JOURNAL

Of a journey from Southampton to the Southern Ocean and Graham Land in Antarctica, to South America and across the Pacific to New Zealand.

Part 1 October 1st to December 8th 1958

Southampton to the Cape Verde Islands, Montevideo, the Falkland Islands, South Orkneys, Hope Bay in the Trinity Peninsula and King George Island in the South Shetlands.

For Vera, Judith, Helen and Jane

October 1st

A lovely fresh morning with the hand of autumn pricking out odd trees to make them orange, Richmond Park looked finely empty and spacious, creating the illusion of the country reaching into London. Even the suburbanised Surrey countryside wore an air of rich leafy composure. Then a long delay as the Guildford by-pass was reduced to an impotent half-mile queue of vehicles waiting to cross the railway bridge reduced in width by repair work to one traffic lane. Over the boundary we went into Hampshire and rain and a little beyond Farnham another vexatious delay. On the middle limb of a sharp bend the driver of a Bedford truck loaded with "Corona" soft drinks had stopped to fasten his tarpaulin cover. Oncoming traffic was using the other lane so Patrick braked sharply and came to rest almost ten feet behind the lorry. An Austin pushed up behind us: a Bentley coming behind found no room between the bend and the Austin in which to stop and hit it. Patrick saw the impact in the mirror and released the brake before the Austin hit us and moved to within six feet of the lorry. We escaped with a buckled bumper and exhaust tail pipe, the Austin and the Bentley had more evident signs of damage. The two teddy-boy types in charge of the Bedford truck greatly annoyed me by regarding the whole thing as a huge joke. There is no doubt that their thoughtlessness in parking their lorry where they did and not on the straight which began 30 yards further on caused the whole mishap.

On through more rain and drove into Southampton, 40 minutes or so late. A glimpse of the fine main street of shops rebuilt in contemporary style and there is no doubt that this phrase now has veracity in Britain. Shops, houses, pubs, churches as well as schools, hospitals and other large establishments, are now arising throughout the land which are by many hands and very varied in character and in quality but are undoubtedly examples of a single vision. This style has been long in emerging but has now fair become universal and we can see an end to imitative building. And in the middle of the shops stands the Bargate in an octagon of garden and greenery overlooked by new shops which are not in the highest flight but at least confront the medieval arch in their own right. And in the Lower Town the modern pub the "Queens" confronts the "Dolphin" hotel with its lovely bow-fronted bays from the days of Trafalgar, across the street on level terms.

A great congestion of traffic at the dock and a wrong turning as we joined the confusion of roads and railway lines in the dock area before at last we drove through a transit shed and onto the quay where Shackleton lay. It is impossible to see her properly because of a crane and a line of railway trucks. But, no doubt about it, she is small. The crane just forward of the bridge seems the biggest thing about her and makes everything else even smaller. There are groups of FIDS chaps and reporters on deck. I report to the chief officer - Tom Flack - a tall blonde young man with piercing blue eyes and aquiline nose and find my cabin. This is the governor's cabin - reputedly three-berthed but half of it is taken up at this moment by half a dozen heavily bound wooden packing cases boldly labelled as follows.

FIDS GEOGRAPHICAL PROJECT

GOVERNOR'S CABIN RRS SHACKLETON

FOR USE ON VOYAGE

PROFESSOR D.L.LINTON

We all crowded in - Vera and the three boys - and soon one of the reporters had found us and was busy taking photographs and family details.

I left them in possession while I went with the radio officer and the FIDS chaps to the merchant marine office to sign on as a supernumerary at the agreed wage of a shilling a month. Here I met the Master - Captain Blackburn a large man of about my own age, quiet and full of authority. On being introduced he expressed the hope that I would "Come and live with us in the Ward Room" an invitation I was delighted to accept.

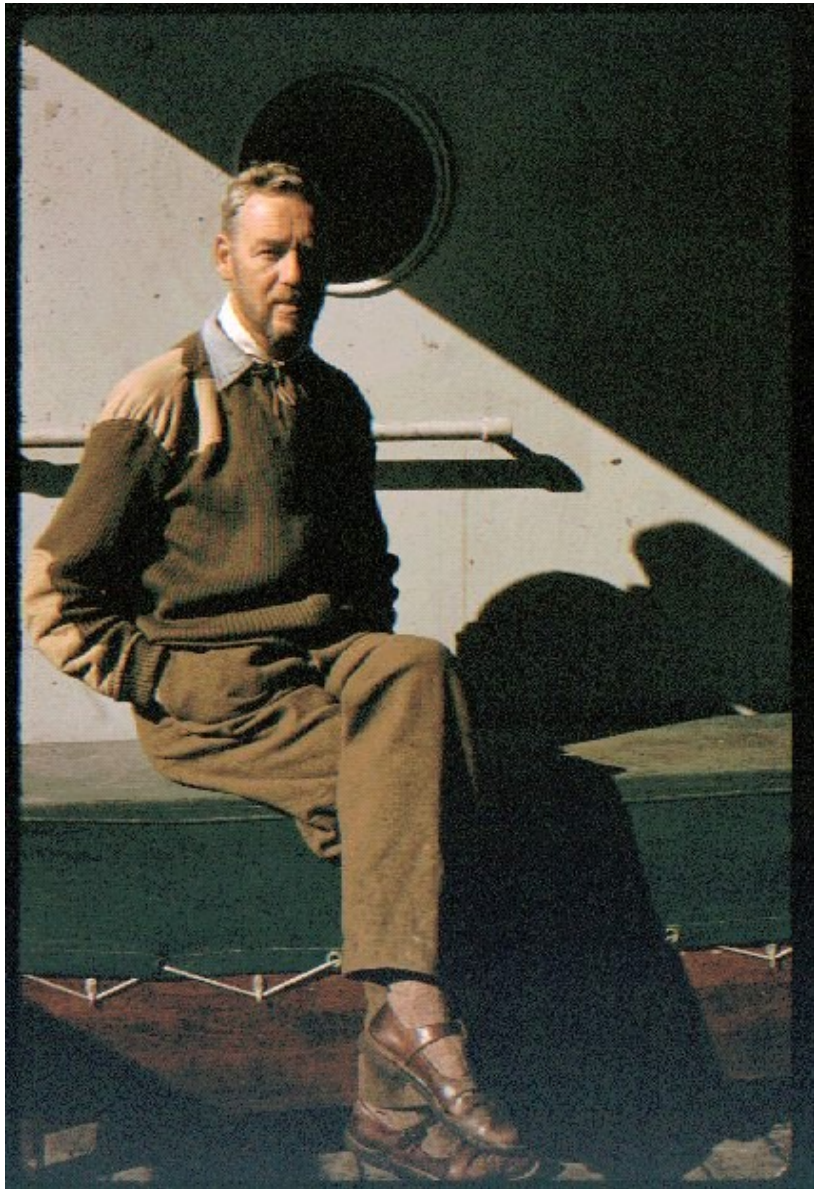
Then we go to lunch with Derek and Petra Searle - making seven at table and by taxi back to the ship - the car being left at a garage for repairs to the exhaust. The ship was now seething with friends and relatives. At the head of the gangway Sir Raymond Priestley had evidently been waiting for me for he expressed concern that an important part of the Expeditions programme was not going to be fulfilled. He is a most heartening man. Mr Sloman introduced Mr Willis who safeguards FIDS interests at the Colonial Office and Captain Johnson, Master of the John Biscoe Then down to the "FIDDERY" where Bunny Fuchs was talking to the chaps and wishing them a successful trip, for a brief word with him. A bearded representative of the Associate Press pathetically exclaimed that he had been chasing me round the ship since ten o'clock this morning and appealed for a photograph. So he took his photograph in the cabin with Judith and Vera sitting beside me.

At last comes the moment of farewell. The little bit of deck space crowded and more crowded. As Patrick put it, mostly there were fathers seeing off their sons in our case the sons were seeing the father off. Derek and Petra Searle had wisely gone to the railway station together and parted there. For all around now sweethearts were being separated from young men who would be two whole years in the south. I said goodbye to Oliver, Vera, Judith, Paul, Matthew and Patrick and they and many others went ashore leaving, it seemed, only a handful of young men to line the rail.

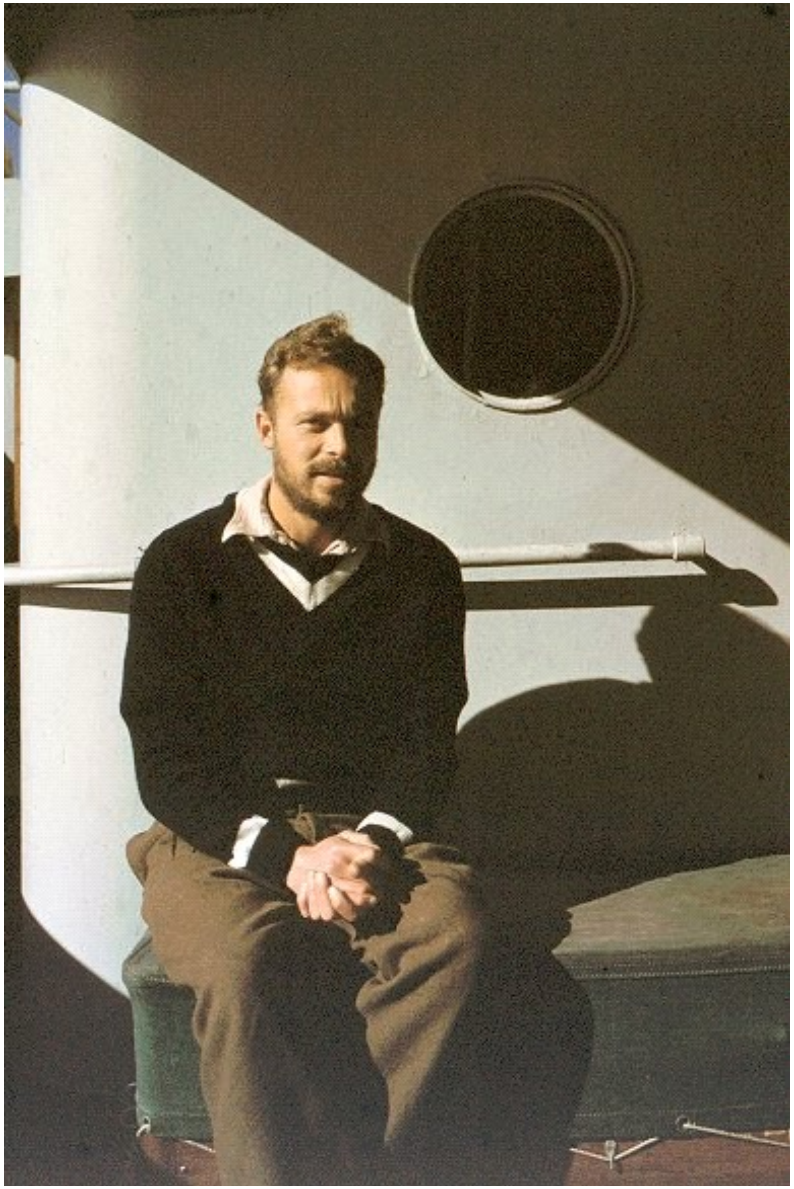
Some last minute comings and goings from quay to ship and the gangway was hoisted and stowed on the quay. Families and friends flowed around it and I could see Vera keeping Oliver from the edge. A long period of suspense and unreality follows. From the quayside came last minute instructions of the most pointed and personal kind - don't forget so and so and don't indulge in this and that - but they were brushed aside by the excitement of the young men. At last at 3.20 we cast off and make a half circle astern, before heading down Southampton Water. Even so the crowd on the quayside remained for a long time fixed and when it broke up the individuals were only just visible as such, a strange moment. I could imagine my dear ones picking their way back through the dockyard to journey home and take up the traces of normal life. For me lay something unlike anything in my life before. To be part of a ship's company and make the ship my home, to endure and to enjoy the sea itself for weeks on end, quite apart from the job I hope to do for FIDS are wholly new experiences for me and I could hardly believe that I was really embarked this easily upon a new stream of experience. No doubt this is why we always see each other off - to dramatise in some way the critical moments in our lives. No doubt this is why Judith and Paul came all the way from Cambridge to see Shackleton leave and how glad it made me that they were there.

The rain showers of the morning had given way to a fresh clear blue sky with broken clouds scudding before a strong westerly wind. Ahead on the starboard bow lay the Isle of Wight, a two dimensional silhouette with Ryde church dominating the near and the swelling ……skyline the further scene. To starboard lay the western Solent a river of molten gold on which the dazzled eye could not look. We could not take that way because - as Captain Blackburn reported to me the seas outside were too heavy for the pilot boat.

Later I could see the force of this.



ANT 80 : Self



ANT 79 : Derek Searle

Cups of tea had been served in the Fiddery: I was offered one but declined, for I was rapidly losing interest in such things. Leppard, the liaison officer between the FIDS personnel and the ship's officers gave them a short talk on do's and don'ts and introduced myself and Derek Searle to them. Optimistically he said I was living in the ward room, we would be spending the evening with them and get to know them. The sea had other intentions. We had now rounded Culver Cliff at the eastern end of the Isle of Wight and the motion of the boat was considerable. The ship seemed filled with crashing, crushing and clattering noises. I returned to my cabin, grateful that I had already unpacked and stowed essentials. Suddenly I was sick and after that was glad to lie on my bunk with a blanket over me. I must have slept. When I awoke it was dark with the two cabin ports outlined against the moonlit sky outside. I undressed, took an avomine tablet and was glad to be into bed: 9.30 pm.

Oct 2nd

When I awoke the motion of the boat had greatly lessened and the weather was sunny and fresh and doubtless breezy. I was lazily contemplating getting up when the ward room boy brought me a cup of tea, which I drank until the layers in contact with the thick layer of sugar at the bottom of the cup became too sweet. Breakfast, he said, would be at half past eight. Then I found the Chief Officer at the head of the table, with the Chief Engineer on his left and Mrs Richardson, the Chief Engineer's wife, on his right. Next to her was Tom Woodfield, the first officer, and opposite him Jim Martin, the second officer. I sat beside Mr Martin and later Mr Bosher, the third officer, took the remaining seat. After a minute or so, Mr Flack said to me "I suppose you know that we are going back to Southampton". Not having been on deck I had not realised anything of the kind. After a bit I learned that about 2am a thrust bearing had run hot and given way so then the shaft casing had exploded. For some time we had been drifting off Alderney, and then had begun the return under reduced power. No wonder the Chief Engineer looked worried and that Mrs Richardson was being embarrassingly cheerful. Now, at noon, the Needles are just visible ahead with the strong line of white cliffs to Freshwater Gate, and the swelling outlines of the Central and Southern Downs stretching out to starboard and some 50° of the horizon. The sun makes our wake a dazzling avenue of light and the vessel rolls uncannily in the strong beam wind.

