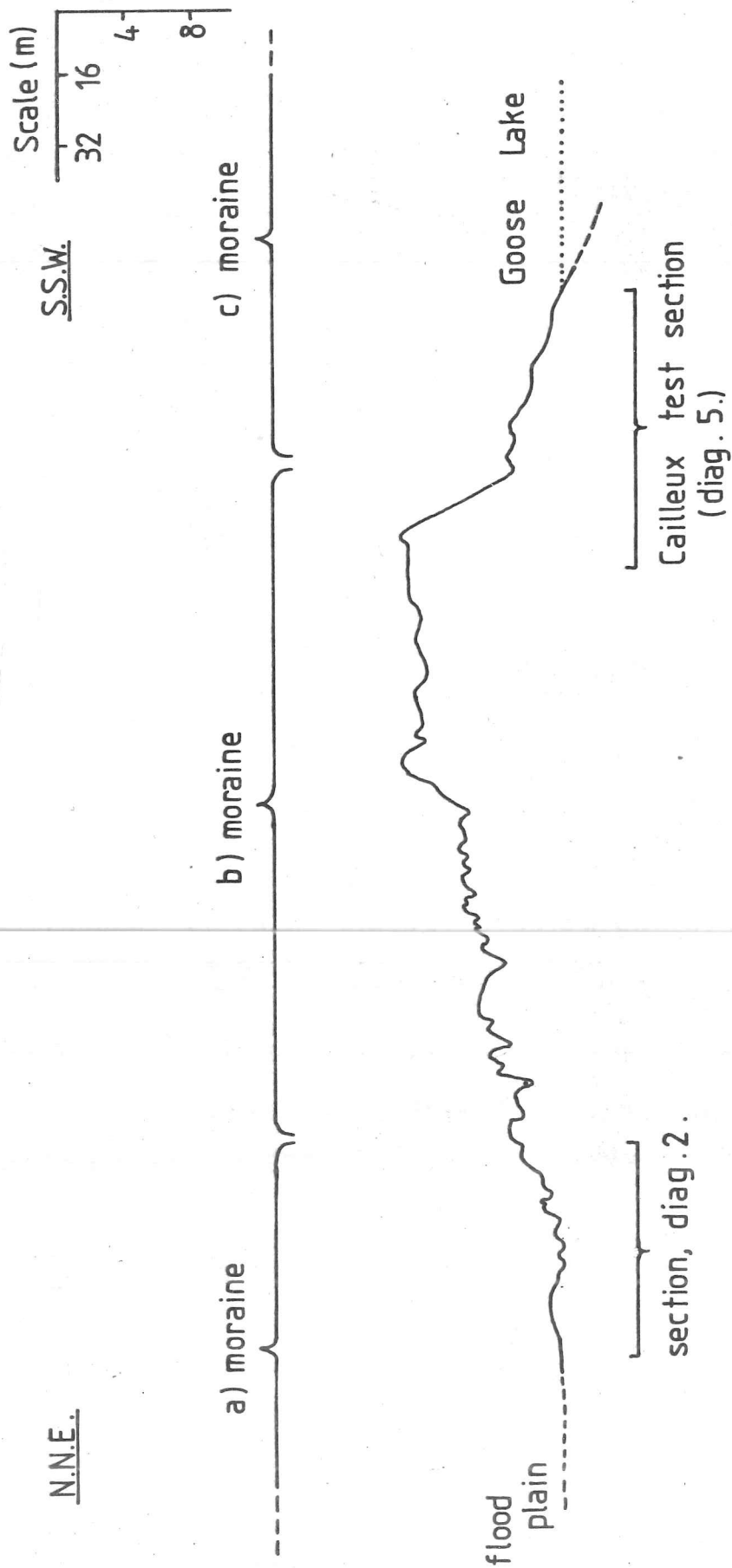
Diag.5. Graph of flatness and roundness tests at 1m intervals across parts of moraines b) and c), N.E. of camp, along cross-section (diag.1).

same time, possibly during the 1890 surge, and therefore constitute push moraines. a) are probably shock ridges caused by the mass of ice pushing up a barrier of sediments with some speed and force (Brúarjökull is known to have moved at least 5m/hour; Thorarinsson 1969). The lobed nature of these ridges may reflect uneven pressure from the ice or the ice margin itself may have been lobed. The b) moraines appear to be composed of river and / or flood plain gravels at the base, which were partially covered by a layer of peat/moss (similar to the flood plain north-east of base camp now). Later these deposits were covered in fine lacustrine deposits (clays), possibly as the ice advanced. This series of sediments was then compressed, folded and thrust by the surging ice. This process would have been aided by the fact that this area is underlain by permafrost, and the sediments would therefore have been pushed more easily along this solid impermeable surface.

The dry valleys running along the ridges and the melt-water overflow channels were then formed with the ice in close contact with the moraine.

After a surge there is often a retreat of the ice until equilibrium is again reached in the glacier (Thorarinsson 1940). It is likely then that after this surge the ice retreated, leaving behind a mass of terminal and dump moraine c), and then the ice cored hummocky moraine as pieces of ice fell off the retreating or downwasting margins.

The southern morainic ridge in this area reaches a height of 40m above the hummocky moraines. There was not sufficient time to study this ridge in great detail, but a



Diag. 6. Cross-section of morainic ridges S.S.E. of Eyjafjell (see diag. 1 for position).

..... Standing water

few important points must be raised. As with the northern ridge there are a couple of meltwater overflow channels cut through this moraine. However, no push features were seen in this ridge, and it appeared to consist mainly of large, frost-shattered boulders and rocks, with no low, hummocky ground to the south. In a couple of places evidence of ice coring was found, over which only a thin layer of moraine was seen in some examples. It is thought that this ridge or series of hills was formed by ice coring and not by any push mechanism.

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Clapperton. C.M. 1975. The debris content of surging glaciers in Svalbard and Iceland. Journal of Glaciology, Vol. 14, No.72 p. 395.

Thorarinsson. S. 1940. Present glacier shrinkage and eustatic changes of sea-level. Geogr. Ann. Stockholm, 22, p. 131-159.

Thorarinsson. S. 1969. Glacier surges in Iceland, with special reference to the surges of Brúarjökull. Canadian Journal of Earth Sciences, 6, 875.

Louise Gilbert

David Payne

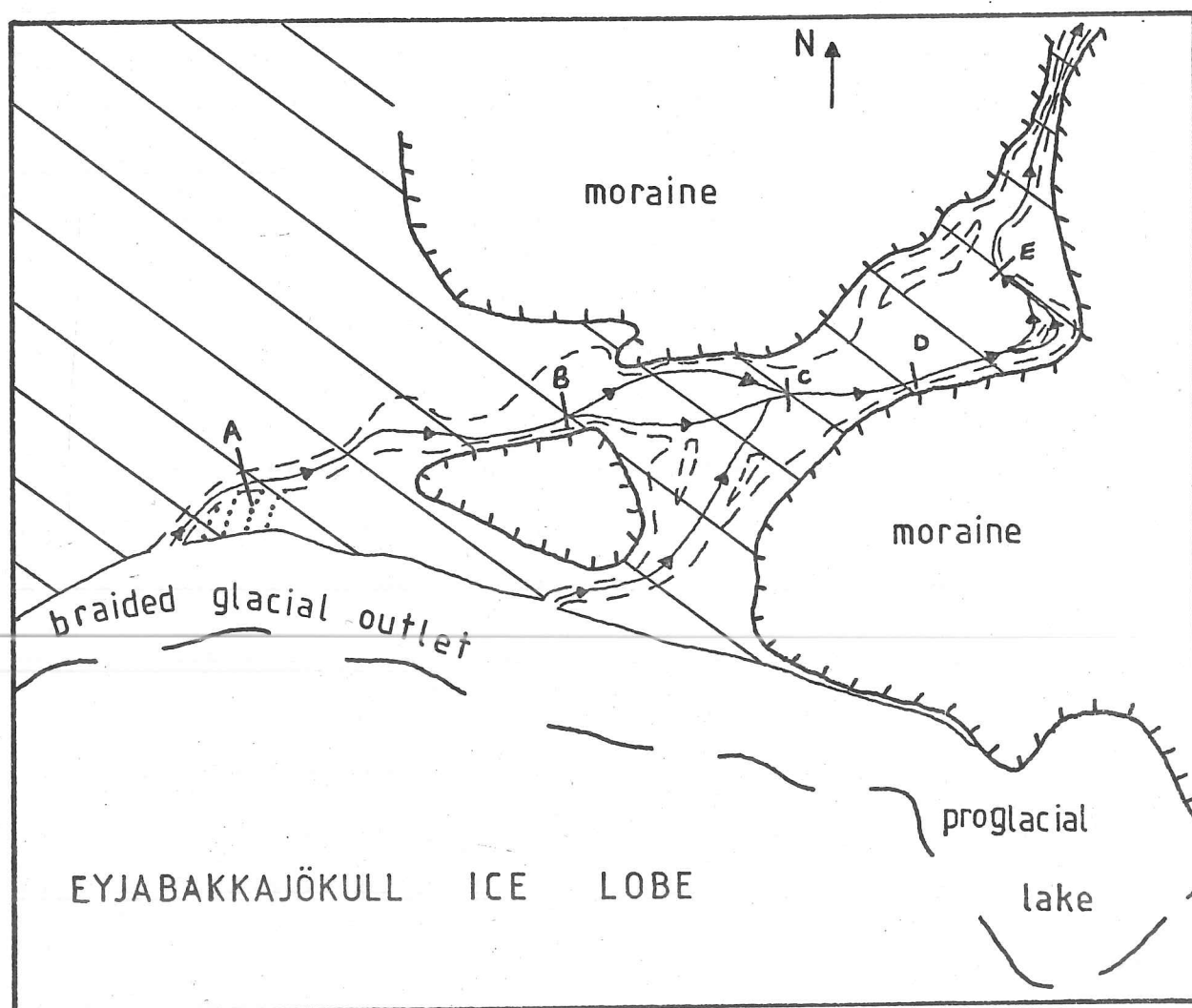
FLUVIAL GEOMORPHOLOGY

Our initial intention was to study the discharge channels leaving the glacier snout and crossing the outwash, looking at water and bed characteristics, relating these to discharge variations. The main discharge channel was too deep wide and fast-flowing to study with any safety, and so a secondary channel was chosen for detailed study.

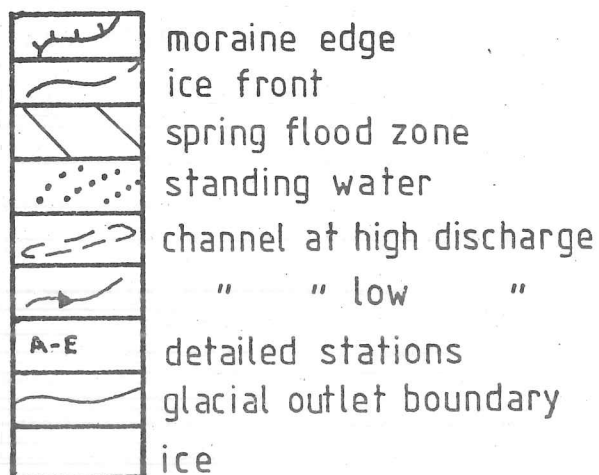
After a short time in the area, it was apparent that the main control on the characteristics of the study distributory was the amount of water flowing down the main glacial discharge channel, and variations in the course of this channel. In spring, the amount of water discharged by the glacier is greatly increased by melting, and this discharge floods the whole of the outwash zone, bounded by the morainic deposits and the volcanic range, cutting new channels through the sandur. In the summer months, after flood subsidence, the major outlet returns to its initial course, following the front of the ice round into the pro-glacial lake, abandoning the flood channels it had previously utilised.

Fluctuations in the volume of summer discharge, or alterations in the line of the deep water channel in the main course, causes periodic flooding of these abandoned channels, by the creation of new stress points along the channel bank. The channel we studied was, theoretically, the first to be flooded if discharge increased (see diagram one). During our study period, the channel did indeed flood in this way, and so we attempted a comparison of the channel morphology in flood and at low water levels, using observations taken from survey stations situated every 100m along the channel bank for a distance of 2.5km. Detailed cross-sectional data from

five stations, together with material from bed and bank, stream velocities and pebble orientations, demonstrated at-a-station and downstream variations in channel morphology.



Dgm1: Schematic diagram of study river.



0 250 500 m.

The general appearance of the distributary was that of a channel meandering through a level, homogeneous flood plain, with a high incidence of braiding both in the central channel, and in the numerous, often spring-fed tributaries crossing the sandur.

Discharge through the system varied enormously and irregularly. The incidence of flooding, which produced pronounced and severe bank erosion had no apparent correlation with microclimatic change or daily temperature increase (producing meltwater peaks in the early afternoon), but was governed largely by the path taken by the deep water channel of the main glacial outlet.

High discharges (often pre-empted by ice falls or braid shifts) bringing increased sediment loads downstream, produced a net effect of channel width increase rather than deepening; so that the main distributary, with an average low flow cross-sectional width of 10m, grew to a width of up to 150m, completely obliterating pre-existing morphological features, creating new channels in the erodable outwash, identified at high flow by the presence of fast flowing water streams with in the overall channel, with deep water channel velocities of 14m/sec. (32 mph).

Bankfull cross-sections of the main channel, levelled at low discharge indicate a gradual increase in channel width with distance from the glacier snout, depth varying only where the plain is constrained by morainic deposits, which though often unconsolidated, were more resistant to erosion than the fragile channel bed.

Detailed comparisons between the five control points were difficult to obtain, as discharge varied to such an extent

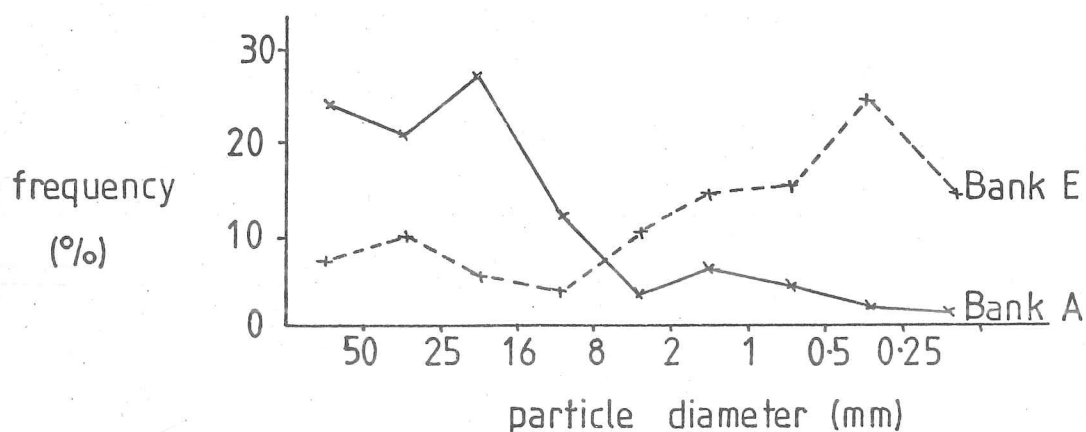
and with such rapidity as to preclude concerted form examination; however cross-sectional changes with respect to flooding again demonstrated the increase of width over depth with discharge variation, and several distinct braid and point bar formations were created with the onset of flooding.

A comparison of standardised ground samples from these stations indicates that particle size decreases rapidly with distance from the glacier snout, and that braid samples have a much higher percentage of fines than their bank counterparts (see Diag. 2).

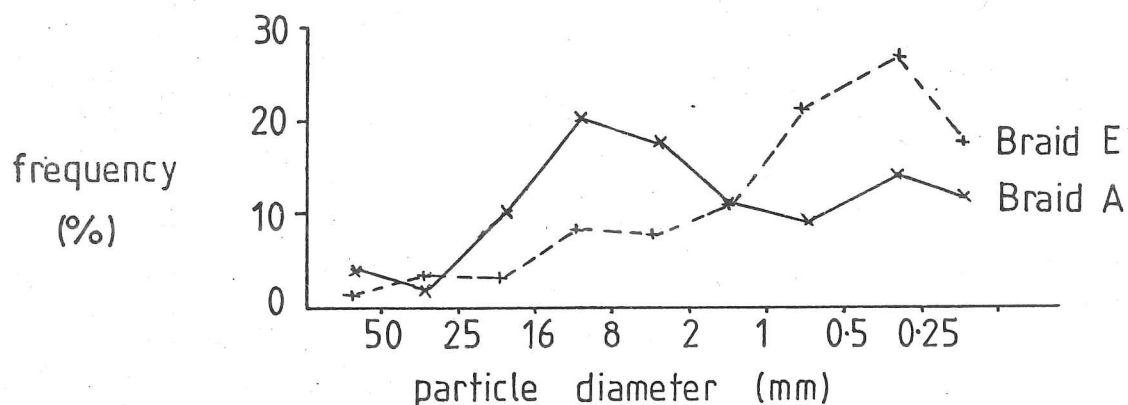
Diag. 2. Particle size distribution. (by weight)

St. = Station.

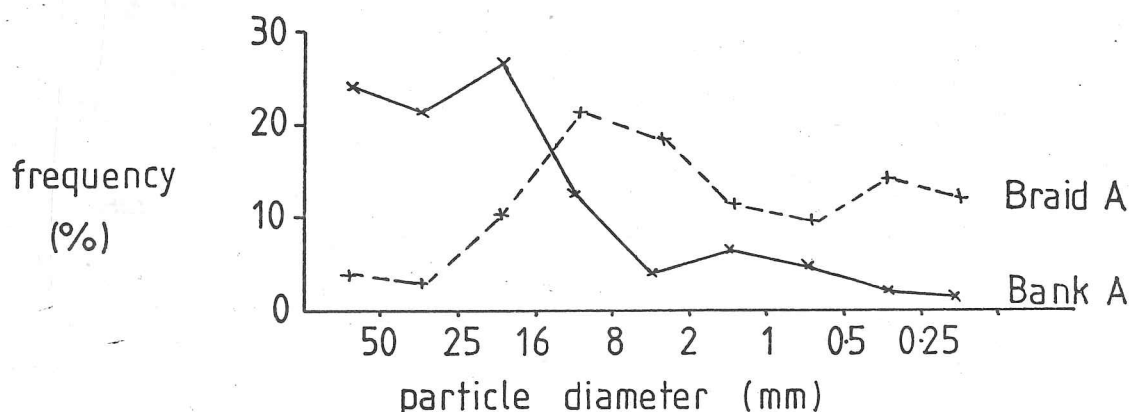
<u>Particle Size</u>	<u>Bank Samples</u>		<u>Braid Samples</u>	
	<u>St. A (%)</u>	<u>St. E (%)</u>	<u>St. A (%)</u>	<u>St. E (%)</u>
> 50.00mm	24	7	3	1
25.00-50.00mm	21	9	2	3
16.00-25.00mm	27	5	10	3
8.00-16.00mm	12	3	21	9
2.00- 8.00mm	3	9	18	8
1.00- 2.00mm	6	14	11	11
0.50- 1.00mm	4	15	9	22
0.25- 0.50mm	2	24	14	27
< 0.25mm	1	14	12	16



a) Bank particle size frequency.



b) Braid particle size frequency.

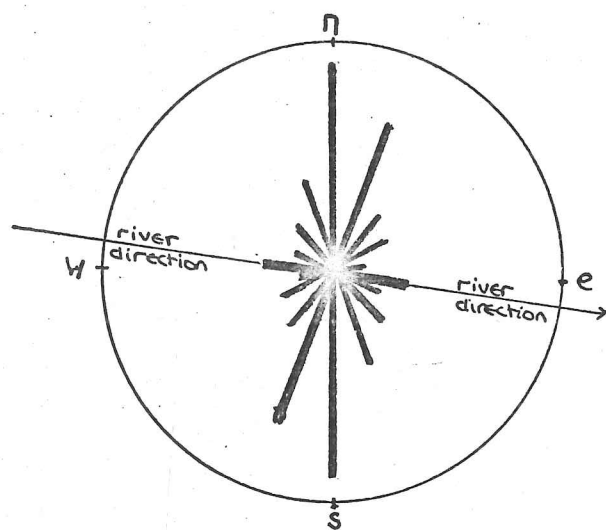


c) Bank/Braid particle size frequency - Station A.

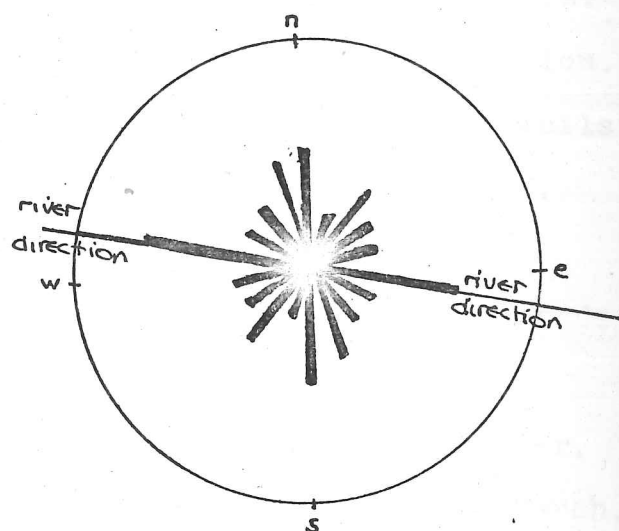
Particle long axis orientations were collected from the five stations, diagram 3 giving the example of Station C. In every case, dominant long axis orientations for bed particles were normal to flow direction. Bank orientatin, while more random, did show some tendency to peak parallel to the flow direction, though in many cases this was not a statistically significant result.