Not until 3.15 did we actually round the Needles and see the impressive geological section that is Alum Bay. The sea was still rough and the whipping spume off the waves produced every now and then a little momentary rainbow in the spray. The pilot cutter came out to meet us in a smother of spray. At

times her fine flaring bow was pointing to heaven and we could see water running off the forward part of the keel: next moment her bow had plunged into the trough and we were looking at an oblique plan view of the deck and wheel house. As he came near the pilot hailed us - “Hallo, Shackleton, I cannot board you here. Steer course 050 and follow me”. He passed astern, went about and slowly came up with us on the port quarter and repeated his message, which we now heard clearly since he was to windward of us. He proceeded towards Hurst Castle, lifting and falling on the heavy stern sea, until more sheltered water was reached and the pilot came aboard.

In the narrows between the I.O.W. and the Hurst Castle spit that juts out a couple of miles from the Hampshire mainland we met a formidable tide race. Great standing waves witnessed to the five and six knot current that was running seaward. Our reduced speed of six to six and a half knots was only just enough for us to make any headway. Slowly and painfully we crept past Hurst Castle as the afternoon wore away into evening. At last we were off Cowes and began the run up Southampton Water. It was dark before we were abreast of the great oil refinery of Fawley with its myriad lights outlining its cracking plant and fractionating towers. On our port side an ocean tug, CLAUSENTUM, not all that smaller than Shackelton, kept company on a cable’s length. From time to time instructions passed by loud speaker across the water from pilot to tug master. At length we were gliding beside moored vessels and dockyard cranes into the basin where we were to berth. Two harbour tugs offered assistance, this was declined and slowly with the assistance of a bowline to CLAUSENTUM Captain Blackburn brought us alongside.

Before the gangway was fixed the engineers on shore were questioning the Chief Engineer on board as to what had happened and requesting the drawings of the thrust bearing. In a moment more they were aboard and disappeared with Mr Richardson into the depths. In their wake came the fitter with the ship to shore telephone, and the customs officers. Out in territorial waters we had opened our bond and now all cigarettes, cigars and liquor and our purchase tax free cameras had to be delivered up and sealed in bond till we were again three miles beyond the Needles, and last of all came the news hawks. All day the ship’s officers had been apprehensive about this moment and now the Chief Officer was as non-committal as man could well be. I had commented at breakfast that Shackleton was second only to SCEPTRE in “publicity per ton” and drawn a wry laugh from the First Officer. Now the recollection of the publicity at sailing made keener the feeling of astonishment on return. We sat in the ward room feeling futile, though much enlivened and entertained by a kindly visit from Captain Johnson of the JOHN BISCOE, who was as anxious as our own ship’s officers to hear the engineer’s report. At a few minutes to midnight they appeared and many technicalities ensued. The work was in hand and would go on till complete, then there would be trial of the engine in the dock basin, and then, probably on Saturday, we would again go to sea.

Oct 3rd.

A happy day ashore enjoying the warm hospitality of Frank Monkhouse in his department and his home, and talking over old times till a late hour with Martha and Harry Rothwell.

Oct 4th

A day for patience. All night the repair work had gone on and we began the morning with hopes of sailing at 2pm. When I returned from a morning shopping expedition to the town those hopes had been deferred. Basin trials began at 1.15. After running for forty minutes or so at half speed the engines stopped. At 2pm they began again and were run up to full speed. The ship strained at her double wires and hawsers and a great confusion of water boiled up from her stern and streamed off across the basin taking every floating object, moored or free, with it. At 4pm the engineers were happy about the bearing but had located trouble in the pump. So work continued. In the meantime Captain Blackburn had announced a firm sailing time - 6am Sunday - and booked a tug accordingly.

Today I have begun to know the officers of the ship as persons - and no doubt they can say the same of me. Captain Blackburn joined me when I was alone in the wardroom and we talked for an hour or more about Australia and the Australians, of the nature of geography, of egalitarianism and bad manners and much more. And Mrs Blackburn very kindly made me a cup of tea in the wardroom pantry! And an hour later the Chief Officer invited me to join him for dinner in town. We went to the Cowherd’s Inn on Southampton Common and I enjoyed both a good meal and very pleasant company; and I learnt a great deal about Port Stanley and F.I.D.S. and its two vessels.

October 5th

Sunday. A dull. Overcast, windy and showery morning. At 10am punctually we cast off and were assisted in turning by the tug DUNNOSE. On the quayside some of the engineers, the agent’s representatives and the relations of a few of those onboard braved the rain to wave us away. A quiet leave taking. Some of

the cars ran down to the most southerly point of the rocks, where the JOHN BISCOE lay at 37 berth, from which we had sailed on Wednesday and their occupants got out to wave a last farewell. The engines were already at full ahead and will, we hope, run so without intermission until we call for water at St Vincent in ten days time.

By noon we were approaching Hurst Castle. The sky was now wholly overcast with low hung cloud, from which rain was always falling somewhere and at times hissed furiously on the sea round us and obscured almost all view of the land. As the showers passed the land to the north would redefine itself in masses of ashen grey between the grey sea and the grey sky. To the south the downs of the Isle of Wight had more colour and the sea on this side had a surprising yellowish-green hue, like the waters of a glacier lake, despite the leaden grey and indigo of the rain clouds that hung just above the Central Downs. Cotman in one or two water colours painted the sea this colour and Turner in oils. The likeness to glacier water suggests suspended matter of very fine grain.

At 12.40 the pilot cutter came out from Freshwater Bay, turned in a fine smother of spray and drew alongside. The pilot stepped delicately on board and waved to us as the cutter drew away. By the time we had eaten lunch the grey shape of the Needles had fallen astern and the motion of the ship was becoming unpleasant, and became more so during the afternoon. The wind was fresh enough to give some sea but under it was an increasing swell and the waves were steepened by the outgoing tidal stream. Captain Blackburn himself complained of the “nasty, awkward motion” and expressed his opinion that it would not greatly improve until we crossed the continental shelf and got into deep water. And so far as the tidal currents are concerned that is no doubt quite true.

At 5.35 the sun sank into an indigo sea on the starboard bow. Above the sky was clear and blue while the horizon was rimmed with cumulus clouds flushed salmon pink above and falling into the violet grey horizon haze below. A deeper grey shape upon our quarter revealed the outline of the Isle of Portland.

Dinner for me was a precarious business - but the mate and the Chief Engineer also sent away their plates and the former announced his intention of going straight to bed. As I did.

October 6th

A fine fresh morning of blue sky and sparkling sea soon giving way to showers from the WNW. The motion of the ship still awkward so that I was content to spend some of the morning lying down. One was grateful for the fiddles at meals and there were one or two casualties of glassware. At lunch time Ushant was on our port beam, two or three miles away, but looking green and near in the sunshine. It bristles with light towers: one at the north east end, the main one, tall and branched, a little west of centre, and three, of which one is said to be disused, on the reefs at the western end. Here are strange lumpy rocks that might be houses or trees at a distance - or for that matter tors - but every now and then a mass of white water is seen to lift over one and subside. Much rock seems to be exposed at the north eastern extremity also.

The seaway off Ushant is one of the major traffic lanes of Europe. At any time during the morning one could count at least half-a-dozen ships inward or outward bound. As the afternoon wore on and we shaped our course across the Bay of Biscay fewer ships were to be seen but there was never a time when we were quite without company. At dusk a large tanker on our port beam was making three knots to our two and as darkness came on her lights were far ahead.

Film evening in the ward room. A pleasant film (“Brothers-in-law” produced by the Boulting brothers) and a pleasant evening but neither the film nor the occasion roused any enthusiasm.

Oct 7th

I woke with the sun streaming through the cabin port onto my face - momentarily that is. The sun was shining from a sky mostly overcast by high cloud and as the ship rolled sometimes I could see the sea and horizon and sometimes the sun 25° above it. At the other end of the cabin the bright round image of the second port was now on the carpet and now running fully three foot up the door and back down again every ten seconds. Each oscillation is accompanied by a series of shuddering creaks from the woodwork of the cupboard at the head of my bunk, and a hollow gurgling from the outlet of the wash basin. It is astonishing to me that I have slept so well each night to such an accompaniment of noise and motion.

At noon little blue sky was left to be seen and low grey cloud was spreading in from the west: rain was evidently not far away. The wind was freshening over a

heavy swell and the slate grey water heaved and sank in an ever changing topography. The Chief Engineer opined that in his many crossings of the Bay of Biscay he had never met it in an uglier mood - and he had obviously hoped for kindlier treatment of his new bearings. Engine revolutions were notched up from 220 to 250 at noon but in such adverse conditions there appeared to be no appreciable gain in speed. During the afternoon the rain lashed outside while I lay on my bunk transported to J.R.R.Tolkein's world of fantasy: how grateful I am to June for introducing me to Hobbit lore and how well her gift is fulfilling her wish that it should "amuse and beguile" me.

Never yet it seems have we been out of sight of ships - certainly I have never looked for one in vain. Before noon six or seven are visible at once. During the early afternoon two very large tankers - perhaps 20,000 tons - passed by to port inward bound: indeed all the larger vessels we have seen have been tankers. And even now the lights of another one are visible away to starboard. And the rolling and pitching, and the creaking of woodwork, and the roar and swish of water outside the open port goes on continuously, with sudden smashes of crockery or furniture to mark the ship's more violent plunges.

October 8th

A grey morning - the sea much calmer though the motion of the ship is still enough to make fiddles necessary at table and a shower bath a mild adventure. The sky wholly overcast with low grey stratocumulus and the horizon obscured by sea mist beyond which lay the Galician coast. Coasters, tankers and tunny fishing boats provided company and at lunch time the Union Castle mailboat passed by at less than a mile distance. Although the sky was overcast the air was deliciously warm and after noon the low cloud began to break up and reveal blue sky with shreds of cirrus and to allow the sun to shine upon us with real warmth. A school of porpoises appeared on the starboard bow and made straight for the ship leaping in twos and threes with marvellous speed and grace: did they pass under the ship? In a trice they were gone.

After lunch I settled to some work and the two ladies betook themselves to the deck to enjoy the sun's warmth but in an hour were back again as we ran once more under the blanket of low grey stratus and drizzle began to fall through the warm air. At dusk we were alone for the first time on a grey sea - perhaps only because of our more circumscribed horizon.

October 9th

It is strange how little one accomplishes on board ship. The crew no doubt do what they are told, the officers do what they know has to be done: but even they spend a lot of time standing and contemplating the sea or sitting in the ward room and maintaining little or no conversation. As for myself I have been ever ready to give myself the benefit of the doubt and lie on my bunk when I fell apart, or, now that I feel fitter, simply to lean against the rail and look at the now empty sea. I feel no desire yet to break into the six packing cases in my cabin - and nor, so I judge, does Derek Searle - but I did at least do my washing this morning and this afternoon found much interest in drawing two hydrological maps of British rivers from a report I brought with me.

But this evening has been purely social. - drinks before dinner with Captain and Mrs Blackburn in their cabin, and "Scrabble" in the ward room after dinner.

The best of the day however was the hour I spent alone at the bow of the ship after lunch. Although the sea and sky have been almost uniformly grey all day, although there have been no other vessels in sight, the scene never lacked interest. The water is now much bluer and clearer than the water in the Channel. The sea surface was everywhere broken by small waves whipped by the northerly wind and under these a considerable swell has been running all day from astern and giving the Chief Engineer some little anxiety since a stern sea drives his propeller shaft forward onto the new thrust bearing. On the top of this swell the waves were being lifted into the wind and breaking and in the moment of breaking would turn blue-grey in a smother of foam white and aquamarine. At the stern also when the bow wave rose over the swells that were running faster than the ship a magnificent cascade of blue-white water curls over and away from the ship to fall forward in a welter of foam. Even the reflection of the ship's hull shadowing the water as it sped over it at a good ten knots was deep indigo blue. And as I gazed at our forefoot cleaving swiftly enough through the dark water I was suddenly thrilled to see three streamlined shadows beneath the surface. At once they were not shadows but three dolphins rising, leaping out of the water, swimming, diving and rising again. Three, four, two more: to starboard others leaping out of the front of a great sea. With long snouts and a blowhole behind, a dorsal fin and two shapely tail fins spread horizontally they moved without apparent effort more swiftly than the ship. Some were perhaps only five feet long but the largest looked to be seven or eight feet but the muscular effort involved in moving such large bodies must be considerable and I am astonished that I could see so little evidence of how propulsion was achieved. Their movements are made even more fascinating by

their co-ordination. At one moment three sleek dark slippery bodies rise together from the water, arch over and descend. Next moment they are several feet deep and through the water their shapes change from dark to light as they roll over and show their bellies. Then they will move together and pass from one side of the ship to the other passing beneath the bow and obviously playing with the ship. Then suddenly the last two move abruptly and simultaneously to starboard and are gone, leaving the sea empty save for two small petrels that for ever fly in dizzy zigzags between the waves, never resting and hardly ever seeming to pause to take from the water the food they presumably are seeking. I go astern to watch them but am wearied by their never ending skimming over the sea and leave them to it.

October 10th

This morning I saw my first flying fish and although Captain Blackburn's comment that we shall see plenty of those pretty soon may be true enough it was for me the first sign of our approach to tropical waters. To be sure it was an isolated sign for I have seen no more and none of the FIDS appear to have seen any. And the skies remain anything but tropical in aspect. Grey stratus and Str-Cu has covered most of the sky most of the day and the rifts of blue and their brilliant blue reflections on the sea have been the exception. I am puzzled by the combination of a stable and very extensive sheet of low cloud with CuNb masses giving rain squalls. During the forenoon three or four were visible at once and the one ship we have seen today which crossed our path ahead of us at no great distance was at one time blotted out by rain. But the afternoon was warm and dry and the FIDS mostly stripped as they worked chipping and repainting on the foredeck.