Finally, Cailleux tests on 200 pebbles from each cross-section indicate a rapid decrease in particle angularity with increasing distance from the glacial snout.

Diag 3. Pebble Long Axis Orientation at Station 'C'



BED 'C'



BANK 'C'

The channel studied displayed many characteristics of temperate channels, but the variety of channel form was considerably greater over the 2.5 km section than comparable sections of temperate streams, with the flood regime dominant, and pronounced grading of both bed and bank particle size and angularity. The channel comprised subsections of distinctive erosion (bank erosion) and depositional (deltaic silt deposits) environments, with the speed of channel morphology change greatly exceeding those of temperate channels.

Keith Bothamley

Catherine Lyons

PLANT BIOLOGY

The seasonal productivity of upland pastures in the U.K. has severe repercussions on the efficiency of its utilization. The pasture is actively growing only from May to August, whilst maximum demand on the pasture occurs from October to April. Thus demand and supply are out of phase, with a resultant loss of both quantity and quality of herbage. British uplands are used mainly to support sheep and the stocking rates are determined by the amount of feed available during the winter. Sheep are mated during October and carry the lambs until March, after which the ewe must produce quality milk. Thus, for the lambing to be successful, the sheep must be kept in good condition just prior to mating and through to lactation. Attempts to alter the timing of lambing to increase the utilization of summer production have been abandoned as lambs born in late autumn lose weight over the winter. Attempts to increase winter herbage and thereby increase the stocking levels by the conservation of summer production have met with problems of poor weather conditions and high losses due to the leaching of nutrients.

Increasing the pasture output by replacing the indigenous species by more productive lowland types has only resulted in an increased output during the summer and has not lengthened the seasonal production. In studying the factors affecting pasture production, it has been found that a negative correlation exists between the ability of a grass species to grow at low positive temperatures, and its ability to survive sub-zero temperatures (i.e. cold tolerance).

Thus those genotypes which show low temperature growth, a feature which would be desirable in upland pastures to extend the duration of production, are not cold tolerant and are killed out by sub-zero temperatures. The search for those genotypes which combine both cold tolerance with a reasonable level of low temperature growth, has led scientists both to the Mediterranean uplands, and to the high latitude areas of Scandinavia and Iceland. It was hoped that by recording growth rates and temperatures over a period of six weeks, that it would be possible to determine whether the grass species in the vicinity of Eyjabakkajökull were of genotypes which combined cold tolerance and low temperature growth in such a way as to be useful for future introduction into the British uplands. Due to the isolation of the area, it was impossible to know what kind of vegetation would be encountered, and on arrival it was evident that what little vegetation there was would be of no value to the improvement of upland pastures in more temperate regions.

The most abundant grass species found on the outwash plain was later identified as Phleum alpinum, with the moraines only supporting sedges. This species, although related to Phleum pratense, a very important grass in Britain, both in upland and lowland pasture, is of itself of no agricultural importance. It is a rare alpine grass of wet slopes and rock ledges, restricted to the higher mountains of north central Scotland and north west England. It is the most widespread of all the species of Phleum occurring from Arctic regions, spreading through Europe, Asia and China.

With hindsight, it is difficult to justify further investigations of a similar nature on the grasses of this region.

Gillian Perry

VEGETATION AND PEDOLOGICAL STUDY.

Cath Lyons

Keith Bothamley

Owing to its erratic nature there were many days on which study of the meltwater rivers was impossible. It was therefore decided to use this spare time to make a vegetation/pedological study. This entailed taking 1 square metre quadrat samples at 30m intervals along a transect. The transect used ran from the low marshy plain of the river Fljótsdal, through the area of moraines, to the proglacial lake. (see Diag. 1 for cross-section of transect).

Under the cold conditions of this region, soil formation processes are considerably stunted, and plant colonisation is therefore difficult. However, the soil here has a fairly uniform parent constituent and can be roughly dated i.e. deposition of sediment is related to the glacier surges and retreats.

When this quadrat study was completed, the plant work was extended to collecting anything which grew in the area around Eyjabakkajökull.

FOR VEGETATION FOUND AT EACH LOCATION SEE TABLE 1.

Location 1.

Flat marshland exposed to N., W. and E. Bog moist underfoot.

Soil Profile:	1 Moss	3cm
	2 Semi-peat	24cm
	3 Grey gleyed clay	

Location 2.

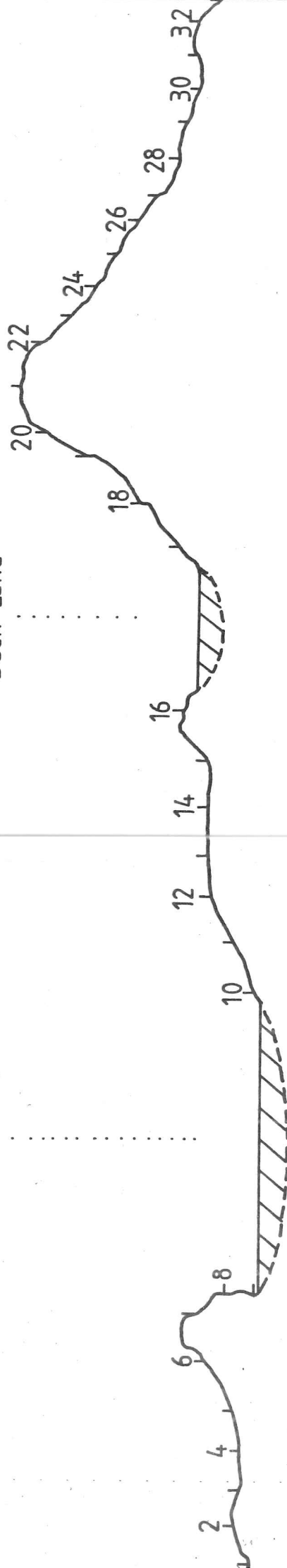
Low lying, again exposed to N., W. and E. Moist. 4 zones.

N.N.E.

S.S.W.

Goose Lake

Duck Lake



Point of quadrat location

Standing water

Scale 1:5000

datum 320 m

Diag.1. Cross-section of moraine along transect line, from flood plain in N.E. towards ice margin in S.W.

Soil Profile:	1 Roots & peat	9cm
	2 Clay	7cm
	3 Brown peat	7cm
	4 Moist gleyed clay	

Location 3.

South facing slope on the edge of moraine ridges (1890),
exposed to the S.E. and N.W.

Soil Profile:	1 Brown root mass	3cm
	2 Black-pale grey soil	6cm
	3 Brown peat	3cm
	4 Grey clay	2cm
	5 Black carbon layer	1cm
	6 Clay proper	

Location 4.

East facing slope, within small ridges.

Soil Profile:	1 Brown friable earth	14cm
	2 Light brown, with fine roots	2cm
	3 Clay, some roots	14.5cm
	4 Black carbon layer	1.5cm
	5 Clay proper	

Location 5.

North facing slope, bank in a ditch. Sheltered.

Soil Profile:	1 Brown root layer	4cm
show leaching	2 Grey soil, roots	3cm
	3 Pale buff layer	2.5cm
	4 Brown peat	5cm
	5 Clay proper	

Location 6.

Top of a ridge, exposed to winds in all directions.

Soil Profile: As Location 5.

Location 7.

Dry North facing slope.

Soil Profile: Dry sandy material

Location 8.

Steep S.E. facing slope, exposed to W., E. and S.

Soil Profile: 1 Chestnut root layer 4.5cm
2 Grey/brown layer of
clay, lightening down,
pebbles throughout

Location 9.

Near lake edge, more sheltered, subject to flooding.

Soil Profile: 1 Loose top with roots 2cm
2 Angular pebbles & sand 10cm
3 Lake deposits - heavy
grey clay & silt

Location 10.

Opposite shore of Goose Lake, subject to flooding.

Soil Profile: 1 Root zone 3cm
2 Buff clay with black/
dark brown lenses,
pebbles throughout

Location 11.

Shore, sheltered from S.

Soil Profile: Uniform brown crumb structure, with
many pebbles. High % silt.

Location 12.

Flat shore area.

Soil Profile: Heavy but with better crumb structure
than Location 11.

Location 13.

Flat area within a N. facing gulley.

Soil Profile: Increase in pebbles, no horizons.

Location 14.

Slight slope, facing N., exposed to winds in all directions.

Soil Profile: Many pebbles, no horizons.

Location 15.

Slight slope facing N., very exposed.

Soil Profile: Many pebbles, no horizons.

Location 16.

North facing slope on shore of Duck Lake, slightly sheltered from S. winds.

Soil Profile: Some brown roots
Grey substrate at 8cm

Location 17.

North facing shore, higher up slope.

Soil Profile: 1 Root depth 8cm
2 Darker soil, less clay

Location 18.

Shallow gulley.

Soil Profile: Roots to depth of 8cm
Soil dark brown with many stones
which fall into gulley.

Location 19.

North facing slope.

Soil Profile: 1 Pebbled surface
2 Grey/brown soil 15cm
3 Chocolate brown soil 9cm
4 Grey/brown with pebbles

Location 20.

Steep North facing slope.

Soil Profile: 1 Grey/brown surface
2 Light brown grit

Location 21.

Peak of N.-S. moraine ridge, very exposed.

Soil Profile: 1 Grey/brown surface
 2 Light brown grit

Location 22.

South-east facing slope.

Soil Profile: Soil more clayey here, more pebbles,
 no horizons.

Location 23.

Similar aspect to Location 22, but slope less steep.

Soil Profile: Clayey soil, many pebbles, no zones.

Location 24.

North-south slope but protected here by a few E.-W.
aligned hummocks.

Soil Profile: Clay soil with many pebbles, similar
 to Locations 22 and 23.

Location 25.

East facing slope still protected by hummocks.

Soil Profile: Clay soil with increase in % pebbles.

Location 26.

East facing slope slightly more sheltered than Location 25.

Soil Profile: Grey/buff soil, no horizons, pebbles.

Location 28.

Lower down slope.

Soil Profile: Grey/buff clay similar to Location 26.

Location 29.

Further down slope.

Soil Profile: As Locations 26 & 28.

PLANT TYPE	LOCATION																																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
Sphagnum	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Arctostaphylos uva-ursi	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Salix	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Cerastum fontanum	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Polygonum viviparum	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Lichen	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Empetrum nigrum	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Phleum alpinum	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Potentilla crantzii	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Sabbaldia decumbens	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Silene acaulis	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Veronica alpina	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Polygonum viviparum	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Poa alpina	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Saxifraga oppositif	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Ceratum alpinum	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Saxifraga hypnoides	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Carex	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Eriphorum	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Armeria maritima	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Draba norwegica	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Festuca rubra	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Trisetum spicatum	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Ceratum alpinum	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Saxifraga caespinosa	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
Percent vegetation cover	100	100	95	95	100	80	80	15	30	45	1	10	25	10	100	20	20	10	15	20	20	10	45	5	70	5	60	5	10	1	55	5	5	3	0	

Table 1. Plant distribution.

Location 30.

Aspect still the same, therefore only change is the micro-climate as we get nearer the ice margin.

Soil Profile: Buff clay, no horizons.

Location 31.

Top of small hummock 1m high, very exposed.

Soil Profile: As Location 30.

Location 32.

Sheltered flat area.

Soil Profile: Increase in pebbles in this buff clay soil.

Location 33.

Flat area not as sheltered as 32.

Soil Profile: Mixture of pebbles, clay and silt.

Location 34.

Flat land sheltered by 1m high E.-W. ridge.

Soil Profile: 1 Thin brown horizon 2cm
2 Gritty soil with pebbles

Location 35.

Flat top of a low lying hummock.

Soil Profile: 1 Thin brown horizon 1cm
2 Gritty soil.

As we would have expected most variety of plant species is found growing on the more developed soils eg. Location 4. Some species, eg. Sphagnum, can be found growing throughout the transect. It can therefore be assumed that this is an important colonizer. Lichen is also found scattered at points along the transect, but was not as prevalent as the Sphagnum. It is interesting to note that a micro gradation of plants was seen even within a quadrat. If Sphagnum and Lichen were trap-

ped in the 1m grid the Sphagnum would grow in the damper areas, and the Lichen in the dry ones.

While some species colonised throughout the transect some could be said to be related to specific parts;

- | | | |
|-------------------------------|---|--|
| 1 <u>Saxifraga caespinosa</u> | } | all found growing on the poor dry soil well into the younger moraines. |
| 2 <u>Festuca rubra</u> | | |
| 3 <u>Trisetum spicatum</u> | | |

These plants probably grew here because they can adapt to these dry conditions. (Festuca rubra is often found on sandy coasts in Britain). There is also less competition on this poor soil. Other species seem to be restricted to the damper, stratified, better colonised soils further away from the ice front.

Thus we see all the gradual colonisation of a soil. The morainic till with its high percentage of ash and consequent dry structure is gradually converted into a gley marsh soil as we move away from the ice margin. Conditions in these marsh soils are as yet anaerobic - there is a marked absence of fauna. However, in time, if drainage permits there seems to be the vital constituents to form pasture land. By English standards the Eyjabakkajökull pastures may not seem too good, but Icelandic sheep farmers were already making use of the land for sheep grazing.

PLANT COLLECTION WORK.

All the plants mentioned in this section were collected either near Eyjabakkajökull in the Jökulsa valley or close by the Snaefell Hut.

There are 622 species of vascular plants in Iceland, most of which are 'common' plants. Variations found in distribut-

ion between East and West Iceland are due to the influence of the warm gulf stream (in the W.) and cold polar stream (in E.).

Plants collected: (Icelandic name in capitals if known).

Arabis alpina (SKRIDNABLOM)
 Arctostaphylos uva-ursi (SORTULYNG)
 Armeria maritima (SKEGGSAN DI)
 Bartschia alpina (SMJORGRAS)
 Calamagrostis stricta
 Cardamine pratensis
 Carex capillaris (HARLEGGJASTOR)
 Carex nigra
 Cerastium alpinum
 Cerastium arcticum (KIRTILFRAEHRNA)
 Cerastium fontanum
 Deschampsia cespitosa (SNARROTARPUNTUR)
 Dryas norvegica
 Dryas octopetala
 Empetrum nigrum (KROEKILYNG)
 Epilobium aragallidifolium
 Erigeron borealis (TAKOBSFIFILL)
 Eriophorum angustifolium (KLOFÍFA)
 Eriophorum scheuchzeri
 Festuca rubra (TUNVINGULL)
 Festuca vivipara
 Galium normanii
 Graphalium supinum (GRAMULLA)
 Oxyria digyna (ÓLAFSSÚRA)
 Phleum alpinum (FJALLAFOXGRAS)
 Poa alpina (FJALLASVEIFGRAS)
 Polygonum viviparum (KORNSÚRA)
 Potentilla crantzii (GULLMURA)
 Rumex acetosa (TÚNSÚRA)
 Salix
 Saxifraga caespitosa, S. hircules, S. hypnoides, S. oppositifolia
 Sibbaldia decumbens
 Silene acaulis (LAMBAGRAS)
 Thymus drucei (BLÓÐBERG)
 Trisetum spicatum
 Veronica alpina
 My thanks to Dr. C.A. Stace of Leicester University.

MAGNETIC TIME REVERSALS

INTRODUCTION:

On average, the earth's magnetic field changes direction every 400,000 years. It takes about 10,000 years for a reversal to be completed. If molten rock forces its way to the surface, and flows out as lava from a volcano, it will become magnetized in the direction of the ambient field as it cools.

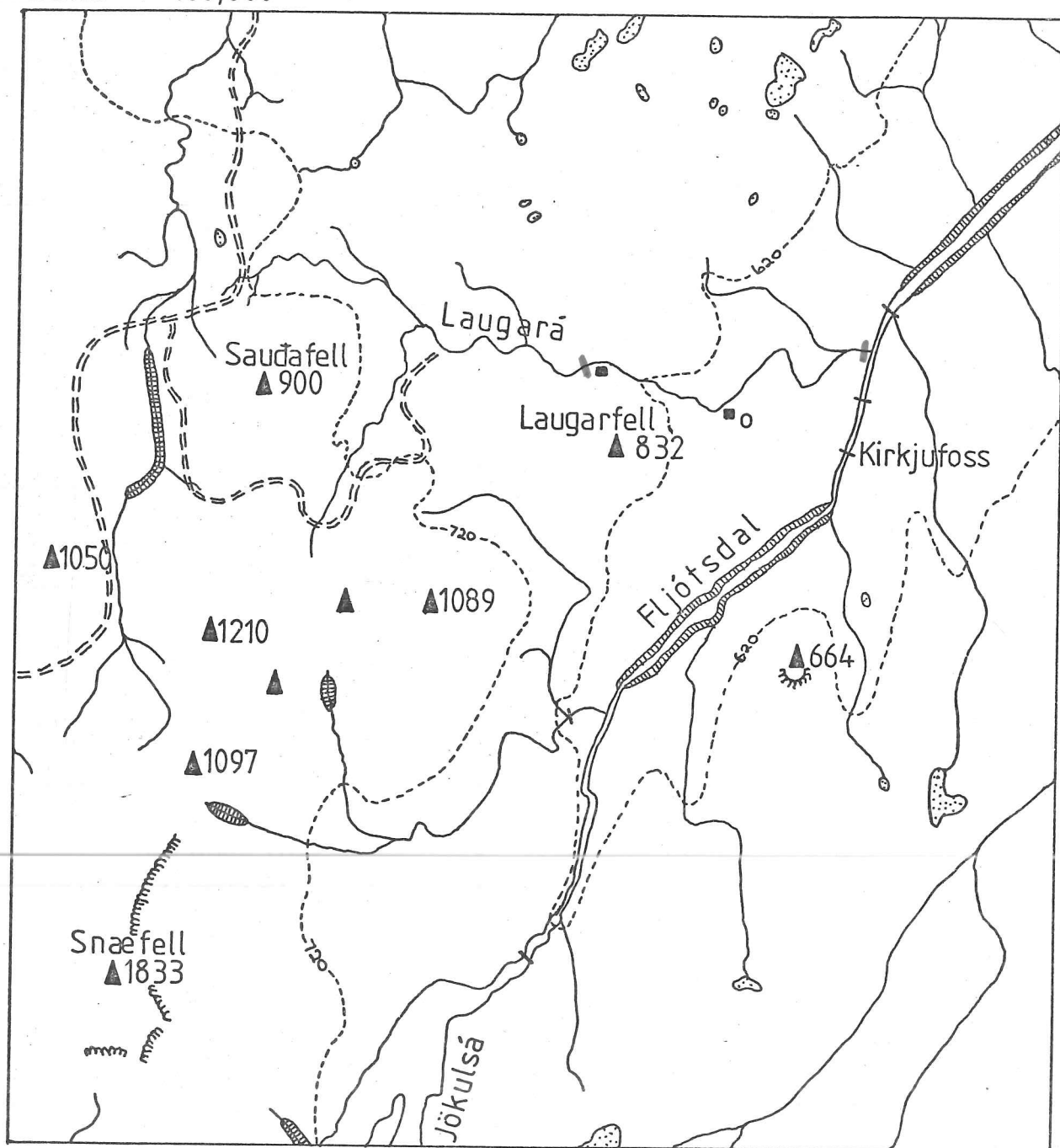
By studying a long series of lava flows, a reversal scale, direction of magnetization as a function of age, can be established, by measuring the direction of magnetization in each lava flow, and dating it using radioactive decay methods.

METHOD:

Initially, it was hoped to study a total of 64 lavas in 3 separate valleys, but due to a heavy fall of snow it was only possible to study 14 in the "Langer" valleys (labelled "V" valley). In Iceland, the magnetism of the lavas is strong enough to be detected by an ordinary magnetic compass. The direction of magnetization was found using two compasses placed at either end of a piece of wood, 1.5m long (see diag 1). One compass was placed over the top of the lava flow and the other 1.5m from the rock; the two readings being taken and compared.

A sample was taken from each lava to be dated using the K-Ar method. Unfortunately, it was only possible to date 6 of the sample, but these were contaminated with magmatic Argon, so the ages are not reliable. A table of the lavas,

Scale 1: 100,000



Map showing relative position of Laugara Valley.