Tonight was film night in the wardroom but I joined the FIDS in their mess to see Kodachromes of Port Stanley and the bases that Norman Leppard was showing. Afterwards some of us found our way up into the bows and there watched the spectacle of phosphorescence in the curling foam of the bow wave. Nothing like all the wave was luminous but myriad balls of light appeared to be tossed about in the seething water, which the black water ahead was ever and anon shot through with filaments or patches or rare scintillating flecks of brilliant luminosity. A sight worth coming far to see.

And as we stood there the lads drew my attention to a flashing light at the horizon, on the port bow. No light was actually visible but the reflection of a light on the underside of the clouds: after a time it seemed more certain and we made out three flashes followed by a longer interval. When I came in I spoke to the mate about it and later we went up to the bridge. The third officer had seen it and reported it to the Captain: the list of lights showed it to be one that is itself visible for 27 miles on one of the islets off Madeira. My suggestion to the FIDS was correct - we were looking at the loom of a light on an island sixty or seventy miles away which we would pass tomorrow morning. Madeira! Never having myself been more than a few miles south of Lisbon before, I feel very much on the threshold of a new world.

October 11th

I woke suddenly and remembered we should be off Madeira at six - I scrambled to the open port at the foot of my bunk and there it was. A vast hazy shape less than three miles away at its nearest part, stretching for miles to north and south and reaching up into a great grey solid bank of cloud which broke off along a sharply defined and dazzlingly bright margin against the radiant blue morning sky behind. All the land was in grey shadow but then ahead of me were immense seaward slopes and cliffs that truncated the much gentler upper slopes on which I could see many tiny white houses. I began to appreciate the scene: the cliffs must be hundreds of feet high. Abreast of us on a prominence at the cliff top was a tiny white light house - as I learned afterwards 1012 feet above the sea. Beyond it a village - if you can so describe a grouping of a score or so of houses spread in open array across a slope. To the left another small village on another broad interfluve. I suddenly remembered my sketchbook and began to sketch the impressive cliff profiles to the north and the features I could only discern as delicate inferences of grey tone in front of me. Alas the ship was drawing south and the sun rising and with one bound the sun leapt clear of the cloud cap and immediately a broad river of golden light spread across the sea toward me. My delicate nuances vanished behind a veil of haze illuminated by the dazzling sun. My attention was perforce given to the cloud itself. At the northern end ragged masses of F-Cu appeared to be driven against the slopes of the island, but at a higher level, sheets of stratus spread out over the sea. Through or over these rose the great cloud cap of the island obscuring everything above some 4000ft.Towards the south the surface of this cap was a smooth slope - probably reflecting the general shape of the island and 3-5000ft above it. It was over this smooth island shape that the sun had so disconcertingly raised itself. Over the summit and northern part of the island the cloud mass rose still higher and at 7-8000 ft passed into broken A-Cu.

Fortunately some broken cumulus to the south of the island now obscured the sun and as the ship drew away southward a new and lovely effect appeared. Slanting shafts of sunlight struck down and began to touch some of the middle slopes, revealing once more the strong contrast between their long gentle ascents (at 5-8°) and the wall of seaward cliffs by which they are truncated. The suggestion was strongly conveyed that these were the constructional lava slopes of a volcano whose lower slopes had been undermined and gnawed away by the waves. For a considerable stretch the cliff edge bordered what seemed to be a level platform dissected by the formidable ravines of rejuvenated streams. These ravines had cut the platform into detached portions each with its own habitation clusters. Did the platform mark an erosion stage at a line of 1000 ft or more: or was it merely a portion of the constructional slopes of the island whose seaward edge along the cliff happens to be fairly level?

As the Shackleton drew further south I could see more of the interior aspect of the island. Two large open valleys could be discerned which might plausibly be consequent depressions between constructional slopes of lava poured out from different centres, but in the unfavourable lighting no details could be seen.

Now at 10.30am Madeira is hardly visible. Dead astern lies a piled mass of cumulus cloud a dozen or more miles in extent and reaching two miles into the sky. Below the cloud base is grey haze and if you look again you can see that this haze ends to left and right in sharp sloping edges - all that can still be seen of the slopes of Madeira.

After such a beginning the rest of the day might well have been an anticlimax, but though there were neither ships, porpoises, nor flying fish to be seen, there was no lack of interest. I spent a most interesting forenoon in the chart room and on the bridge and "assisted" in shooting the sun with the 3rd officer's sextant at noon. Each officer has his own sextant and the Chief, Second, and Third all make their own observations: at 50° 54.5' the noon sun is still not nearly as high as in England at midsummer. With the noon position worked out it was found that we had made 256 miles in the previous 24 hours - our best yet - at an average speed of 10.8 knots, which gave much satisfaction to the engineers, but I was startled to learn that there are still almost a thousand miles to St. Vincent.

After lunch Mrs Richardson and I repaired to the foc'sle head so that she might take cine shots of porpoises should any appear. Nothing of the kind turned up and she wandered away and I was joined by increasing numbers of F.I.D.S. All find the fascination of looking down from the bow into the blue water. We found that it is momentarily possible every now and then to look clear through the crest of the bow wave as it curls smoothly away from the ship's side and before it breaks and see the red-painted hull right down to the keel, and indeed the white-painted figures of draught far below the water line.

The wind today has been north-easterly and fresh and steady but the weather is hardly what I expected of the trade wind belt. There is still much low cloud, though now it is neither stratus nor even stratocumulus but broken cumulus and at times with a turret line aspect. Above this is a non continuous layer of altocumulus and dotted about are fairly numerous shower clouds. At times the rain can be seen falling from these and evaporating as it falls, but one or two passed over the ship and it was necessary to shut my cabin port to prevent my bedclothes getting wet. Later in the afternoon as I was working at my maps of stream run-off on the wardroom table there was much noise of sawing and joinery work on the fore deck. In a remarkably short time the FIDS had closed in the ends of the space between the forward end of the hatch and the after end of the foc'sle and had lashed a great tarpaulin over it, filled it with sea water and were disporting themselves therein. One or two were taking a dip after supper when I was on the bridge again with Mr Bosher and judging by their squeals found the water colder than they had anticipated. Apparently, once the sun has set, the evaporation from the surface of the strained tarpaulin is considerable and a marked lowering of temperature results.

As the evening wore on the sky overhead cleared. We seemed to have run out from below the canopy of altocumulus and now the lower cloud was also becoming very broken. The Plough and the Pole Star remained obscured behind the cloud sheets we had left behind us to the northward, but Cassiopeia of the familiar circumpolar constellations hung in the middle of the northern sky. Pegasus was unfamiliarly placed high up near the zenith and towards midnight Orion rose in the east. By 3am he had wheeled far up the eastern sky with the Pleiades overhead, and Sirius, well above the eastern haze, shining in through my cabin port.

October 12th

At last, typical trade wind weather. A resplendent Sunday morning with blue sky overhead but with loops and streamers of cirrus and enough small cumulus to thicken up near the horizon and give the appearance of a broken cumulus layer, the horizon itself not being visible because of white haze. A fresh breeze - force 4 or even 5 - blows from the northeast raising a considerable sea in which the ship rolls a good deal. Nearly all of the water was slopped out of the

"swimming pool" during the night. Everyone who can be seems to be on deck. The two ladies in sun tops on the flying bridge, the FIDS in shorts with cameras slung round their necks or else in bathing slips around or in the pool, and the engine room hunks sitting on the life-jacket lockers aft whenever they can get up for a breather.

October 13th

Having looked forward with, perhaps, romantic impatience to the trade winds and their weather I seem, now we have reached them, to take them entirely for granted. In a full day I have paid little attention to either sea or sky, but have spent my time indoors completing my hydrological maps and the brief written account that is to go with them. But at noon this supernumerary officer tried his hand at shooting the sun with the ship's sextant. I could hardly believe that the sun glared down from the masthead only a foot or two, as it seemed, from the zenith was really no more than 58° 3' above the horizon. This gave us a noon latitude of 24° 4' and a ship's run (in 24 and a half hours) of 267 miles. During the afternoon we crossed the Tropic of Cancer - and for the first time I entered "the tropics".

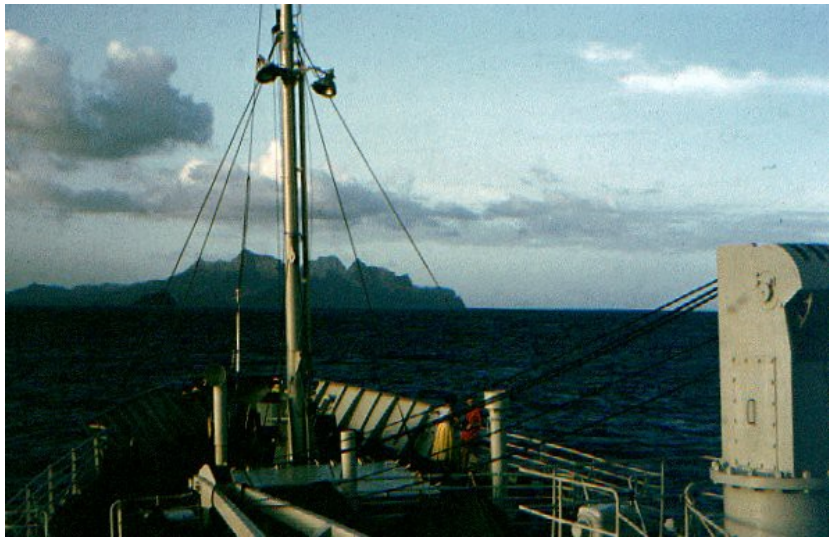
At dusk I encountered the Captain who was like myself taking a breather on the top deck and was carried off to his cabin for drinks before dinner. After dinner I joined the latter stages of a discussion on FIDS bases in the FIDDERY and stayed for a recital of long playing records selected and played by Tom Flach on his Hi-Fi player. The Emperor Concerto at the outset commanded respectful silence, but the operatic arias that followed were played against an increasing buzz of conversation. "South Pacific" became little more than background music and it needed the sadistic ballads of Tom Lehrer to restore silence. The FIDS would not have missed a word of that.

October 14th

It seemed this morning as though we had gone back three days or 10° of latitude. The sky at breakfast time was wholly overcast with grey cloud, broken cumulus below and altocumulus above, with a big shower cloud ahead. This soon sprinkled light rain on the decks, sprinkled them but never wet them, and soon enough the sun was shining through breaks in the cloud cover and the decks were as dry as ever. Afternoon saw the sky blue again with little cloud except near the horizon. And one cannot help but imagine that, as in an English July, the hot bright afternoon will wear away into a long light warm evening and a slow twilight. But before six the sun has already vanished behind the low banks of distant cloud and haze on the horizon, the clouds in the eastern sky are tinged ever so briefly with pink, the zenith sky becomes a super blue so that the thinnest of silver crescents appears for a short time above the delicately tinted sunset sky before it too drops behind the clouds and the first stars appear. Now is the moment when the First Officer makes his star sights, when the sky is dark enough for the bright stars to be clearly seen, and light enough for the horizon to remain visible, A few minutes more and the favourable conditions have changed and the warm tropic night is upon us.

October 15th

The Cape Verde Islands! What would they be like? I was by no means the only person who asked that question yesterday: today we have seen for ourselves, and many and various are the impressions that have been carried away. They are not in the least the "desert islands" of popular imagination: but that in literal truth is what we have seen, and this simple fact is, I think, what has most impressed us. I learned my first lesson about the Cape Verde Islands last night in the chart room. The mental picture one has of a group of tiny islands rather uncertainly placed off the African coast expanded and crystallised into one of some ten or eleven large islands arranged rather like a horseshoe open to the west. The NW and SW islands must be more than a hundred miles apart: the most easterly and westerly members must be even more - probably 150 miles. And the whole group is 300 miles from the nearest point on the African coast: since they lie in about 17 degrees north. This means that they lie opposite the southern portion of the Sahara, and since the NE trade blows here almost to the exclusion of all other winds it brings the drought and often the dust haze of the Sahara to the islands. It is apparently common to approach to within a mile or two of the islands in the haze without seeing them, but this morning we were more fortunate. When I went on deck, just before 6am, we were already abreast of the north eastern part of S Antonio the north westernmost island.



CV1 : Approaching St Vincent : 15 Oct 58

The shore was about three miles away and the land rose steeply from the breakers by irregular cliffs and rock slopes of incredible bareness for two or three thousand feet till they were lost in a mass of heavy grey cloud that made the ground below it look grey also. The cloud cap recalled Madeira but the resemblance, and even the cloud cap itself did not extend far. Further south the crest of the island could be seen as a high irregular ridge clear against the sky, while the other islands within sight were quite clear of cloud. Ahead lay S Vincent, our objective, much lower than the high and massive S Antonio, but fantastically broken into a bewildering assemblage of rugged peaks. To the SE was S. Lucia, almost equally saw-toothed, and further east one could faintly but clearly discern the shapely mass of S. Nicholas rising to over 4000 feet rather like a transparent cut out hung against the dawn sky. It was difficult to believe that it was more than 50 miles away. At this moment the sun broke through the thin cloud that rimmed the horizon and at once proceeded to climb straight up into the sky, with almost visible haste. A little earlier the officer of the watch had seen, on the bearing of the sunrise, the outline of Una da Sal - 110 miles away, and not possessing anything like the 10,000ft needed to make it visible in normal conditions: evidently it was raised into visibility by abnormal refraction which is not uncommon just before sunrise.

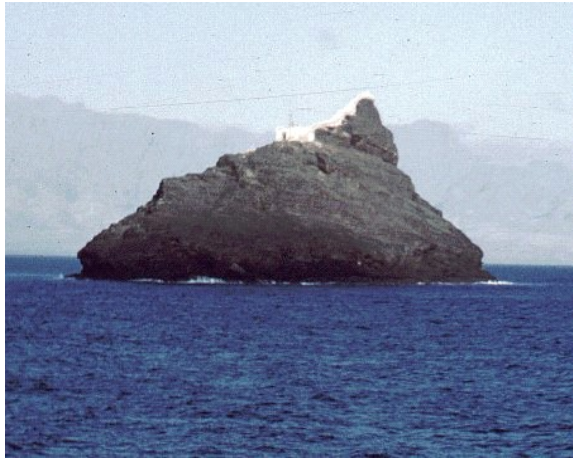
As the sun rose we could better take stock of our surroundings. San Antonio appeared like a vast tip heap: in the cliffs and on the slopes the tilted layers of lava were exposed to view. No doubt the form of the whole island is essentially constructional - a vast pile of volcanic ejectamenta built up round several closely spaced orifices from the ocean floor as far below sea level as the

present summits rise above it. Though the low morning sun served wonderfully to reveal the powerful gullying and furrowing of the slopes (PHOTO) the impression remained strong that erosion had as yet made little inroads upon the mass of the mountain.

CV2 : Gullied slopes of S. Antonio : 15 Oct 58

Yet from another point of view the effects of erosion are important enough. In the larger of the gullies and ravines at the northern end of San Antonio are the only stands of vegetation of any stature that we saw - a sort of patchy maquis or scrub. Elsewhere low growing shrubs in open formation growing equally patchily to little conceal the underlying rock. It is moreover the erosion of the gullies that has provided the material for the long detritus slopes that here form a fringe at the foot of the mountains. These gentle slopes, predominantly of sand and gravel, are themselves dissected and the inter stream divides are so completely dry that they are quite without vegetation and form conspicuous stripes of bare flowing sand. Equally bare of plant life are the parasitic cones of red and grey volcanic ash that rise at several points from the lower slopes of the main mountain: one at least showed a well formed crater.

Our approach to the harbour of S. Vincent necessarily carried us further from San Antonio and as the morning advanced cloud covered the main ridge and haze obscured all details. But the great bulk of the island remained and when we lay at anchor in Porto Grande it hung like a delicately tinted and almost transparent back cloth against the western sky.



CV4 : Rock San Antonio behind : 15 Oct 58

At the entrance to the Porto Grande is an islet - the Ilha dos Passeros - of most commanding aspect. Sheer cliffs rise some 200ft from the water and then on the top of the island is a white coast guard's house from which a massive white stone flight of steps leads up the spine of the ridge to a lookout at the top. How those who live there manage to get up to their house was a matter of general speculation but this is surely not the most interesting thing about this rock. On its other side its structure is laid bare for all to see - a simple sequence of lava flows and layers of ash dipping seaward (NW). Ashes may accumulate anywhere but lavas can only flow downhill on solid ground from the source vent to their final resting place, and it is clear that the lavas of the I. Dos Passeros must have originated in a crater high above the Porto Grande or even further south. Nor is other evidence lacking to support this conclusion. The cliffs and peaks on our port hand as we entered showed everywhere dips towards the north: those that made such a wild and picturesque group to starboard have westerly dips: and when, in the afternoon, we saw the southern cliffs south westerly, southerly and south easterly dips could be clearly seen. It is clear that the Ilha do San Vicete is only the basal wreck of a much larger volcanic cone that perhaps once had something of the aspect of Fogo - one of the southern islands of the group, which I am told showed some volcanic activity nine or ten years ago. What catastrophe destroyed it, or when, one may speculate freely.

CV5abc : St. Vincent

By 8 o'clock we were at anchor and after breakfast I took a sketching pad and pencils to the cool and quiet vantage point of the now deserted bridge. There was so much of interest to record that I hardly knew what to choose: and even when my attention settled on the bold shapes of the hills that rear so abruptly behind the town, I still seemed uncertain whether it was the larger shapes or the details of rock form that I was trying to rend. So a couple of false starts had to be abandoned, and even after that progress was slow. But as I sketched and looked the interest of the desert island landscape grew continually. No one who has grown up in a humid island where soil and vegetation hide the bare bones of the landscape can cease to marvel on the so obvious fact that here the geology is all laid open to the eye. Before me was, essentially, a scarp face of bedded lavas in the upper part and ashes below: the former respond to the process of earth sculpture by standing in lofty mural cliffs across which the successive flows can be clearly traced.: the latter build softer rounded forms. And across both run numerous dykes that have resisted weathering and erosion better than the surrounding rock, be it lava or not, and stand up in wall-like features that seemed to my eyes too much like the textbook diagrams to be true. On the higher cliffs some of them gave rise to fantastic rock pinnacles: on the lower hills of ash sometimes an irregular black outcrop along the crest of the hill showed that the dyke might well be regarded as the stiffener to a mass of easily eroded material that has prevented the whole from being swept away.

Despite the lack of vegetation this landscape does not lack colour. The lava slopes are grey and buff with darker cliffs on the massive flows, and with crags that gleam white in bright sunlight. But the rounded low slopes are ochre, brown and rust red. These are the colours of ferric oxide that text books tell us is a feature of deserts. Perhaps this is so: and certainly this place with a record of only twelve rainy days in an average year, bringing an annual rainfall that only averages 4 inches may pass as having a desert climate. But it was noteworthy that the red colour was deepest and most conspicuous on certain gentle slopes below the mountains and above the actual valley floor. In Spain and Portugal I suspect they would be called rinas while Lester King might claim them as pediments. Be that as it may they can surely be claimed as graded slopes not graded to present sea level, and as such they point to a fairly recent fall of base level of perhaps 200ft. Evidence in the same sense is provided by the isolated hill of red ash near the Esso oil tank installation. At first sight I thought this hill was another parasitic ash cone like that of S. Antonio. But its forms are those of erosion not accumulation. The upper slopes are gently convex: the lower slopes are concave and between the two systems are angular breaks of slope that show the upper, convex forms to be older forms that are being encroached upon from below by rarer concave forms as the result of a fall in sea level.

While I was sketching and contemplating these mostly desert slopes a great deal had been happening. We had taken 50 tons of fresh water from the water carrier TARRAFAL. There is no water on S. Vicente and water both for the town and for watering ships has to be brought from S.Antonio: consequently it is dear. We took 50 tons at ten shillings a ton. Not that much smaller than the

Shackleton the TARRAFAL had not had any new paint for years: the wood of the steering wheel was whitened by the weather and rust was everywhere. Her crew of four lean dark skinned islanders were ragged in the extreme. Two dogs on her deck yapped incessantly till our cook threw them two magnificent bones. A small boy in an old patched and torn shirt put his hand through a large vent that exposed most of his chest and begged appealingly for a new one. Mrs Richardson was moved and would like to have done something for the boy: her husband suspected this was just his begging shirt and that he had better ones at home.

On the other side of the ship a small market was in operation. The islanders had tied their boats to our tail and were offering an astonishing selection of wares. One boat had a very dull looking cargo of withered vegetation - in fact large bunches of bananas. Most boats had some bananas and some oranges. Fantastically shaped cowrie shells and other strange treasures of the sea were there. Small cushions embroidered with brightly coloured beads in geometric patterns, plaited straw hats, silk scarves and guitars were all on offer. Purchase was by barter. One of the lads obtained a guitar for an old shirt and a pair of jeans: a bar of chocolate would trade for four oranges. The islanders would accept almost anything in order to trade at all. One of them when offered a jar of Brylcream dipped his finger in it put his finger in his mouth and announced "him good". After an hour the bargaining slackened and as the bosun had the lifeboats swung over the side for routine testing of the davits, the boats below had to be cast off. But they were hopeful to the end and not till we weighed anchor at noon did they really leave us. What kind of homes did they go back to? Were they pleased with their morning's trading? Weatherbeaten and dried by the sun, their skins told of varying mixtures of Portuguese and negro blood: one young lad had fascinatingly beautiful chocolate coloured thighs. The feet of the older men, knotted and bony with the skin cracked and burned, recalled the feet of apes. Do these people live in the rows of small one storied, probably one-roomed houses, without any chimneys that I could see through the binoculars? Or did they live in slum tenements by the waterside? These people are poor but there is prosperity for someone in this barren place - new houses, a new church, a new refrigeration plant and some major constructional work below the prison testifies to this.

October

CV6 : Fair Wind Sky : 19 Oct 58

16th

Prostrated by a migraine headache I lay all day in my bunk, sometimes conscious, more often not. Sometime during the afternoon I woke up to find the Third Officer closing my ports: there had been heavy rain and the easterly wind caused the rain to drive in onto my bed.

October 17th

Migraine has given way to plain seasickness and the sea and the weather were far from helpful - indeed the doctor found himself with quite a visiting list. The wind was now south easterly and fresh (force 4-5) and there was considerable head sea and swell. The motion of the boat was now quick, often violent and always uncomfortable. All day the sky was overcast, the air hot and humid. Rain fell at intervals and when at last I got on deck just before dusk there was moisture in the air and rain was falling in two separate rain storms from large CU-Nb clouds to north west and north east. The whole sky was overcast with layer cloud at many heights and though the mate described the weather as typical the sky he agreed was more like that associated with a temperate depression.

October 18th

Trade wind weather again - fresh and invigorating, and calculated to blow away the dregs of my headache. Although we are still 5° north of the equator we are clearly in the SE trade and the heavy swell derives from the south Atlantic. It is unusual in the experience of our officers for SE trade to extend so far north or for the doldrums weather to be encountered so soon upon the journey. I cannot help but associate these things with the frontal aspect of yesterday's sky and conclude that we have experienced a good example of the intertropical front as the convergence zone of the north east and south east trades.

We experienced no belt of calms - the easterly breeze has always blown strongly through my cabin when the ports have been open. To be becalmed in a sailing ship in the hot humid conditions we experienced yesterday must have been trying enough for seamen, but much worse than trying for passengers in the old emigrant ships to Australia. With what relief they must have welcomed the first freshening breezes from the south east bringing fresh air into the ship and giving it motion through the water.

Our speed has been a little reduced by the head sea - only 9 knots yesterday - but it is a fine sight, especially from the bridge, to see the bow lift to an oncoming sea and then plunge forward and down sending massive sheets of smooth blue white water arcing out from the ship's sides at great speed, only to fall in a smother of foam and be left behind in the onward motion of the ship. Even ten knots seems a grand speed when you spend any time watching the water. And suddenly as you watch there will be a noise as of pattering rain drops and you wake up and realise that dozens of flying fish are taking wing before your eyes and are flying swift and low away from the ship. Then with a little plop in the water they are gone, save perhaps for an odd fish that continues to wing his way for twenty or thirty yards just above the water planing at great speed, sometimes dipping the right wing to turn to starboard, and sometimes the left wing to turn to port. Finally he too disappears with a little plop into the steep front of the advancing sea. You wait and watch and watch and wait, hoping for more but nothing happens. Then, when your attention has wandered, there comes a thrilling moment when a patch of sea about half the length of the ship suddenly shimmers into life, there are momentarily not just dozens but hundreds of these tiny fish fleeing in concert from the disturbed water of the ship. In a twinkling they are gone and for an hour the sea is lifeless and empty. True we have sighted three or four vessels in the last day or two: and we have had a visit of some hours duration from a migrating swallow presumably blown off course to South Africa: but for the most part the sea is very, very empty.

October 19th

Another lovely day of sunshine, blue sky with puffball cumulus blown before the wind, and cool refreshing breezes. The sun climbs out of the eastern sea and all morning stands above a broad lane of dazzling brightness that runs just abaft the beam from the ship to the horizon on the port side. At noon it is high over head and in effect lost to sight and the sea is everywhere gay with the shimmer of gold upon it. In the afternoon the shimmer of gold becomes a second broad lane of dazzling brightness stretching to the horizon, this time on the starboard hand. Towards this river of light the sun descends vertically and at five o'clock is only a hands breadth above the horizon. Now it drops behind the tattered

CV7 : Equatorial Sunset : 5.20 pm 19 Oct 58

lines of windblown cumulus and they become dramatic with deep interior shadows and frayed edges of green light. On the opposite side of the horizon the lines of cloud become smoked salmon pink and cast lovely lavender and lilac hued shadows upon each other.

At 5.20 it was possible to point a camera directly at the partly obscured sun, swimming behind its screen of clouds in a sky itself now luminous and partly golden. Twenty minutes later I could photograph the red disc as it stood enlarged in the haze just above the horizon: three minutes more and it was gone leaving only a brief red glow behind it. Already the eastern sky was darkening and its clouds were purplish grey. Overhead the waxing moon shone silver and the first stars could just be discerned.

During the evening an unexpected shower occurred but by eleven o'clock the sky was again as clear as at sunset and it was now the turn of the moon to make her swift descent into the sea. A truly equatorial moon lying squarely on its back, with the rounded western limb directed towards the source of its light, now far below the horizon, and the jagged line of the terminator directed upwards towards the zenith. I tried to examine this through the bridge binoculars but had to be content with only momentary glimpses of the great craters sharply displayed in the lunar twilight because of the motion of the ship. After spending half a minute and more getting the moon in view at all she would rise with an air of urgency out of the field of view and another half minute would be needed to catch her again.

Just before midnight we reached the equator and I and the high spirited FIDS let off a stream of rockets from the foc'sle head, to the great alarm of the officer of the watch who was very conscious of what the lads had forgotten - that there were forty gallons of petrol in cans stowed on deck. But his alarm proved groundless as luck had it and Shackleton entered the Southern Hemisphere unscathed but with a pretty bunch of coloured balloons flying from the yard arm.

October 20th

King Neptune came around about 10am and paraded the ship with his queen and his retinue summoning all and sundry to his court. The bosun who has a deep bass voice and a very fine beard made an impressive Neptune garbed only in seaweed shirt made of frayed rope and bearing crown and sceptre. He took his stand on the driving platform of the 5 ton crane on the fore deck and his queen (the ship's steward) looking bloated and blousy sat on the crane driver's seat beside him. Derek Searle as clerk of the court (the Royal Court having become a court of justice?) and wearing a bowler hat as befitted the dignity of his office declared that Neptune would sit in judgement on various persons who for various reasons had shown themselves untitled to enter his majesty's southern realms. Mrs Blackburn was the first prisoner called and had to be sought by Neptune in her cabin. After some delay she appeared, clambered onto the hatch and was charged with attempting to evade publicity at the Shackleton's sailing. Medicine was administered and she was steered across the hatch and duly chucked in the pool. Mrs Richardson followed and then myself, charged with paying too much attention to the geomorphology and not enough to bartering for bananas at St Vincent. The medicine comprised a dark brown concoction whose composition certainly included vinegar and curry powder and onions swimming in a brightly yellow green liquid of equally revolting taste. I was then "lathered" on hair, face and body with orange, yellow and green washes applied with mops and "shaved" with a theatrical cardboard razor about the size of a butcher's chopper before being consigned to the, by this time, very welcome pool. After me the "prisoners" were called in twos as there were 25 of us to be initiated in all. Some of the FIDS were, of course, very rebellious and Neptune's henchmen had some hard struggles to prise them free from their chosen lodgments - in one case the head of the foremast. As the proceedings drew on they became decidedly less formal and long before the last prisoners - the two young mess boys - were called the administrators of justice were just as wet as any of the prisoners, the hatch cover was swimming with water dyed with the coloured concoctions that had been used. And of course at the end Neptune, his queen, the clerk of the court and all the attendants were surrounded and driven into the pool by the rest. And by the time everyone had finished ducking everyone else it was clear that the pool would have to be drained and cleaned out.