Rivers

Waterfalls

Cliffs

Lakes

Mountains



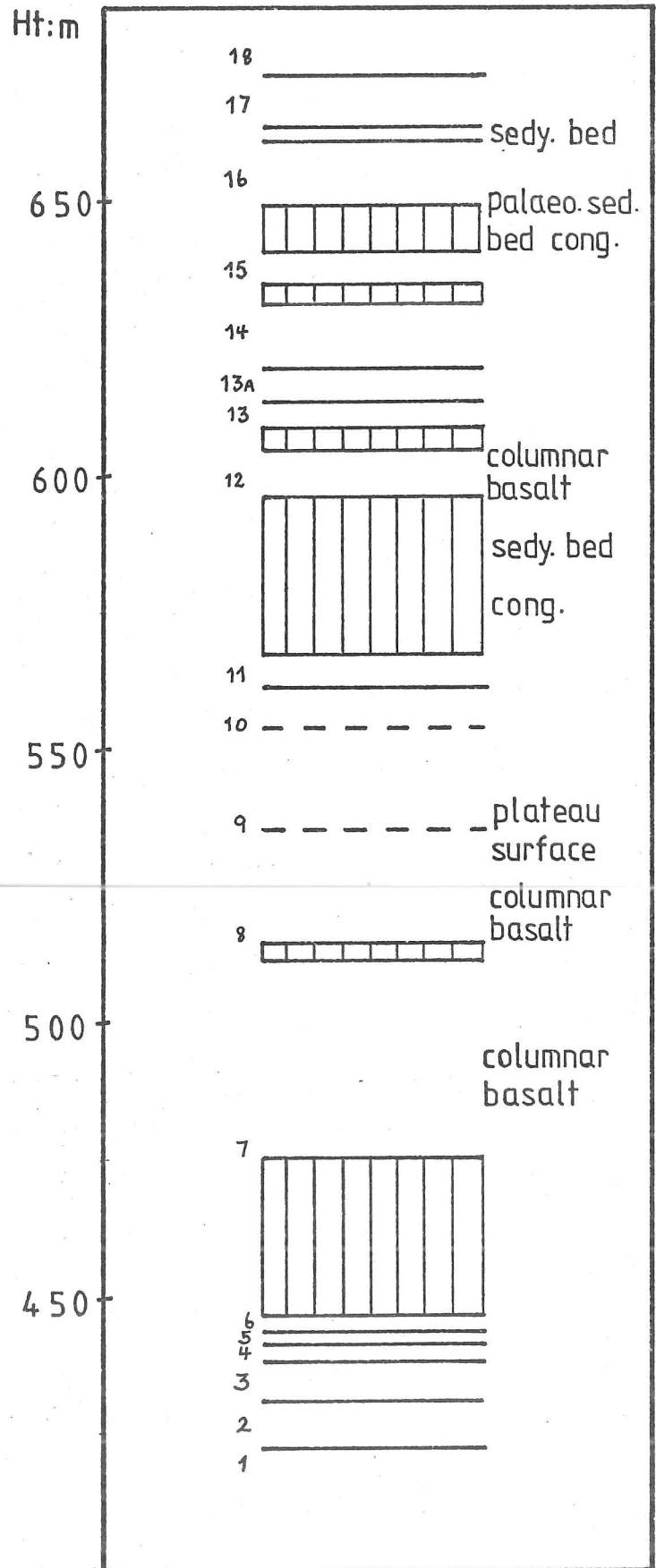
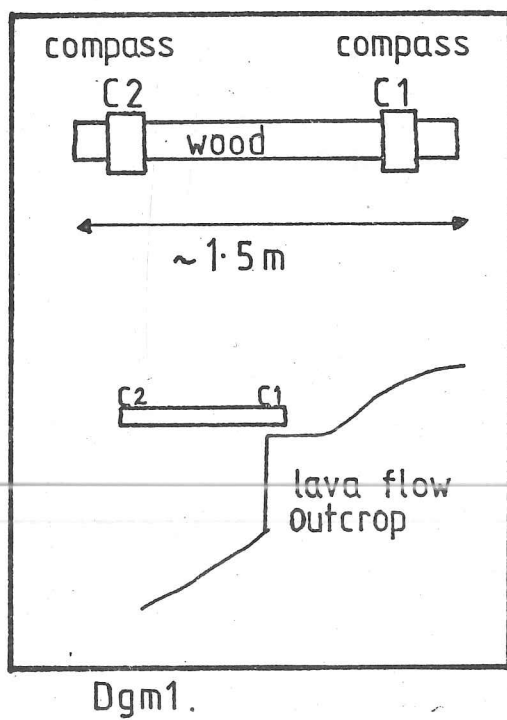
Contours (m)

Tracks

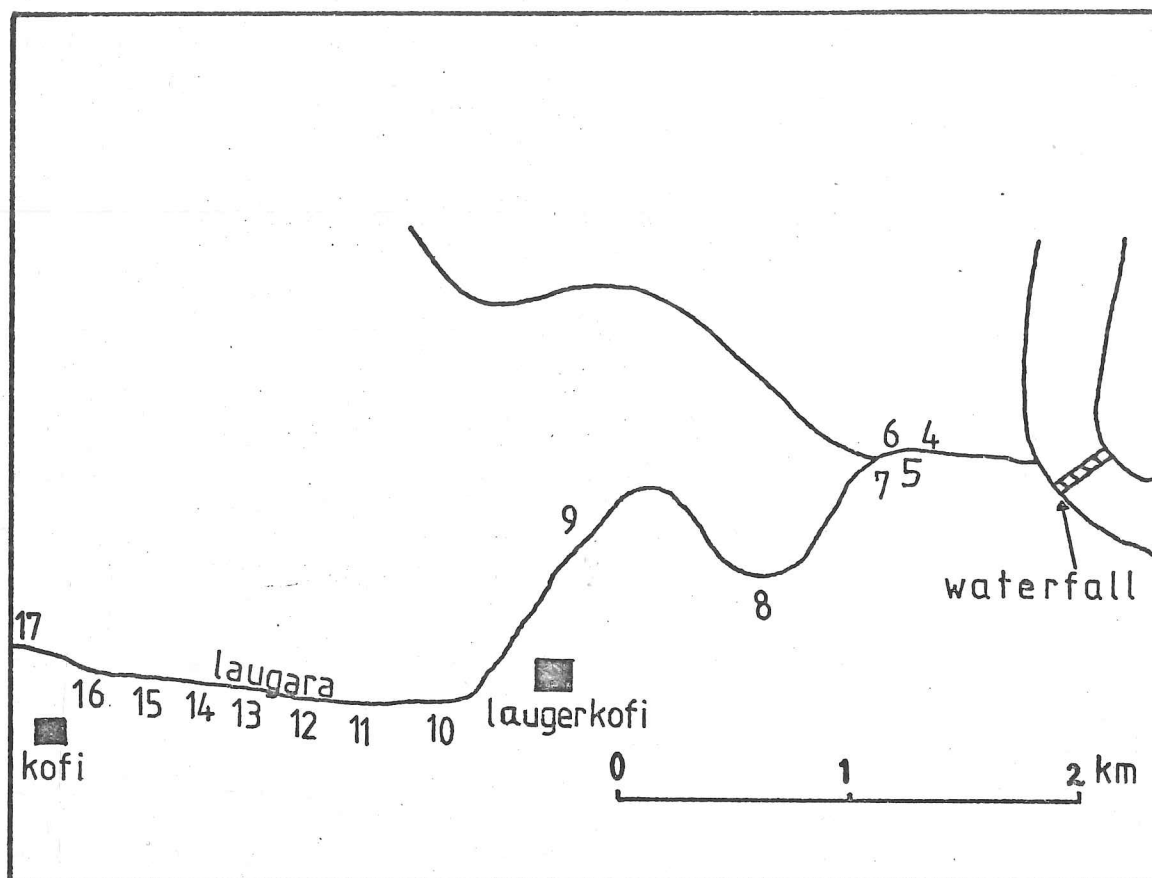
Huts

Hot Spring

Top & Bottom of Study Section



Dgm2: Geological profile of Lauger Valley.



Dgm3: Position of lavas in Lauger valley.

<u>LAVA FLOW</u>	<u>DIRECTION</u>	<u>AGE (m.y.)</u>
17	N	2.2 ± 0.1
16	R	4.7 ± 0.2
15	R	
14	R	
13A	R	5.5 ± 0.7
13	?	4.0 ± 0.8
12	R	
11	N	6.5 ± 0.5
10	R	
9	R	
8	?	
7	N	
5	N	6.5 ± 0.4
4	N	
3	N	1.6 ± 0.3

their direction of magnetization and age (where applicable) is given with diagram three.

In 1967, a total of about 900 separate lava flows in **Iceland** were studied of which those in the Laugar valley were the youngest (Dagley, P. et al 1967). It was found that the top lava in the valley (V19) was normally magnetized but a reversally magnetized breccia was found at the base of Snæfjell which is apparently younger. Although the record of the polarity zones in this area of peneplanation may not be complete, the time gap between the plateau where V19 was found and the breccia is not thought to be very long. This suggests that V19 represents either the Jaramillo or Oldurai normal events. It was also found in 1967 that the lavas in "V" valley were less than 3×10^6 years old, suggesting that those dates found for lavas 3 and 17 could be accurate.

My thanks go to Dave Payne and Louise Gilbert who helped me collect the results, to Dr. J. Mitchell and Mr. R. Ridley of Newcastle University Physics Department who dated the rocks, and to G. P. L. Walker who supplied me with all the geological details of the area.

REFERENCE:

Dagley, P., Wilson, R. L., Ade-Hall, J. M., Walker, G. P. L., Haggerty, S. E., Sigurgeisson, T., Watkins, N. D., Smith, P. J., Edwards, J., and Grasty, R. L., (1967). "Geomagnetic polarity zones for Icelandic lavas" *Nature* v 216 (25)

David Try

ITINERARY.

- July 14 Drove from Newcastle to Thurso.
 16 Sailed from Scrabster to Torshavn.
 17 - 20 Camped in the Faroes.
 20 - 21 Sailed from Faroes to Seydisfjordur.
 22 - 23 Drove from Egilsstadir to Eyjabakkajokull.
 24 - 30 Carried food, equipment etc. to base camp.
- August 25 Climbed Snaefell (1833 m.).
 29 - 5 Dave, Dave and Louise camping in Laugara
 valley for Dave Try to do Geophysics
 project.
- September 3 Heavy snows.
 6 - 11 Carry remaining food, equipment etc. to
 Snaefell Hut.
 11 Icelanders arrived with two vans.
 12 Drove to Seydisfjordur and camped.
 15 Sailed from Seydisfjordur to Scrabster.
 19 To Newcastle by train.

TRANSPORT.

Ensuring that your transport gets you to and from your destination without last minute snags is essential both to overall team confidence as well as to the purely practical point of actually getting you where you want to go.

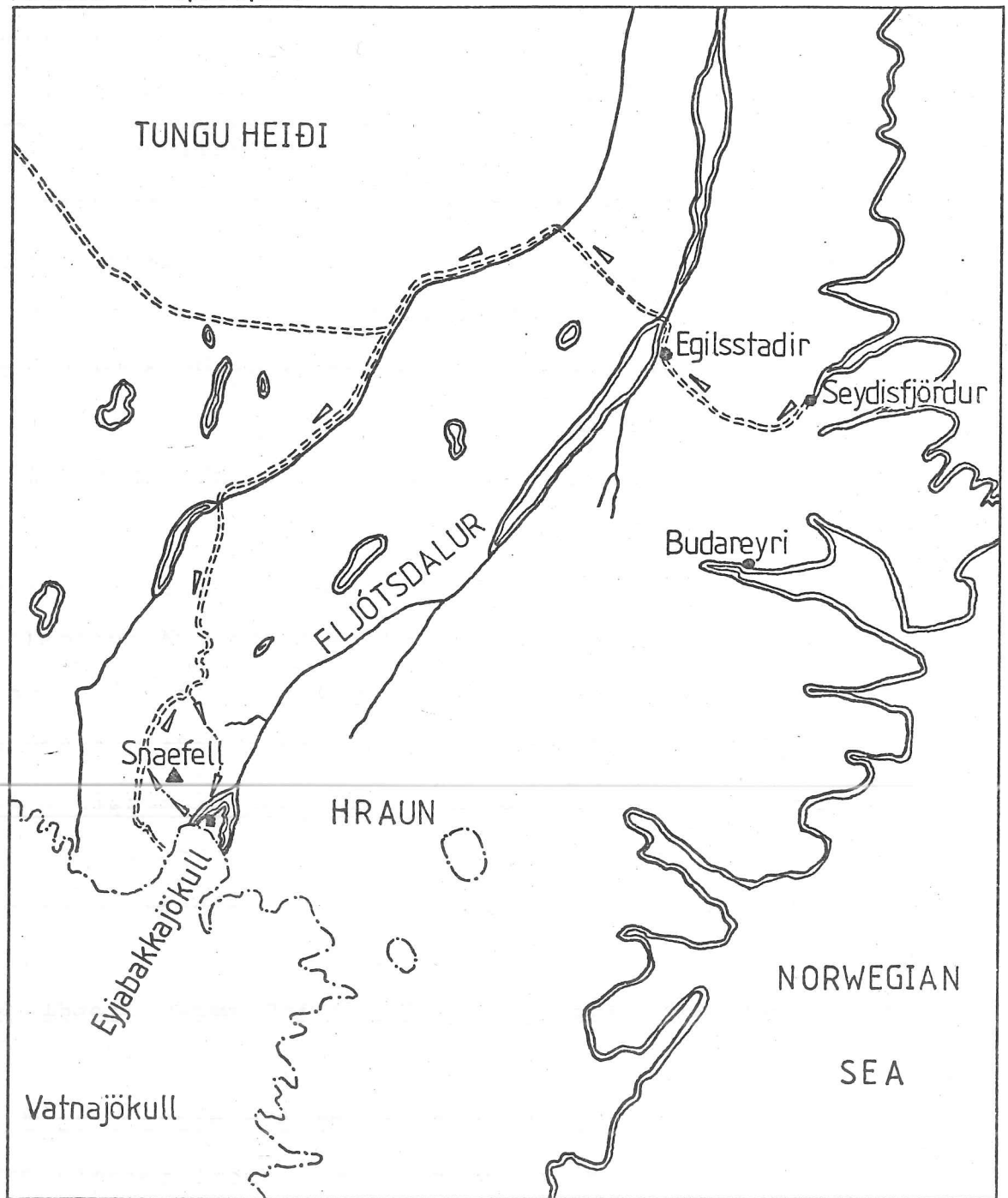
Our transport arrangements were altered on several occasions and the final combination was not settled until approximately a fortnight before our departure.

Transport to and from Iceland is reasonably straight forward. Two alternatives present themselves; either a plane flight from Glasgow to Keflavik (near Reykjavik) changing to Egilsstadir, or a boat from Scrabster near Thurso in Scotland to Seydisfjordur on the Icelandic East coast. Personal comfort always takes the back seat in these decisions, as monetary matters dominate. We were assured that our luggage would probably be transported free of charge on the boat; but that if we flew we would have to send our luggage by boat, at extra cost.

Boat passages were duly booked, and as it turned out, we had little difficulty in persuading all concerned that our $1\frac{1}{2}$ tons of food and equipment was 'hand luggage', and even got it fork lifted from terminal to store to boat and back at every stage on fork lift pallets.

Transport within the two countries was the problem. In Britain we were fortunate enough to be offered the services of the University Geography Department's transit van, to take some of the equipment to Scotland, driven by Mr. M. Robertson, to whom our sincere thanks go. A second vehicle

Scale 1:1,000,000



Map of South-East Iceland, to show the route taken from
Seydisfjörður to Eyjabakkajökull.

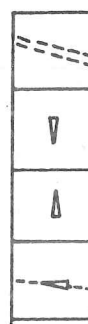


Coastline

Lakes

Rivers

Ice margin



Roads, Tracks

Outward route

Return route

Route over open moor

was kindly provided by the parents of Dave Try, who travelled with us to Thurso.

Arrangements for travelling to the study area in Iceland were more complicated. We needed vehicles to carry us and our equipment 100 kms. to the glacier, drop us off, and return 7 weeks later to collect us in time for the last boat back to Britain. The terrain is very rugged and so quotes ranged from £750 to £1500 for this stage alone. One month before the departure date, Bjarni Hauksson, an Icelandic student at the University, told us that he could find someone to do the job for £500, and so we leapt at this chance, hastily altering previous arrangements.

Leaving Newcastle on Saturday July 14th. the party drove to Scrabster in Caithness, where the boat, the MF "Smyril" departed for the Faroe Islands on the 16th. After having spent 4 nights in the Faroes while the Smyril ran its shuttle service between the Faroes and Norway, we sailed for Iceland; arriving at Seydisfjordur on Saturday 21st. July. Here we were met by Bjarni and three Icelanders together with two four wheel drive Russian Yak vans. After camping the first night in Egilsstadir, we drove towards Vatnajökull.

This section was the most difficult. The final 25 kms. to the glacier front were very rugged and boggy, comprising melted permafrost layers and outwash channels, and the best part of 2 days were spent covering this distance, with numerous halts to push and winch the vans out of the bog. After proving how skilled at handling these superb vans they were, the Icelanders left us with only 9km. to walk to the glacier, promising to pick us up at the other side of

Snæfell on the 12th. September.

Towards the end of our stay in the Eyjabakkajökull area, the weather deteriorated rapidly, and we were faced with a 13km. carry of the remaining food and equipment through the snow covered mountains to Snæfell rescue hut, where we were being met. Much to our relief, the vans appeared in the evening of September 11th., and we drove back to Seydisfjörður where we camped until the departure of the Smyril on the 15th. When we were safely back at the coast, the driver of one of the vans told us that if we had been a day later crossing the mountains we would have been unable to drive out at all, the conditions having deteriorated so badly.

As we were the first people to venture down the valley to the ice cap in the summer, we were at the ice front for the maximum length of time possible by vehicular access.

Once back in Britain, after a force 9 sea crossing from Iceland to the Faroes, and a 12 hours rest in Torshavn, Faroes, we allowed ourselves the luxury of British Rail to transport us home, arriving back in Newcastle (after many changes and cups of coffee), in the early hours of Wednesday 19th of September.

CUSTOMS.

To our surprise and relief, little trouble was encountered at any of the 8 customs checks. The Icelandic customs officials seemed to be concerned not with what we were importing, but that we were going to export it again, and not sell it internally. Faroese customs didn't even want to see our passport photographs, and the British officials at Scotland, obviously used to dealing with similar parties, merely wanted a list of everything we were taking with us.

Two points which emerge are that it is advisable to carry several complete lists of equipment and food to wave at every officer, and secondly, that if you sit around the customs area for long enough, offering to let other people get through before your awkward luggage, you are usually let through without question.

It must be pointed out that passing through Icelandic customs on the inward journey was eased considerably by the presence of our Icelandic friend who knew what was happening and explained us away. We are indebted to Bjarni Hauksson for this help.

THE FAROE ISLES.

The Smyril docked in Torshavn, the capital of the Faroes, at 6 o'clock on the morning of Tuesday July 17th., and our equipment was stored in a dockside warehouse owned by the Smyril's agents. The Y.H.A. campsite at first appeared to be too expensive, but no other suitable site was found. The cost however, included gas cooking, a dining/common room and good washing facilities.

The time spent in the Faroes was used by the team to get to know each other and the equipment better. Wednesday 18th. was spent exploring Torshavn, and on Thursday most of the party walked to the top of a nearby hill to get a clear view of the islands.

Language was not a problem, and the local Tourist Information Office was very helpful. Banks are open for all shopping hours, and stamps can be bought in most shops. Prices were generally twice those of Britain.

The Smyril sailed at midnight on 20th. July.

On the return journey 9 hours were spent in the Faroes, but this time our equipment was left aboard the Smyril.

WEATHER AND ENVIRONMENT

Prior to the expedition we had some insight as to the probable environment and weather conditions as a result of discussions with personal contacts. However, the weather proved very unpredictable, due to one or all of the following reasons:-

- a) The ice margin 200m south
- b) The range of mountains, including Snaefell, to the west
- c) The physical barrier of the moraines

Dramatic wind reversals "on" and "off" the glacier were experienced on many evenings, especially when the preceeding day had been clear and sunny - it would seem a classic example of a local wind, formed as a result of differential heating of the ice mass and the rock surface.

When winds were westerly, we frequently experienced a rain shadow effect as a result of the mountain barrier to the west. We were also slightly less susceptible to frost and snow due to the warming effect of the air by its descent down the eastern side of the mountains.

The moraine area itself provided good examples of local microclimatic influences with frost occuring in hollows and the parallel moraines providing a perfect trap for low level cloud and fog. Northern facing hollows contained permanent snow throughout the summer.

Although "local" features obviously provided some variation to the weather experienced; the overall pattern was dictated by frontal depressions which develop in the Snaefell area during the summer months. There were a great many overcast days, although during the early part of the

expedition we did experience beautiful, cloud-free days with high temperatures. The change in weather over six weeks was very noticeable indeed, with initial temperatures over 20°C giving way to heavy snowfalls in September, combined with sub-zero temperatures: nightly snowfalls of up to 1 foot were experienced.