October 21st-25th

Less than six days have elapsed since we crossed the equator and already we are beyond the Tropic of Capricorn. After the two days of heading into the south east trade and the sea and swell that brought our speed below ten knots we have had winds first on the beam and then going abaft it till now we have a following wind and sea that carries waves, low clouds and even our own smoke ahead of us. Assisted by wind and sea and the set of the Brazilian current our speed has crept up to nearly twelve knots and in these last days we have covered 251, 273, 262, 269, 281 and 281 sea miles or 1617 sea miles in all. The consequences of this rapid traverse of the southern tropical latitudes have been quite marked. The sun which stood virtually overhead at noon on Wednesday is now quite obviously being left behind and shines pitilessly on

the after deck where there was formerly a little bit of shade. The moon, now almost full, though she rides high, turns our wake to a highway of heaving silver. And the days seem suddenly to be drawing out - though that is partly because we retarded our clocks another half hour yesterday.

The trade winds are still with us - but with a difference. Sea and air temperatures had both fallen noticeably and the thin silk shirt which was all the covering I could tolerate at the beginning of the week now seems a little inadequate for leaning on the rail in a fresh breeze to watch the sunset. And though often enough the sky is clear and blue save for puffs of cumulus there have been many occasions when it has been overcast with layers of high cloud. Since we passed the light of Fernando de Noronha on Monday evening we have been on a course that parallels the Brazilian coast and only sixty to a hundred miles from it. Some of the great banks of towering cumulus and sheets of altocumulus that we came under on Tuesday had no doubt an origin over the land. On Wednesday afternoon the southern sky was grey with layers of high, medium and low cloud looking very much like the layers of frontal cloud associated with the approach of our temperate zone depressions. There was no sunset to watch, but after dinner the sight of the gibbous moon almost in the zenith and surrounded by a complete 23° halo was as spectacular as it was unfamiliar.

Ships have been sighted every day but as they have become more frequent the flying fish have become less so, and the sea seems emptier than ever. Yesterday's highlight indeed was no more than a discolouration of the water. The mate was leaning over the after rail when he asked me to confirm that there was a patch of green water in the middle of the blue. The whole sea was brightly lit at the time so there was no question of cloud reflection or cloud shadow. At first we wondered if we were looking at a patch of oil on the water, but soon we noticed others nearer at hand and as the water in these was lifted up by the waves it showed yellow or even brownish red in the wave crests. We agreed that such discolouration must be due to plankton floating in the water. At length we could see a very extensive belt of discoloured water ahead and we waited till the ship would pass through it. When it did so we could momentarily see myriad tiny flecks of matter hovering and dancing: nearer was clear blue water: further away the water was cloudy and yellow, and where the waves slopped it up against the sky, tawny or russet shades could be seen. This great coloured band with its clouds of floating life passed slowly astern and was the last of its kind.

Now we begin to look for signs of life of the south. In the ward room an albatross sweepstake has been opened. In previous years albatrosses have been sighted north of our present position and since yesterday we have all been on the lookout for the first of this voyage. And we have entered against our names the hour of the day on which the first sighting will be made. The Chief Engineer picked noon today and has already lost his stake, I have opted for 5pm on Monday.

During these days Derek and I have been regularly at work morning and afternoon. On Tuesday morning we uncrated over 14,000 photographs and in the afternoon covered the walls of my cabin with cover diagrams and generally prepared for serious business. On Wednesday we examined together the 77 "print laydowns" in which many thousands of vertical photographs have been laid down side by side and photographed to give a sort of photographic map. These gave us a sort of bird's eye view of our field of operations - an area of snow-covered mountains and islands amounting to about 40,000 square miles or about the area of England. This view, and Derek's previous experience on the ground, allowed us to make a first classification of the different kinds of terrain we should have to deal with. The next step has been to use the print laydowns as maps and draw on them with chinagraph pencils boundaries round the areas occupied by each of the terrain types of our classification. Of course we have struck snags and amended our classification a little and learned to compromise with it in other ways. Already we have begun to assemble the first results of this "Reconnaissance" on the sheets of the 1/200,000 maps and it is clear that the procedure is proving productive. The distribution of the different terrain types that is being revealed has given us much clearer ideas about what places we would like, if at all possible, to visit "in the flesh". And at the same time some most suggestive relationships are coming to light that afford clues in our search for the origins and mode of evolution of the landscape.

Since both the print lay downs and the maps are large we have been working in the ward room, because the dining table there is the largest in the ship and offers the nearest approach to an adequate working surface. Our work has thus attracted much interest of a sympathetic kind. I am sure that when it comes to the field operations the Chief Officer at least will do all he can to make it possible for us to visit the places we think most important for our purpose.

October 26th

The albatross sweepstake has been won and lost. When I went on deck before breakfast, I was greeted by the Chief Engineer with "It looks like my wife's

won" and to be sure, there astern planing and turning just above the waves, was a great bird that could only be an albatross. Its body was white, but its long wings, lazily drooping towards the tips, were dark with a white diamond patch near each wing root. Not the pure white bird I expected, but still, an unarguable albatross. At breakfast it appeared that the first mate observed it at 7.5, and since Mrs. Richardson had named 7am on the 26th as the hour at which the first albatross would be sighted, there was much badinage about her having brought it in a crate and released it from her cabin at 7.0 to be observed at 7.5.

The arrival of the albatross has coincided with a marked change in weather. The morning sky was wholly overcast with layers of medium and high cloud through which not only could the sun be discerned for a while but enough sunlight filtered to fill the whole air with glorious light. Sea and sky were grey yet uncomfortable to look at. Later the cloud thickened and by late afternoon patches of clammy grey mist lay on the sea. The wind had dropped and, although the ship still rose and fell on the fairly heavy swell, yesterday's creaming waves had given way to a smooth grey surface that was oily by comparison. Looking out of the wardroom ports at the mist Derek and I discovered that our first albatross had returned with two companions and we left our work to watch their masterly flight. With only occasional beats of their long but narrow wings they glide about over and between the waves, often being lost to sight between the heaving swells. Their turning is spectacular: the wings lose their lax droop and stiffen, the body is turned, the inside wing dropped and the outer raised, and the turn is made without a wing beat or any loss of height. Indeed there could be no loss of height for time and again the wing tip and its reflection in the water were separated by only the smallest space, and once I certainly saw the wing tip break the water surface. And as we watched the great birds we were astonished to see two great forms in the water – not swimming but lightly basking just below the surface and protruding at one moment a great jaw full of teeth and at another a smooth black back and dorsal fin. What were they, small mammals of the whale tribe or great sharks? They dropped astern without showing more of themselves. Perhaps we shall recognise them if we see others of their kind.

October 27th

Temperate zone weather with a vengeance! Grey overcast skies, chill air, a grey sea whipped by a south easterly wind into a nasty chop and an uncomfortable motion that reminds me of the English Channel. At times the cloud base is at sea level and a little rain falls. The officers gave discarded "whites" for "blues" and I have gone back to my cabin for a pullover. The FIDS have dismantled the tarpaulin that held their swimming bath. Astern there have been as many as seven albatrosses wheeling and planning within inches of the water and they have been joined by up to five Cape pigeons – very smartly dressed birds with a white body, black head and tail and dark wings with two white patches on each. They seem to be translucent when seen from beneath. Like the albatrosses they are scavengers and when the cook disposes of "gash" from the galley even the lordly albatross forfeits his title of nobility and settles on the water with the pigeons. In fact the albatross is very like a larger edition of the black headed gull with a longer wing: so long, indeed, that when he alights on the water he does not at once fold it away like the Cape pigeon. And I am told that when he wants to take off, since he cannot flap his long wings at water level, he spreads them and rises on his feet and treads water until he gains sufficient lift to soar into the air. Once in the air he seems to be the master of economy, availing himself of every upward air current that will sustain him.

October 28th

Grey skies continued early this morning but at breakfast time a rift approached to the south and soon we "steamed" out from beneath our cloud into blue skies and sunshine. So we remembered that we were still on the equatorial side of the latitude of Gibralter and that the sea temperature yesterday was still 70°, members of the crew were again seen working without shirts and Mrs. Richardson resumed sunbathing on the boat deck.

Noon disclosed that we were in latitude 33° 17'S and for the third day in succession more than a score of miles south of our dead reckoning position. We have been making about 270 miles a day but not along the course set, for the original current has been drifting us southward about a mile in each hour. So we are still more than fifty miles away from the Brazilian coastline, though our course now is south westwards into the Plate estuary. This meant that at dinner this evening we were steaming straight into the sunset and could admire it from the ward room portholes. It has also meant a great change in the colour and appearance of the sea water. Yesterday, though the skies were grey, the water in the bow wave still had the clear rich blue that so delighted us a fortnight ago and has been taken for granted ever since. Now we have lost it. At noon today, though the sky was blue, the sea was green: at the bow one could still see down through the clear water to the keel but as through green bottle glass.

By late afternoon under a bright sun the water had taken on a strange leaden hue, tinged still with bottle green. In the wake the colour that mingled with the rising milky-white masses was a pale green, quite different from the cerulean hue of yesterday. And with the change of colour has gone a loss of translucence: it is hard to be sure, but the water begins to look turbid and one is reminded of the water of glacier torrents. So, though we are fifty miles from the coast and two hundred still from Montevideo, the great river Plate already makes us aware that it pours into the ocean every day more water than any other river save only the Amazon and Congo, and that its waters are heavily laden with the silt washed off arid mountainsides in the Argentine Andes, rich coffee lands in interior Brazil, fertile forest lands and treeless Pampas.

October 29th

What a wonderful morning for our approach to Montevideo. From my cabin port I looked out over a glassy smooth sea flooded in golden light from the sun almost dead astern, and reflecting the blue of a sky free from all but horizon cloud. Our bow wave was the only ripple on the placid surface of the sea and from it spread a long series of waves en echelon. One could count up to twenty of them stretching back towards the horizon before they became lost in the glare below the bright morning sky. An outward bound tanker and an inward bound freighter served to indicate that this peaceful water is the great node of South American maritime commerce. A streamlined modern Argentine liner with blue and white funnels and cream painted hull went by reflected in the water – a painted ship upon a painted ocean indeed. An occasional black backed gull flapped lazily by, but its flight seemed laboured compared with the effortless soaring and gliding of the albatross.

On deck I found we had already passed inside the Isla de Lobos with its lighthouse, between the island and the seaside resort of Punta del Este marked by a scattering of giant hotels now seen in silhouette against the sun. On our starboard beam a group of rounded hills were painted in lovely pastel shades ranging from warm pinkish brown through lavender to cold blue grey: above and behind them the sea mirrored the sky. Their forms were the gracious forms of full maturity – residual hills rising from a base-levelled plain. When viewed through binoculars it at once became clear that over much of their extent the rock of which they are made is naked to the sky. There are woods on the low ground about them and on parts of the lower slopes and it looks as though they were once entirely forested but that the forests have been cut and burned and with their removal the soil has been eroded entirely away. Thus my first view of the hills of Latin America – and that it is Latin America is made immediately clear by the giant cross (?150ft high) on the top of the 1385ft Cerro Pan di Azucar – at once gives vivid expression to P. James summing up of the geography of the continent: it is no new continent waiting to be opened up but one that has been rifled and exploited for more than four centuries and left despoiled of some of its greatest riches.

The Cerro Pan di Azucar seen through glasses gleamed palely through the haze like Cezanne's Montagne Sainte Victoire, and it seemed that like it also it could be made of limestone with a great cliff towards us, furrowed by gullies and mantled lower down by talus. I could at times believe that I saw signs of anticlinal structure in the rocks, but whether that were so or not it was clear that the rounded form of the hill truncated all structure. Even more impressive was the low 800 odd Cerro des Toros which appeared from end to end to be composed of strata dipping steeply to the west but whose rounded form at first suggested that the hill was made of a massive rock like granite. Indeed, when I first turned the glasses to it I half expected to see tors upon its surface!

As we proceeded the lightest of breezes began to ruffle the surface of the water – at first in long strips and patches that were curiously persistent with equally persistent areas of unruffled water between. Even when traversed by the ship and its wake they could still be seen to persist. As the wind disturbance grew so the mirror glass reflections of the sky became broken and destroyed and one became much more aware of the colour of the water itself. This is now greenish yellow and as it streams by the ship it is visibly turbid. As I write this (11am) the tops of churches, chimneys and the skyscraper office and apartment blocks of Montevideo are visible "hull down" over the horizon ahead. I got a vivid sense of riding over the bulge of the curving surface of the earth as the buildings grew in front of my eyes as we approached.

U1 : Landfall Montevideo : 29 Oct 58

October 30th and 31st

The sun has set behind a web of most delicately tinted clouds just forward of our starboard beam. We are on course again, due southward now, and the buildings of Montevideo sank into the horizon haze some hours ago. Our Uruguayan interlude is over and with an unexpected feeling of relief we turn back to our shipboard routine. How excited we were to arrive, how intensely we enjoyed it all, yet how glad we were to cast off this afternoon and once more put to sea. Yet for my part I am glad to think that at the end of January I shall return and for a week visit part of this friendly and likeable city.

As we approached on Wednesday across the khaki coloured waters of the Plate and watched its skyline take shape all was curiosity and ignorance. Today as we left that same skyline was all meaningful and full of associations. Away to the left lies El Carro – the hill which gave Montevideo its name – a low rounded hill crowned with an old fort of 150 years ago. As I looked back at it it was no longer just a hill. Yesterday I was taken there by Mr Forster, the quiet and friendly representative of the British Council in Uruguay, and his vivacious and charming Greek-born wife. At the top of the hill we passed through a stone gateway into the fort that reminded her of the gates into hilltop monasteries in her native land. From the ramparts we looked out over a splendid panorama. On one side the ever present river extending immense, brown and turbid to the southern horizon. On the other, toward the sun, the green Uruguayan countryside, a country of small relief yet not flat – a rolling lowland not a true plain. It is a green lowland by no means without trees, in groups and spinneys beside houses, and certainly not part of the Argentinean pampas. The slopes of the Carro itself are grassy with blue-green splintery outcrops of amphivolite

and a few planted eucalyptus trees that make a lovely frame to the pictures of the many towered city seen across the waters of the bay. All round the foot of the Carro lie the great frigorificos or meat packing stations, five or six of them: with their ranges of large buildings and tall smoking chimneys they outwardly resemble any other factory: but beside them are large grassy paddocks and in one were herded hundreds of cattle that have, perhaps, entered the factory by now. These great plants, though obviously an integral part of the Montevidean economy, are some miles removed from the city and their workers are housed in a separate township – Cuidad del Carro - which lies on the lower slopes of the hill towards the bay. It is an extensive arc laid out in a gridiron system of rather narrow ill-kept roads. The rectangles between the roads are occupied by single storeyed dwellings each standing in its own garden plot and often shaded by its own jacaranda or other blossom trees. It is certainly garden suburb development and the workers here have sun, fresh air and greenery that would have delighted Ebenezer Howard. Many of the houses too are substantial, and sometimes tasteful, concrete constructions. But many others are of rusty corrugated iron or sheathed with old tin boxes pressed flat: curtains at the one window, or a young woman wiping her hands on her apron at the back door show that they are indeed human habitations. Such tin box or corrugated iron shanties are scattered indiscriminately among the other dwellings and the best and the worst may stand side by side. There is evidently no control of development to preserve amenity here

On our way back to the city the Forsters took me through the industrial districts that have grown up along the waterfront. Here are the great oil installations, occupying the whole of a small peninsula, and the great grain and flour silos. Here we passed warehouses full of woolsacks, and here I saw for the first time in my life a warehouse stacked high with the hides of cattle. Here we repeatedly crossed the railway lines that link factories and docks with the interior of the country and at the end we came to the railway station – which a homesick friend of the Forsters said she loved to visit because it reminded her of her

native Bradford. But whereas the railways penetrate to the heart of that hilly Yorkshire city, the railway that connects the Uruguayan countryside with the capital ramifies in the port area but comes to an abrupt end at the slight slope that leads up to the town: the city itself seems to turn its back upon its railways as on some necessary evil.

Looking back from the Shackleton as we drew away I could see among the dock installations the two large warehouses that backed the dock where she has lain, and immediately to the left of them the city proper began. The very first building one could pick out, standing on the flat ground by the waterfront I recognised as the old university building to which I had been taken the night before by Professor Jorge Chevataroff? (the Professor of Geography here – a Uruguayan of Russian parentage – to see his "laboratorio"(?). Parts of the university are, I believe, housed in the suburbs but this building, which once held the whole university and still holds the faculties of the humanities and pure science, really beggars description. It stands separate and foursquare, four stories high: its architectural style is, I suppose, French of about 1800. Its basic plan is that of a hollow square divided by a cross piece to give two long narrow courtyards. These are surrounded by balconies which are connected by bridges and supported by cast iron pillars – it belongs to the era of the Crystal Palace and Paddington Station.

It was about 8.30pm when Professor Chevataroff? took me there and the building was too ill lit for me to gain more than a general impression but that was one of incredible squalor, peeling plaster, unpainted woodwork and rusty iron spoke of decades of neglect. We crossed one of the courtyards whose tiled floor the Professor described as "good for football" and I have no doubt the urchins of the lower town use it so. We entered a lift that had no light, ascended in the darkness, came out onto the first balcony and crossed the footbridge to the centre block. Lighted windows marked the two small rooms that constituted the department of physical geography. In the first the Professor's assistant Senor Sorreano had just given a lecture and half his audience had stayed to meet us. The furniture of the room was co-eval with the cast iron columns of the courtyard, and every inch of space was covered with maps, photographs and specimens: so much so that when handed specimens by Professor Chevataroff – and his vigour and enthusiasm led him to hand me many – I could see nowhere to put them down. The first room was dedicated to geology and geomorphology, the other to plant geography and oceanography. Plant geography was represented by thousands of plant specimens pressed between paper and stacked in endless columns the full height and width of the long wall opposite the windows. Oceanography was represented by a tiled section of benching under the windows and here Senor Sorreano works on the sediments of the Rio de la Plata. Geology overflowed into this room too and specimens and specimen boxes were gathering dust on every available flat surface. Here was surely an object lesson: in those two small, overcrowded and dusty rooms a man and his assistant were doing excellent work themselves and kindling an enthusiasm for physical geography in others. Here, no doubt, Professor Chevataroff writes his numerous studies and edits the REVISTA URUGUAYA DE GEOGRAFIA . And here he was bustling around showing me everything and allowing me to pay attention to nothing, while his colleagues and students who had waited some time to see me, stood around and smiled and one by one politely took their leave. And finally we went back across the footbridge, descended the pit in the unlit lift, recrossed the tiled courtyard and left the building to go into the town to dine.

From the old university building one ascends through the streets of the "old town" – not narrow and tortuous like those of the older parts of cities in Scotland, France and Germany, for those are medieval, but laid out in regular gridiron fashion like the Ciudad del Carro. Indeed the spacing of the grid and the width of the streets is about the same and both may well have been laid out in the nineteenth century. There is a seventeenth century cathedral, and the city fathers are re-erecting one of the old town gateways in the Plaza Independenzia, but those parts of Montevideo that have not been built or rebuilt in the last generation are predominantly Victorian or Edwardian in age and aspect. From the decks of the Shackleton as we came in this older part of the town looked a huddle of small white buildings, many of them being demolished, while taller buildings rose beyond. As we departed the view was the same but the impression conveyed was entirely different. The taller buildings now had individuality and a name. Here is the big administration building and next to it the custom's house. A little further to the right the cluster of tall buildings marks the banking quarter where all the many and beautiful ornamental stones of Uruguay have been cut and polished to provide pillared facades or immense stone floors for the temples of finance. Nearby I could just discern the towers of the seventeenth century cathedral overtopped by a 14 storey hotel and my thoughts went back to the green trees in the courtyard they overlook, though still more pleasing is the…… (left blank) where evergreen magnolias, pines, arunculas, red-blossomed acacias, date palms and flame trees make a delightful mixture of colour and texture of foliage. As my eye moved to the right along the skyline it came to the two buildings which attracted most attention upon our arrival – the uncompromisingly plain foursquare red brick tower of the Victoria Plaza Hotel, completed two or three years ago, and the equally lofty tower of the Palacio

Saloo. The latter rises above an arcaded ground floor, which looks out onto the Plaza Independenzia, as merely a grey stone, over-ornamented Edwardian commercial palace as far as the (blank) storey. Above this level it becomes an architectural monstrosity. Turrets are corbelled out at corners, and balconies before windows, in a reckless and tasteless proliferation that makes the whole thing a piece of petrified indecency.

To the right of these two buildings tall buildings stand, though none are quite so high. They mark the course of the Avenida 18th Julio, the main street for "shopping" and entertainment. Here are the jewellery shops and department stores, the cinemas and bars, the neon lights and the crowds. It rises gently away from the square and has something of the bustle, life and vulgarity of the Canebiere in Marseilles but its shops have no more of la mode than suburban London, if as much, and its "night spots" disappointed our FIDS by displaying less female nudity than a Manchester music hall. Still further to the right many tall office blocks and apartment blocks rise a dozen or a score of stories high and at last, dwarfing all, is the fine modern hospital – the first building to appear over the horizon when we sailed in on Wednesday morning. One might have expected that with so much building and re-building modern Montevideo would appear like Atlanta Georgia, or a lesser New York, but this is not so. American influence is nowhere apparent and the feeling of the city is definitely European. Whether in the old town - where debased French architectural style is the rule – or in the new where architectural eclecticism ran riot before the vogue for clean and functional lines became general, one could be in some previously unvisited European capital. Though the buses, taxis and private cars hoot and accelerate as they approach any street intersections that are not controlled by traffic lights, that is in deference to a sporting principle and not to American hustling. Hustle has no power here. One cannot walk beneath the shadeless palms of the Plaza Independenzia without thrice hearing the word manana as one crosses the square: that is if you can hear any spoken words at all. Perhaps when no presidential election impends it is quieter but during our stay loudspeakers on buildings and electioneering vans blared out dance music, slogans and exhortations at maximum volume. The posters on a van urge citizens to vote for Ginnu(?) Rivas because of his "caracter y dignidad" while the loudspeakers of the same van blare out the frivolous and inane singing of a bevy of chorus girls. Loud speakers and motor horns provide the voice of the city and because of them, not only were we glad to return to the familiar and now homely noises of the ship, but we came away without knowing whether Montevideo works or thinks or knows content, or whether it merely blows a whistle and bangs a drum to prevent itself hearing anyone else speak. Au revoir Montevideo. Whatever your weaknesses and faults, lack of hospitality and incivility to strangers within your gates are not among them and I shall look forward to coming back again in January.

November 1st

If one sails from any British port be it London, Glasgow, Liverpool or Southampton there is a deal of navigation of inshore waters before one reaches the sea and for some hours one coastal landmark succeeds another before all finally drop astern. Leaving Montevideo is quite different. One steams out between the two breakwaters along the 5 mile dredged canal due southward along the very course one must set for the Falkland Islands, or for that matter for the South Pole. And by the time the fort on the Cerro and the tall buildings of the city have disappeared into the haze astern no other land is in sight. Away to starboard the Argentine pampas lies too low and too far away to be seen. So we quickly returned to our established routines and Derek and I were fully occupied now with the stereoscopic examination of some of our vertical photographs. The weather too seemed to what it had been earlier in the week and we had the illusion we were still in the tropics. The captain's wife took a swim in the pool – unaware that Saturday afternoon was set aside for the crew – and Mrs Richardson resumed sun-bathing. The fresh northerly breeze helped us on our way and maintained 70° temperatures. And though the albatross and the cape pigeons returned to their stations behind the ship, three or four red-throated "sparrows" together with midges, dragonflies, hoverflies and a multitude of moths seemed to have "sailed" with the ship from Montevideo and made it their home.

November 2nd

What a change has come overnight! The wind has gone to the south and is blowing almost a gale. The sky is grey and overcast and in the rain showers the cloud base descends to the grey sea surface. SHACKLETON pitches every few seconds and she bucks and rears to the head sea and swell. From the bridge it is a fine sight to see the bow rise to a great wave and then plunge down into the trough beyond to send great sheets and waves of green water cascading away on either hand. The wind picks up this outflung water and drenches the whole forepart of the ship and the well deck runs all the time with swirling streams. My admiration is caught by the way in which the raking bow divides the waters and the beautiful flaring sides cast them aside: but occasionally she "takes it green" right over the bow – something Tom Woodfield says he has not seen her

do before in his three years with the ship. Some of the FIDS have returned to their cabins but I find myself unexpectedly, though perhaps precariously, still up and about and eating and working, but wondering whether, if this is our first taste of the Roaring Forties, how long I shall survive. On deck it is miserably cold. The temperature, which last night at midnight was 69° , has dropped in 24 hours to 50° and it feels as if ice might begin to form at any moment. Our feathered passengers from Montevideo could be seen earlier today huddled and miserable in the shelter of the after deck but they are now nowhere to be seen. But sea birds now abound – the albatross and cape pigeons have been joined by giant petrels and (blank) while flocks of (blank) rest primly on the water.

November 3rd

During the night the gale blew itself out and the sea began to go down: soon after sunrise we sailed out from under the cover of grey cloud and by breakfast time we were sailing on a blue sea under a blue sky. A blue sea – but not the same cerulean hue of the tropics but a blue-green Prussian blue, hard and cold glittered in the sunlight. By noon the sea had stilled almost to nothing and glassy patches began to appear here and there though there was still a noticeable swell. The wind fell away entirely and the sun shone warmly and strongly out of the first entirely cloudless sky we have seen since we left Southampton. Tonight Tom Flack, Jack Richardson and I watched the sun descend behind the sharply drawn rim of the sea and waited hopefully and sceptically for the green flash. When the sun was half gone Tom and I could both see purple semicircles floating in the blue sky and looked away to test our eyes. As the last segment diminished it became easy to stare it in the face and we waited for the moment of sudden and final disappearance. But disappearance was delayed and for what seemed a long time a trembling line of red hot fire lay on the horizon till the sun had descended so far out of sight that not even refraction could keep it in our view.

Tomorrow we shall reach Stanley and then no doubt the programme of the ship will be discussed. In preparation for any such discussions Derek and I have worked all the way from Montevideo at our photographs, scanning all the localities which it seems to us important to visit on the ground, and today we have presented to the Captain a chart marked to show all the places where we should like to land and all the coasts where we believe landing would be difficult or fruitless but which we should like the opportunity of examining from the ship. He has made no comment but I believe him to be sympathetic. Last night he, and indeed the Chief Engineer and all the other officers except the officer on watch, came to hear the talk I gave to the FIDS on the "Geomorphological Project". I was delighted at this show of interest and rather believe that they for their part will be quite pleased to feel that the Royal Research Ship will be able to participate actively in a specialist scientific programme.