It was not initially intended to take exhaustive meteorological readings, but a record was kept of the following basic data for most of August:-

Readings

2:8:79 to 31:8:79 at 09.00 and 21.00

Max. Temp. 24°C. (14:8:79)

Min. Temp. 0°C. (27:8:79)

Wind Direction: (Percentage experienced)

N	NE	E	SE	S	SW	W	NW
-	14	10	10	-	18	22	26

Wind Direction on days with precipitation:

N	NE	E	SE	S	SW	W	NW
-	10	2	-	-	-	76	12

Cloud Cover (Oktars)

0	8%	
1-2	6%	
3-4	10%	(Predominant types St. and NSt)
5-6	6%	
7-8	70%	

Total Rainfall - 45mm; fell over 13 days

These results do not include the low temperatures and snow of the last fortnight of the expedition.

FAUNA.

The abundance of wildlife in Iceland, especially of birds, came as a great surprise to all members of the team. The birds seen near Eyjabakkajökull are given in a table on the following page, with brief comments on their occurrence, numbers and forms.

The sole native mammal is the Arctic Fox, of which only tracks were seen. Sheep roam freely over this area, being the only possible landuse. They are gathered together in September and taken to lower, more sheltered areas nearer the farms for the winter months. This job is done using horses and dogs; a number of huts and stables being built in this area for the round-up.

Reindeer occur here in large numbers, Eyjabakkajökull being just east of a national game park. Herds varying in size from 8 to over 200 were seen grazing on the flood plain. They are culled once a year by a few government liscensed deer hunters, one of them being our driver. Reindeer horns were found all over the area, the best examples being up to 2 m. in length and extremely heavy.

Very few insects were encountered during our stay. Those found included spiders and flies, but there was no problem with mosquitoes at all.

BIRDS SEEN NEAR EYJABAKKAJOKULL.

Bird	Where Seen	Comments
Whooper Swan	Flood plain	In pairs or small groups, often 1 signet very noisy.
Grey Lag Goose	On/near large lake to east of camp	Estimate 1,000 in flock noise like sheep.
Long-tailed Duck	Small ponds in moraine	6; 1 adult pair, 4 young.
Golden Plover	On grassier moorland areas	Northern form with summer plumage.
Ringed Plover	Pebble areas of the flood plain	Very well camouflaged lots of young.
Snipe	In moraine areas	Very friendly.
Arctic Skua	Only in flight	Light and dark phases.
White Wagtail	Along riverside	6 seen occasionally.
Wheatear		Heard, not seen usually.
Snow Bunting	On flood plain	3, very white plumage.
Raven		Solitary or small groups, noisy.

A number of small excursions were made from the base camp by all or just some of the team; the main ones are described below:

Eyjabakkajökull ice front.

On 17th. August all members of the team walked across the ice lobe from west to east, to place surveying flags on the ice to mark its present position. The team remained roped up at all times for safety, but the surface was in fact very good for walking on, with a layer of crisp melting ice on top. There was very little snow on the ice, making it easy to see crevasses from some distance. The surface was very bright and goggles were essential. The length of this journey was increased because of the height of the river, necessitating fording on both occasions. This day also provided the first sights of the Aurora Borealis.

Ascent of Snæfell. (1833 m.).

Before leaving Newcastle it had been planned that a team should attempt to climb Snæfell in the last week of our stay, but it became increasingly apparent that the weather would not be good enough for this at the end of the expedition. It was agreed that the first opportunity that arose should be taken, and so clothing, emergency food and equipment was prepared and kept available at all times.

Saturday 25th. August dawned reasonably clear, and so the party left camp at 8 o'clock, taking till 9.15 to ford the river. The route taken was from the high valley to the south of Snæfell, mounting the long southern ridge, hence to the summit. There was deep snow covered in sharp rime ice near the top, and the clouds descended giving a very poor

view from the peak. The summit was reached by all members of the team 9 hours after leaving camp. The return journey started with a beautiful orange sunset, after which mist and darkness descended. The course of rivers were then followed down to the flood plain, at which point the mist lifted and the visibility was increased by clear skies, the moon and the Aurora Borealis. Camp was reached at 1.30 on Sunday morning after another cold river fording.

Laugara Valley.

On Wednesday 29th. August Dave Try, Dave Payne and Louise Gilbert walked down the Fljotsdalur valley to just east of Laugarfell, the route being characterised by numerous superb waterfalls. It had been planned that the group should camp here for nine days to collect data for the Geophysics project. However, after three days work the snow began to fall heavily and it was agreed to abandon the remainder of the work. The night of 3rd. September was spent in Laugarkofi with all the equipment ready packed for the next morning. The 4th. was spent walking from here to Halskofi along the east side of Snæfell, which took 9 hours through deep snow drifts with low cloud levels. Base camp was reached on 5th., when we found that the rest of the party had completed the mammoth task of moving the camp and all our equipment across the river to aid our evacuation.

SURVIVAL HUTS AND CAMPING FACILITIES IN THE FAROES AND

ICELAND.

FAROES

- Y.H.A. Campsite
- Space for 15 small tents
 - Excellent cooking facilities
 - 2 showers
 - 2 inside toilets
 - 2 outside toilets
 - Common/dining room
 - Expensive; £1 per person per day

ICELAND

- Egilsstadir Campsite
- Free
 - Lots of room
 - 2 toilets (got blocked)
 - Washing facilities (cold water only)
 - Shop/petrol station close by
- Halskofi
(Shepherd's Hut)
- Sleeps 4 comfortably, 6 at a push
 - No cooking equipment
 - Stream water 45 m. away
 - Very warm inside
 - Dimensions 3x4x3 m.
 - Triangular construction
- Laugarkofi
(Shepherd's Hut)
- Sleeps 6 comfortably, would fit 12
 - Primus stove with coal
 - 1 big cooking pot
 - Lamp
 - Matresses

A lot of miscellaneous equipment
 (eg. nails, hammer, saw)
 Water 18 m. Hot spring water 45 m.
 Not as warm as Halskofi
 Dimensions 4x5x4 m.

Kofi at top of Laugara Valley

- 2 beds, room for 3 people
- Genuine rescue/survival hut
- Cooker and gas
- Cooking utensils
- Map (1 : 100,000)
- Candles
- Dimensions 2x3 m.
- Quite warm

Snæfell Hut

- Tourist/mountain/survival hut
- About 14 bunks
- Could sleep at least 40
- Supply of food/coal/paraffin/wood
- Excellent Raeburn
- Very warm
- Kitchen very well equipped
- Stream water 18 m.
- 2 toilets outside
- Lamps
- Rugs
- Price; £1.40/person/night
- Local topographic and vegetation maps

The Shepherd's Huts are in use for about 1 week in April/May
 and 1 week in late September.

CLOTHING.

A full clothing list is not included in this report for obvious reasons, but it was felt that some general comments might prove useful. The following articles were used by various members of the expedition:

Monte Rosa boots

Karrimor Totem Senior Rucksacs

Grampian sleeping bags / Blacks Icelandic Standard and Special/
Snowline

G & H Cagjac and overtrousers

Henri Lloyd overmitts

Duvets (point Five and Ultimate) - not essential but useful
luxury

Army combat trousers

Gaiters (various makes) - zips got badly clogged with dust,
use steel straps instead of laces under soles.

Thermal Underwear (various makes) - used for sleeping in.

Socks (Norwegian and Icelandic with at least 20% Nylon)

Bootlaces (14 pairs taken) - very useful for things other
than boots.

Gloves (both a thick and a thin pair advisable)

Sunglasses/goggles - absolutely essential

On the whole we took too many clothes - 2 or 3 of everything
was enough, except socks which frequently got wet.

INSURANCE.

Personal insurance for loss of life or emergency hospital treatment was complicated by the isolation of the area we were staying in, and so we had to insure ourselves for a potential helicopter rescue from the area.

After approaching several apprehensive insurers, the cheapest method of obtaining personal insurance was through BUPA, the private medical insurance company, who covered ourselves and our personal luggage through their worldwide travel scheme. To become eligible for this cover we also had to register for their undergraduate scheme, bringing the cost of personal insurance to £279.

The scientific equipment was insured for loss or damage during the expedition through the University insurers, at a cost of £65, and we took out a claim for £210 on this cover for damage to the surveying equipment.

FOOD.

The high cost of food in Iceland, the lack of a big community in Eastern Iceland, and our requirement of fairly specialised food meant that all the food required for the expedition was purchased in the U.K. and transported with the rest of the equipment to Iceland.

The aim of this short report is to give future expeditions an idea of the problems of planning the food for such a project.

The isolation of Eyjabakkajökull and because the food had to be man-handled, dehydrated food was chosen whenever possible. Such food tends to be very similar and flavourless and within a short time the diet becomes monotonous. Because of this we tried to bring as much variety as possible in terms of different flavoured stews, vegetables etc. Some of the most valuable items were found to be OXO cubes and sauce mixes. These are both small, light and help to add a bit of life; OXO cubes also doubling as a good hot drink.

When considering what form of meat to take, we found that dehydrated ready meals contained both meat and vegetables, and did not contain as much meat as we had anticipated. A future expedition would be better advised to buy packets containing only meat and to add vegetables and potato/rice separately. We found that although Smash is very convenient to make and comparatively light weight, when served with the meat it tended to mix into the stew, whereas rice or pasta did not. The general consensus of opinion was therefore that Smash should be replaced by spaghetti or rice. The quantities

of these bulky portions were found to have been underestimated by about a third.

Dried vegetables were found to be very satisfactory, but again the group unanimously voted out the cabbage.

The stews were bulked by the addition of porridge oats and thickened with soups.

With the puddings jellies and Angel Whirls were chosen for their light weight and the lack of cooking needed. However, these puddings turned out to be unpopular, and the jellies proved more popular when eaten raw. Despite the disadvantage of weight the tinned fruit was extremely popular and with custard made a very pleasant, refreshing pudding. It was felt that if an expedition had sufficient cooking facilities that steamed puddings might be more practical than the cold sweets.

As each project required people to be away from the camp at different times it was found that lunch meals, where soup was supposed to be a part of the menu, consisted only of ryvita, with the soup being used as flavouring for the main meals. Despite the initial amusement of the team almost everyone managed to reach their 18 ryvita a day, with very few being left at the end of the expedition. The main complaint was that although there was sufficient condiments to put on the biscuits they were sweet, and people therefore turned to and finished a 7lb tin of marmite with ease. Cream Cheeses and luncheon meats soon became boring, and a greater variety would have been preferred. Tomato sauce proved to be very popular on the lunch ryvitas, and a 1 gallon jar ran out about two thirds of the way through.

Porridge was available for breakfast, but in general people preferred the quicker cereals with powdered milk, which made up very well in cold (freezing) water.

The quantities of milk worked out exactly right and allowed for a hot milk drink at night which was popular. Of the brands of milk taken with us 5-Pints was found to be far better than the Milac both in terms of flavour and the way it mixed with water.

The sugar used in drinks was in a cubed form as this was felt easier to ration, however more than enough sugar was taken and quite a lot remained at the end of the expedition. Not enough coffee was taken as this is expensive and the tea was donated, but more of a choice would be better.