November 4th

Our travelling anticyclone, or ridge of high pressure, has moved away to the east and let in behind it a north wind that feels more like a north wind in the Northern Hemisphere than the north wind we had last Saturday. All morning it freshened and raised a heavy stern sea which the ship does not like at all and before which she rolls violently. Every now and then the helmsman fails to anticipate the ship's reaction and she lurches in an exaggerated roll that empties the soup from our plates, overturns chairs and sends sliding doors that run athwartships crashing. The inclinometer in the engine room shows deflections of 15°, 18° and 20° but it is hard to believe the tilt is not more. Overhead the sky is low and grey again and the air is wet with wind driven drizzle. But there is none-the-less an air of great expectancy in the ship and in the bow a group of hardy FIDS peer through the spray and mist for the first sight of land. The radar scanner shows land echoes and then suddenly, far nearer than I had expected, I see the outlines of hills and cliffs to starboard. We are off Mengeary Point and, in a very short time, are turning our starboard beam to the line and running into King William's Sound. Waves crash in sudden bursts of upflung foam on the long cliffs of an ironbound coast. Behind the cliffs the ground rises in a short steep slope of a few score feet and then flattens out in a broad platform or even plain about a hundred feet above the sea. Inland low hills of quartzite can be discerned in the rain and mist that shrouds them: though their lower slopes seem to grade down into the plain they rise sharply from it and their upper parts are all bare rock. Not a tree is to be seen – everywhere the landscape is grey-brown with dead grass. Beautiful beaches of white quartz sand that gleams beneath the water and backed by dunes with marram grass of soft green are the most colourful thing visible. Then comes an island where the green colour is darker and the texture suggests a dense covering of bushes and small trees: this is, however, nothing of the kind but a colony of tussac grass. This grass, said to be one of the most nutritious in the plant world, grows on the site of old penguin rookeries in clumps that are man high.

Our first sight of Stanley is gained over a low ridge through which we pass by an opening rightly called The Narrows. The wind being directly on shore and strong, however, it would be dangerous to approach the jetty now and we cast

anchor in the roadstead. The FIDS, consumed with impatience, line the rail of the afterdeck and the old hands among them point out the main landmarks.

My immediate reaction to Stanley was to be reminded of Reykjavik. White and yellow painted houses, built of wood and corrugated iron with red corrugated iron roofs, are set in fairly open formation in garden plots beside the largely unmade roads that run up or along the hillside. All this recalls the Icelandic town. So also do the warehouses of the waterfront, the one or two public buildings of concrete, the corrugated iron roof of the cathedral, the stunted bushes that serve instead of trees and the vivid impression one has that, only a few hundred yards from the centre of the settlement, the last houses give way to the wilderness, unfenced, uncultivated and unimproved. Even the wind and the thin fine rain were thoroughly Icelandic.

In a few minutes the crane on the foredeck hoisted the motorboat over the side and a journey was made to the jetty to bring the custom's officer, the chief of police, the doctor, and most important of all John Green, the Secretary of the FIDS organisation. He brought me a message that at 6.30 a car would be at the jetty to take me to Government House. There in due course a very warm welcome awaited me at the hands of His Excellency and Mrs Arrowsmith. Daffodils in bowls, a big and cheerful peat fire in the grate, an abundance of books, magazines from England, a Siamese cat on the hearth, and an enormous but friendly Rhodesian ridgeback helped to give to their tasteful drawing room a friendly character that matched their greeting. Conversation flowed from the start and even before dinner H.E. was questioning me – or encouraging me to speak my mind - on all sorts of matters connected with SHACKLETON or with FIDS: the quality of the new recruits and how they had comported themselves on the voyage: of our new officers – particularly the new Captain – and the atmosphere and working of the ship.

He was obviously pleased, and perhaps relieved, to hear me say that without doubt SHACKLETON this year is a happy ship, and to hear my report that the young men we have brought have shown themselves both keen and serious, that they had comported themselves well in "Monty", that there were no "bad hats" among them. Before, during and after dinner we talked – and indeed continued long after Mrs Arrowsmith had gone to bed.

November 5th

The weather continues to be Icelandic with a cold wind, grey skies and mist shrouding the hill tops. The wind had dropped sufficiently to make it possible for SHACKLETON to come alongside the jetty this morning but the operation was not carried out without incident. Apparently Captain Blackburn made his approach rather too fast and overshot the jetty bumping the port quarter a bit and coming to rest on the mud. Fortunately the tide was rising so that the ship soon floated off. By the time I reached the jetty at about 10am tying up was just being completed.

Most of the morning was spent with John Green in his office talking over plans. He told me of various circumstances – the projected major expansion of activities at Base E on Stonington Island being the most important – that would influence the actual programme of Shackleton's visit to the bases. On my side I explained what, if the ship was entirely at my disposal (!), I would like it to do. There for the present, until he has had discussions with H.E. – who has been spending the day in a series of personal meetings with all the FIDS – and with Captain Blackburn, I must leave the matter.

After lunch I had my first opportunity to walk through Stanley. Perhaps after all it is more Hebridean than Icelandic: there is no fishing industry here and so all that speaks of the cod industry in Reykjavik – the trawlers and line netters, the nets themselves, the noisome and ramshackle fish sheds along the waterfront, the gleaming spreads of split cod laid out on the rock to be sun (or wind) dried, and above all the pervasive fishy smell are all missing from Stanley. Instead we have here the no less pervasive reek of peat smoke with all its recent associations of the west of Ireland or the Isle of Skye. And so little of Stanley is urban. There are some 300 odd houses and most of them try to grow something in their little garden plots. Only along the one concrete-surfaced road that runs a little back from the waterfront from the jetty westward to Government House does the settlement wear a truly urban look. As I tracked along it from Government House I passed first the nurses home of the hospital, then the Secretariat of the Falklands Island Government: dwellings follow the south side of the road, while opposite are a number of low buildings associated with the government jetty. Next one comes to a stone-built building which, on the ground floor, houses the Post Office, the Public Library and the pleasant panelled room which serves both as Court Room and the Chamber of the Legislative Council, while upstairs is the large hall with stage, dance floor and cinema projectors that is the venue for all the public entertainment of the town. Almost opposite is the black and white painted Catholic church dedicated to St Mary. The Presbyterian (U.F.) church is in a side street near by while a little further along the main road stands the cathedral church of Stanley built of grey stone with red brick arches, buttresses of the tower, windows and doors. The

red brickwork looks well with the red painted roof, but the weather evidently affects it badly: on one buttress the brickwork was rotten and crumbled away leaving the mortar in high relief, while a second buttress has been rebuilt in new brick. Beyond the church is a large foursquare concrete building with a green painted corrugated iron roof. This is the Falklands Islands West Store – the major emporium of Stanley. One approaches up a flight of steps and through a roomy porch which provides a most necessary "air lock" on windy days. Inside one finds a spacious hall with counters arranged around the walls and display stalls in the centre. Here a dozen shops are under one roof: at one section of counter one can buy food, at another stationery and fancy goods, at another drugs and pharmaceuticals and so on. And on display are expensive luxury goods – radio gramophones, tape recorders and the like. Millinery and outfitting are in a separate store. There are other shops in Stanley – the Kelper store, the Philomel store and two or three shops dealing in cameras and the like – but their combined floor space probably does not equal that of the F.I West Store.

On the jetty I met Derek Searle and as we had a great deal to discuss regarding our plans and especially the kit and equipment we would need to take with us, we turned up the hill to the edge of the town and talked as we walked. As we came down again close to Government House my eye lit on a little roadside excavation below some jagged quartzite outcrops. On examination a most interesting state of affairs was revealed. The solid quartzite of the floor of the pit passed upward into weathered rock in which the minute bedding planes in the quartzite had been discovered by acidulated waters and joined up. At first the rock was separated into plates like the slices of bread of a sliced but slightly deformed machine-cut loaf. A little higher and the loaf was crumbling into thin and ragged wafers and a little higher still was nothing but crumb – a completely disintegrated mass of sand, clayey even in places, and with here and there flaky pieces of weathered quartzite lying parallel to the ground surface. On top of this layer of weathered debris were several large masses of quartzite quite firm and unweathered and contrasting sharply with the rotted stone below, and they in turn were buried by about a foot of peaty soil. This arrangement is so similar in essence to many sections that I have seen in Britain, whether in Dartmoor or in the Highlands, that I could not but interpret it immediately in terms of my British observations. To me the gradual upward change from solid rock through a zone of rock whose weaknesses had been delicately sought out by the probing fingers of penetrating groundwater, into a zone of completely disintegrated fine debris could not but suggest a lengthy period of chemical weathering. The inclination of the weathered fragments suggested the operation of soil creep during this period of rock decay. The sound blocks of quartzite on top of the weathered debris have evidently never experienced the period of chemical weathering and must have arrived after it was over: most probably they represent a layer of sludge and stones that crept down the hill from the rock outcrops above during a period of cold climate, but from which the finer material was washed out – (probably with some of the rotten material below) before the peat built up and buried all. I was quite excited to stumble so soon on such a clue to the local history of weathering and climatic change and exclaimed to Derek "Why – this tells me just what I want to know!" astonished he said "What? So soon?" And the mixture of incredulity and admiration in his voice did not disappear when I added that I now felt that I knew the answer to the first question about the famous and controversial "Stone Runs" of the Falkland Islands. The weathered layer in the little roadside exposure spoke eloquently enough of a period of rock rotting that could not have failed to produce an abundance of stones of all sizes over all the quartzite outcrops of the islands – core stones as I should call them at home. One need look no further for an adequate supply for the stones of the stone runs.

Still talking of these things we came back to Government House and enjoyed to the full the unaccustomed pleasure of afternoon tea. Mrs Arrowsmith had most kindly left a tray for us in the drawing room and we savoured to the full the pleasure of a good cup of tea with fresh milk instead of the reconstituted milk of the ship, a delicious sponge sandwich with cream, the elegant silver and china, and the relaxed comfort of easy chairs beside a blazing open fire in a delightful room.

Fl20 : Port Stanley Harbour

November 6th

This has been another grey and windy day, though less wet than yesterday. Most of it I have spent in the invigorating and congenial company of the Colonial Secretary – Mr Denton-Thompson: Aubrey to his wife and the Governor, DT to everyone else. Short and thickset in build with a round, permanently smiling, face of almost oriental cast possessed of a ready fund of genial conversation. The dominant thing about him is none-the-less the jacket sleeve that dangles empty at his left side. It is in his creed not to allow his disability to limit his enjoyment of life. He will help you on with your coat, open the door and close it after you, hold open the door of the land rover and then drive you away before you realise that you could have assisted him.

He took me to see most of the public services of Stanley, beginning with the power station with its three Blackstone diesel engines. Next we drove a short distance westward beside the harbour to "Stanley Airport" – a large green-painted hangar with a slip way running down to the water. Here we saw the two De Haviland "Beaver" float planes being prepared for take-off and I was interested to meet the chief pilot (of two) and the chief engineer (of two), and some of the passengers. Mr Barton, manager of the Falkland Islands Company was seeing Mrs Barton off for a weekend visit to her son's farm: Mr and Mrs Harding were bidding farewell to Mrs Harding's sister. We watched the first Beaver load up and be lowered down the slip by a rope attached to the tow bar of a land rover: the wheels beneath the floats were then detached and soon she taxied across the bay and returned at full throttle. Long before she reached us the Beaver was in the air. Further westwards DT took me to the new water filtration plant and then up the hill to where they are using a stone run as a quarry. The "run" is a welter of blocks of quartzite the size of pieces of furniture – from coal scuttle size to double-bed size – lying like a carpet on the floor of the upland valley where it passes between the steeply tilted rock outcrops and, like a stair carpet, rolls on down the hillside towards the bay. Quarrying is simple if tedious. Individual rocks are prized out of the run, split with wedges and fed to the stone crusher. Convicts do this work as hard labour when there are any convicts. At present the labourers are imported Germans, for there is a shortage of labour in the colony. To everyone's surprise, including my own when I saw it, the stone run proved to be only a couple of yards thick. The superficial layer of large blocks, with their crust of light grey or pale green lichens, gives way downwards to a layer of smaller more rounded cobbles and boulders all stained by iron oxides to a rich rusty brown. Below this again the floor of the quarry is made of still smaller stones set in a matrix of finer material. Here was certainly something to think about!

After lunch Dr Ashmore and the matron showed me the hospital and their pleasure and pride in it seemed to me well justified. Pleasant in outlook, compactly organised and well-equipped, it seemed to me that many small hospitals in Britain might envy Stanley its hospital. And I could not but comment on the prevailing air of relaxed quiet that is so rare in our big city hospitals at home. While I was still watching a German dental mechanic performing mysteries with molten gold, DT appeared to whisk me off to see the two schools – Infants first in a new building, light, airy and well-equipped, but with classes only at half strength following an epidemic of whooping cough that had necessitated closing the school: Seniors in an old wooden building, now far deteriorated and in need of replacement rather than renewal. Here I learned that boys and girls may, and usually do, stay for an extra year after the statutory leaving age (14) has been reached; and that the school has special arrangements with the Dorset Education Authority whereby bright lads and lasses may continue their education in a Dorset boarding grammar school. From the schools we went to one of the most decrepit looking buildings in the town, which in fact holds the broadcasting station and studio, and another, little better in appearance, which is the exchange for the radio-telephone system that

links the “camps” (as the sheep stations are called) all over the archipelago with Stanley and with each other. The human element in this link, Mr Summers, is without doubt a cardinal reason for its success: never inhibited by circumstances nor ruffled by persons, he has for years provided a service which involves the passing of countless messages and the execution of many requests for purchases in Stanley. DT could not praise him too highly.

All these visits gave me a much enhanced opinion of Stanley. Here is a community smaller in population than any English county which has, apparently, no public debt, and provides out of its own pocket for a complete range of public services – administration, police, post and telegraph, power and light, public works, education, radio, hospital and government operated air services. There are fewer than three thousand people in the colony - more than half of these are in Stanley itself. To me this seems a very creditable achievement.