Packets of nuts, raisins, mars bars, sweet-biscuits etc. were very good to add variety to the food and convenient to carry out for the day. We would suggest than any expedition should take as much of these items as possible.

Finally, we found that all the food kept well, with no problems of food deterioration. Even the margarine kept well when stored only under a fly sheet. The main problem was keeping all the food dry, but this was achieved by careful lining of the food trunks with plastic.

Before leaving on any expedition it is our strong advice that each member of the party should know the amounts (in terms of tablespoons etc.) required to make up each portion of soup, stew etc. This would save a lot of argument and panic once out in the field.

The following list gives the average daily portions of food per person:

Porridge 1 oz. (or Alpen, Jordan's cereal equivalent)
 Dried milk 5/7 pint
 Tea and Coffee (average 6 cups)
 Ryvita 18
 Sugar 3 oz.
 Margarine $2\frac{1}{4}$ oz.
 Honey, jam, peanut butter, marmalade, golden syrup and marmite
 Mixed nuts and raisins $1\frac{1}{2}$ packs (small)
 (Cake 1 slice per week)
 Soup 5 oz.
 Cheese spread $1\frac{1}{2}$ oz. or Luncheon meat 3 oz.
 Mars bar or KitKat 1
 Cooked meat (Batchelors) 4 oz.
 Cooked vegetables 4 oz.
 Smash 1 oz., Spaghetti $1\frac{1}{2}$ oz. or Rice 1 oz. (need more)
 Instant Whip 5 oz. or jelly equivalent.
 (Tinned fruit 1 x 2 lb. tin per week for 7)
 Toffee 1

Chewing gum 1 stick

(1 day a week tinned salmon instead of meat in evening)

We also took OXO cubes sauce mixes, spices, and some spirits.

Matches - 1 gross required, in waterproof containers.

Scourers - 30

J Cloth - 8 boxes

Washing-up liquid 6 bottles

MEDICAL REPORT.

Before leaving Britain serious consideration was given towards the health and security of the team throughout the expedition. A short but intensive 'course' of First Aid suitable for expeditions was taken, under the guidance of the University Health Service and St. John's Ambulance, to whom we are most grateful. Generous donations of medical equipment were received from a number of companies and a large quantity was taken with us into the field.

Whilst in Iceland only two serious problems occurred. The first were migraines, which caused considerable pain to two members who were already susceptible before leaving Britain. The second was cramp, again felt by two members, mainly due to crossing the very cold rivers for long periods of time. Both problems were accompanied with acute pain for at least several hours. Migraine sufferers took large quantities of Solpadeine (which was widely used throughout the expedition and found to be very helpful) along with Migraleve. Migraines could have lead to an extremely serious situation on one occasion, on our walk back from Snaefell mountain; Louise managed to drag herself slowly back through the dark to the camp and we were all suitably relieved that it had not occurred earlier in the day. One main cause of these migraines was bright snow and ice, even when goggles were worn.

The following is a list of medical equipment taken, only a small proportion was used but every eventuality must be catered for:-

Fortral - injections were included in our Ist. Aid course
 Swabs
 Needles
 Fortagesic - 100 tablets for severe pain
 Solpadeine - 120 tablets
 Hedex - 130 tablets
 Icipen - 100 tablets, a Penicillin derivative (antibiotic)
 Septrin - 60 tablets (antibiotic)
 Piriton - 100 tablets (allergies)
 Vitamin tablets - 500
 Diocalm - 150 tablets
 Anthisan cream - 25 g.
 Limb-ease - 32 tablets (cramp)
 Raljex - (should have taken much more)
 Agiolax - 200 g.
 Synalar cream - 1 tube
 Antiseptic cream - 14 tubes
 Wash - 40 sachets
 Sterilised water - 25 sachets
 Albucid-Sulphacetamide - (eye ointment)
 Insect repellant - 1 tube, 1 bottle
 Analgesic spray
 Burn spray
 Splints - 2 wooden
 Neatseal - (skin closures)
 Cotton wool - 150 g.
 Gauze - 12 pads
 Lint - absorbent, 50 g.
 Melolin - 7 (10cm. x 10cm.)
 11 (5cm. x 5cm.) } very effective
 Crepe bandages - 12
 Bandages - large, 11
 (7.5cm. x 3m.) 24
 Triangular bandages - 16
 Eye pad - 1
 Adhesive tape - 3 reels
 Airstrip plasters - assorted (elastoplast better than airstrip)
 Cough mixture - 4 bottles

EQUIPMENT.

Theodolite
Level
Tripod
Barometer
Pocket Stereoscope
Staff
Ranging Rods 4
Steel band 30 m.
Tape 10 m.
Raingauge
Sieves
Temperature box
Thermometers 3
Auger (left behind in Iceland as very heavy)
Geological hammer 1
Sample bags (lots needed for all purposes)
Binoculars 2 pairs
Casette recorder and batteries, 2
Force 10 tents (3 x 3man, 1 x 2man) 4
Large tent 1 with poles, spare pegs (need a lot of strong ones)
Tent repair kit and spare material
Tilly lamp 1 and 6 mantles
Paraffin lamps 2 (and wicks)
Gas stove and 2 gas cylinders
Spare sleeping bag (Snowline)
Mending kit (communal)
Paraffin 20 gallons (used 15)
Primus stoves 4 with spare parts
Prickers for stove (take at least 30)
Firelighters 3 packets (do not use for lighting primus)
Cooking utensils (plastic better than enamel mugs)
Porta loo 1
Thermos flasks 3
Dubbin
Rubber gloves 2 heavy pairs
Clock 1 crystal (batteries)

Stopwatch
Rotunda tape 2 reels
Spades 2
Screwdriver
Mole grip
Pliers 1 pair (extremely useful)
Bow saw 1 and spare blade
Small saw 1
Hammers 2
Mallets 2
Camera tripod
Spare laces 14
Karrimor bags (survival) 4
Ice screws 3
Slings 2
Whillan's harness
Krabs 10
Ropes (50') 3
Ice axes 7
Crampons 6 pairs
Waist belts 7

All of this equipment was used at least once on the expedition, and luckily we managed to bring most of it back to Britain in one piece.

MISCELLANEOUS.

This page is intended to fill the gaps that previous pages may have left, and we hope it may be helpful for those planning an expedition. We found in our own preparation that previous reports were less than helpful on miscellaneous items:

Film - Numbers taken varied greatly, the average being 9 x 36.

Most used Fuji film with good results - available from Jessops of Leicester

Cameras - Wide variety used, the main problems due to dust.

Should have taken a zoom lens. U.V. filter used.

Waders - We took one pair which fell to bits, but was extremely useful for river crossings. Needed wellingtons.

Tilly Lamp - Very good, but not enough mantles taken; last about 2 weeks each

Flower Press - Should have taken one

Hot Water Bottle - Were very sorry not to have taken some

Metal Trunks - (6'x2'6"x2'6" collapsable) 2 were used, very useful for storage but difficult to carry. Make good seats, can be locked. Cold to sit on.

Games - Monopoly and cards for wet days.

Books - Light books needed, and lots of them

Weather - Variable and unpredictable. Gales caused problems to the main tent. See Meteorological report.

Rocks - Beautiful pieces of obsidian to be found here, and parallel-sliced frost shattered rocks.

EXPEDITION BUDGET.

<u>INCOME:</u>	<u>£</u>	<u>EXPENDITURE:</u>	<u>£</u>
Personal Contributions	1,120	Transport: Boat	918
(7 x £160)		In Iceland	500
Exploration Council		In Britain	170
Grant (Newcastle		Food: Bought in U.K.	386
University)	600	On boat	50
Royal Geographical Soc.	250	Miscellaneous	35
Tyne Tees Television	200	Equipment:	382
Savacentre	200	Insurance: Equipment	65
Gino Watkins Mem. Fund	125	Personal	279
Drapers Charitable Fund	100	Youth Hostel, Faroes	31
Gilchrist Educational		Snæfell Hut, Iceland	40
Trust	100	Report	50
Newcastle University		Miscellaneous	94
S.R.C. Grant	100	(maps, postage etc.)	..
Raffle	50		
Trustees Savings Bank	25		
Winthrop Labs.	20		
Smith, Kline and French			
Labs.	10		
Mr. O. Jacobsen	10		
Scottish and Newcastle			
Breweries	5		
Miscellaneous	85		
	<u>3,000</u>		<u>3,000</u>

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Associate Biscuits - cakes and biscuits
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 Dr. Helgi Bjornsson of Reykjavik University - proposed research
 Blacks of Newcastle - equipment discount
 Colmans - honey, peanut butter and sauce mixes
 Mr. D. Croot of Plymouth Polytechnic
 Mr. G. Derrick of British Schools Exploration Society
 Drapers Charitable Fund - £100
 D.R.G. Flexible Packaging Co. - paper, tape and plastic bags
 Mr. T. Escritt of the Young Explorers Trust
 Farillon Ltd. - glacier cream
 Freemans Hall J.C.R. Committee - paint and £5
 Geography Department, Newcastle University - loan of mini-bus
 Gilchrist Educational Trust - £100
 Gino Watkins Memorial Fund - £125
 Mr. B. Hauksson (Newcastle University)
 Health Centre, Newcastle University - Dr. Place, Sister Jackson, Steve and Derek
 P.J. Hunter Ltd. - muesli
 I.C.I. - medical supplies
 Mr. O. Jacobsen - £10
 Mr. S. Jonsson of Newcastle University
 Jordans of Biggleswade - breakfast cereals
 K.P. - nuts
 Dr. H. Lister of Newcastle University
 Nabisco - shredded wheat
 Nelsons of Aintree - jam
 Mr. D. Phillips - travel information and boat booking
 Pindisports of Bristol - equipment discount
 Prestige Ltd. - pressure cooker
 L.E. Pritchill and Co. Ltd. - dried milk

Ringtons Ltd. - tea
Mr. M. Robertson - for driving us to Scrabster
Rotunda - tape
Royal Geographical Society - £250
Savacentre, Washington - £200
Scottish and Newcastle Breweries - £5
Shaws - biscuits
Smith, Kline and French Laboratories - £10
Mr. J. Stockdale
Students Representative Council - £100
E.T. Sutherland Ltd. - hamburgers
Tate and Lyle - sugar and golden syrup
Tetleys - Arctic Lite Lager
Trustees Savings Bank, Newcastle - £25
Tudor Food Products - nuts and rainins
Tyne Tees Television - £200
Weetabix - Alpen
Winthrop Laboratories - £20 plus medical supplies
Wallace Cameron and Co. Ltd. - medical equipment
Farley Health Products