This evening H.E. and Mrs Arrowsmith gave a cocktail party for the F.I.D.S. and officers of the SHACKLETON, to which I was very pleasingly bidden as one of the family. It was held in the large drawing room which comfortably swallowed some scores of people without becoming crowded. H.E. surprised and pleased all the FIDS by introducing each of them in turn to Mrs Arrowsmith with “Here is Mr_____ : he is going to _____ and his special interest is _____”

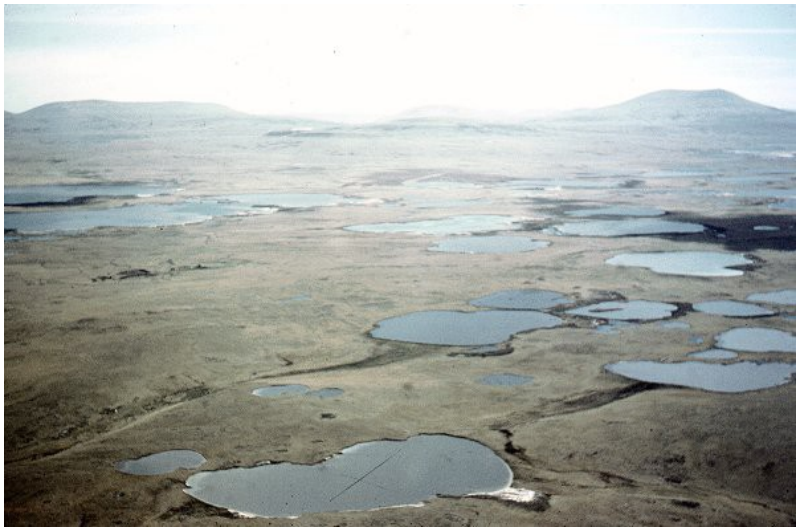
November 7th

This morning broke resplendently fine and clear, and before ten o’clock H.E. knocked at my door and asked had I any plans for the day or would I care to make a flight over the islands: a plane was out now but would be back later in the morning and he thought there would be a seat for me then. Naturally I jumped at the offer and in due course found myself climbing into a Beaver, where, on the seat beside the pilot I found a thermos flask of coffee and a packet of sandwiches thoughtfully provided by Mrs Arrowsmith. Without loss of time the other passengers, including a little boy with whooping cough, followed me in and David Jones, the mechanic, and Jim Kerr, the pilot were unshipping the wheels from beneath the floats. We taxied out across the water, Jim Kerr fastening his seat belt, adjusting his nose trim and noting his ETD on his flight programme as we did so. We turned and without more ado he pushed the throttle right forward and we raced across the water. Less than half way across we were airborne and Jim pulled the throttle back to the “auto” setting and put the propeller into coarser pitch. While watching him at his long practised routine, putting on headphones, plugging in and calling base, I suddenly realised we had passed over the stone run that is being quarried for road metal and were slipping round the back of the mountains. A sudden panorama of bare rocky peaks and ridges built of steeply dipping quartzites was disclosed.

Fl1

The ridges were weathered into fantastic forms with deeply fretted notches and upstanding craggy tor-like masses. Little in the way of a talus of broken rocks marbled their bases but away from the craggy outcrops on the gentler foot-slopes or along the centre lines of shallow depressions were the stone runs. They occupied the positions that rivers would naturally take, they showed branching patterns that naturally recalled dendritic drainage patterns and from their lower ends streams issued and immediately flowed in incised courses. All these things linked the stone runs with the drainage lines of the country. But not so obviously linked to the drainage were the many lines of stone stripes that occurred on the margins of some of the stone runs and elsewhere simply on gentle slopes following what looked to be their general inclination. All this burst upon me so suddenly that I forgot I had a camera or a notebook: I could only look. Then when I remembered my camera and notebook I could hardly decide which to use first. Fortunately the first stone runs were not the only ones

and as we flew beside the Wickham Mountains there proved to be time to take photographs and make notes.



Fl9 : Upland with ponds : 7 Nov 58

As we drew away from the mountains with their tor-crowned ridges and stone runs, the plain below claimed attention. Its predominant colour was ochre, passing into brown in one direction and olive-green in the other. A myriad, minute, variations in the form of the plain surface and its drainage were reflected by a fascinating series of changes in the pattern of the vegetation. Much of the plain was clearly ribbed from east to west: white grass and diddle dee scrub occupied the ridges where the rock was close to the surface. Yellow grass occupied the slopes, and green grass and tortuously meandering streams followed the valleys. On the softer hill tops, along the almost flat summit of a quartzite outcrop, lay a series of ponds. Some of these were small and margined in the northeast by a small scarp feature eroded in peat: these one could probably say occupied hollows where the peat surface had been broken for some reason and the break enlarged by the wind until the water table was reached. Others, however, were much larger – a thousand or more acres in extent. These larger lakes were invariably putty coloured and opaque with suspended matter: the smaller ponds in the peat were clear and dark like strong tea. Jim Kerr pulled aside his mouthpiece and shouted to me that sometimes there were black patches in the large light coloured lakes and then after a few days the black patches would disappear. I looked for but did not see any black patches. What I did see, however, were patches of greyish discolouration with a darker rim with a cauliflower-like outline. Perhaps these were Jim's black patches in a state of decay. In any case they suggested to me that at the bottom of the ponds putrefying vegetation may give rise to accumulations of methane and marsh gas and then from time to time there is a sort of explosion of methane from the bottom which rises to the surface and carries with it a great deal of the bottom mud black with decayed organic matter.

Fl8 : Settlement

Half an hour after take-off we looked down on the most populous of the camp settlements, Goose Green and Darwin, placed on the isthmus that connects all north-east Falkland with the Lafonian plain and at the same time separates Grantham and Choiseul Sounds which are here no more than two miles apart. A few houses with little vegetable plots sheltered by a stunted hedge, a few tracks connecting the houses with the jetty on the one side, and petering out at a gate into the open camp on the other, a barking dog annoyed by the noise of the aircraft, and that was all, save for the boarding school, with three radiating wings, that lies midway between Darwin and Goose Green. So, on over the almost featureless plain of Lafonia: almost featureless but not really so. An

ever changing play of colour goes with the delicate adaptation of the vegetation, the soil and drainage characteristic to the site in which it grows. So we have “upland” silts only a few feet above the valleys but with thinner and more sterile overdrained soils and carrying a cover that appears brown. Elsewhere the main expanses of yellow-green camp give way to darker colonial vegetation in wet places that were once ponds but which have since been filled with peat: as man cuts the peat away the water seeps back into the cuts and many of them, towards the sun, are crossed by flashing silver lines. Away to the south lay the sea sending deep blue branches far into the land in Adventure Sound and the Bay of Harbours. The Lafonia plain may be dull to ride across on a plodding horse, but it has great beauty when seen from the air on such a day as this.

Fl14

A few minutes more and the scene had changed again. Ahead of lay the Sound and its islands and below us Egg Harbour and other ramifying blue inlets that open into it from the Lafonian side. Beyond the Sound lay West Falkland with the Hornby Mountains rising nearly to 2000ft and presenting to us an impressive face outlined by snowy cornices on the top. More striking still, as we neared it, was the long hogback ridge that seems to run unbroken along the western shore of the Sound. Rising to some 500-600ft it follows the outcrops of some resistant beds that dip steeply towards the Sound. The adjustment of surface to structure is impressive: when the outcrop becomes sinuous the ridge bends away westward with it. But inland of the hogback lies a plain which has been base levelled over a parallel series of tilted outcrops or rock ribs.

At Fox Bay we landed and I watched with enjoyment Jim’s easy familiarity with all the routine involved. Headphones unplugged and stored away: trim adjusted: propeller and mixture adjusted: throttle back for the touch down and – there you are with white water breaking away from the large and light, but very strong, floats that cost 2800 pounds each. Jim turns and taxies towards the houses and the jetty and then suddenly unfastens his seat belt, opens his door and jumps down on to the port float, runs along it and picks up the mooring rope, reaches back into the cockpit and turns his engine switch. A boat is being rowed out and as it comes luggage is handed down to Jim and stood neatly on the float as if the latter were the no 15 platform at Euston. The boat comes along side and Jim has a word of greeting for each of its occupants – no wonder he prefers this work to the impersonal grandeur of a transatlantic run. In a moment new passengers have come aboard, Jim has seen them safely stowed and cast off his moorings. The wind being right he opens up the throttle where we are and in a moment we are airborne and on course for Port Stephens. To the north is a plain that is strewn with large and small ponds as far as the foot of the Hornby Mountains. To the west is accidented country with rounded hills near the south coast, grading down into spurs and low plateaux, interpenetrated and peninsulated by narrow and rather steep sided arms of the sea. No settlements can be seen until we come upon Port Stephens at the head of its bay. We pass high above it descending, and Jim banks his plane right round a hill on his port hand. He had obviously done this before so I watch without anxiety as the turf comes ever closer. At the point when, in spite of myself, I think surely now he must open the throttle we glide over a col and begin to descend a little valley only a few score feet above a stone run. I don’t know which to attend to – the stone run with its branching pattern or the neat and economical landing of the aircraft. In a trice we are down, turning on the water and taxiing back to the jetty and the houses. In a moment or two more Jim is out on the float picking up his moorings and greeting old friends and new passengers.

Our mooring is in a little tidal creek with rather steep sills: at tide level wave attack has exposed almost horizontally bedded sandstones and a little further up the slope a massive outcrop of this rock breaks the turf. It is likely that this same white sandstone builds the long narrow ridge that separates Port Stephens from the sea, for on this ridge and on Knoll Island in the bay are innumerable castellate tors. Some are summit tors but others break the slopes almost down

to sea level. Their presence here implies that the conclusions drawn from the deeply rotted outcrops beneath soliflucted material in Stanley should be valid also in West Falkland and can be applied equally to the stone runs of both areas.

From Port Stephen to Westpoint Island is a flight of just over fifty miles and almost all of it over the sea. But because the sea is broken up and surrounded by hilly peninsulas and rocky islands this was surely the most beautiful part of our journey. First we passed over South Harbour, an almost enclosed water entirely dominated by land, though still an arm of the sea. Then we crossed out over the marvellous blue expanse of Queen Charlotte Sound, and to the east I saw something which revealed to me in a trice the nature and origin of this lovely landscape. For more than half a dozen miles Port Richard on the south is separated from the main part of Queen Charlotte Sound only by a curious, low, narrow and sinuous ridge that ends in Queen Point. At no point does it rise much more than a hundred feet from the sea and at several places in its six or seven miles of length it is less than 500 yards across. And as far as I could see it is only slightly cliffed by the sea, its slopes, especially on the south, passing gently into the water, such a feature can only be a divide between two catchment areas – a mature, sinuous and subdued divide with slight saddles attenuating with modest culminations along its length: but if this be so this divide is submerged almost to its crest. The chart shows depths down to, but not exceeding, 28 fathoms in Port Richards and 30 fathoms in Queen Charlotte Bay. Were the waters to drain a\way tonight we should see an undulating plain surmounted by a modest divide of only 250 feet. I think we may well call this area a fully mature lowland embayed by submergence.

Fl12 : Sandstone Outcrops Port Stephen : 7 Nov 58

King George Bay to the north is another drowned plain of similarly large scheme – about 12 miles by 18. It is separated from Queen Charlotte Bay by a cuesta ridge which presents a steep, scarp slope to the south and a gentle dip slope to the north. Stream valleys furrow the northern side and some appear to pass completely through the cuesta from south to north. Towards the west this cuesta loses height and becomes progressively submerged. Former water gaps have been drowned to become the passages (East, Whale, West and False) through which the tide rips between the four Passage Islands. First Passage Island is the largest of these and its low plateau surface is flat enough and extensive enough to carry round ponds like those of the broad mainland watersheds. The island is cliff girt on all sides, especially on the southwest, and long fissures like the "geos" of Orkney and Caithness have been bitten by the waves along some of the major joint planes. It looks inaccessible and inhospitable enough but I saw one sheep station on the island.

Fl11 : Drowned ??? : 7 Nov 58

Toward the eastern end of King George Bay Hummock Island could be seen to present a bold scarp to the north and a strong dip-slope to the south suggesting that the southern part of the bay is synclinal. Be that as it may, the bold promontory of the Byron Heights, which encloses the bay on the north, showed, when we came to it, dips to the north. The heights rise to 1500ft or more and have a cap rock that gives rise to a hard edge with rounded spurs. They break away westwards in a rugged headland called Death's Head, which is cliffed by the sea almost all round: on the north side, however, a long graded slope of perhaps 28°, very heavily stained with rusty iron compounds, cuts smoothly across the gently dipping beds that weather so unequally in the wave-cut cliffs. Here is a remnant of the old mature topography that was formed before the bay was drowned.

We flew through the Westpoint Pass between Westpoint Island and Death's Head and turned to port to land. As Jim was just about to put the Beaver in the water the wind came from the port beam and with an exclamation he pushed the throttle open and we roared out over the houses of the settlement, just clearing the col behind. We then rounded the hill, went back through the passage, circled another hill and came in over another col from the south. Even on a fine day landing at some of these little coves calls not only for skill in landing, but an intimate knowledge of local topography and air conditions.

Between(sic) Westpoint Island I brought out the sandwiches and coffee and Jim found no difficulty in flying and drinking a mug of coffee at the same time. Here the scenery is very lovely with bold hills and islands and promontories rising above the blue waters of Byron Sound. Yet even more fascinating is the scenery of Port Egmont and Keppel Sound. Here a lacework of low yellow-brown islands lies in the blue water. Never have I seen or even imagined such fantastic shapes for islands, and it is clear that they signify the slightly higher portions of a drowned rock plain that has been almost base-levelled. To the south rose the satisfying hills of the Hornby mountains: to the north the long Pebble Island forms a barrier against the open sea with three solitary hills on it rising very conspicuously though their heights (790, 710 and 915 feet) are modest enough.

After landing at Pebble Island we flew southeastward toward the Hornby Mountains. Mount Maria, 2195 feet, the most northerly of them has its northeast flank scared by two large, wide and rather shallow hollows that might, perhaps, be corries, but may be simply due to rivation, or the rotting action of thaw-water supplied by a permanent snow bed. Conjunction terraces and stone stripes appeared to be present in both hollows, while tors could be plainly seen on the divide between. Close under Mount Maria is Port Howard camp, situated at the northern end of the narrow inlet of the same name. This lies behind the hog-back ridge that forms the rampart of West Falkland against the Sound. Landing here is always difficult with the wind from any quarter but the northeast. Jim sidled along the hill slope on the western side and made a side-slipping turn down toward the water, gave the Beaver power to fly straight, and then throttled back to land. When we were taxiing he exclaimed "Good God – I've landed down wind!" We had landed at right angles to the waves all right but they were moving in the opposite direction to those at Pebble Island we had left only ten minutes before.

Port Howard was our last call and from here we headed across the sound on an easterly course to Stanley. The view ahead was dominated by the rounded and mature form of Mount Usborne: on the right lay the plain of Lafonia, on the left more hilly country. Soon we reached the first of the stone runs, but now their features were more familiar and they were outdone in interest by the sudden appearance of the cliffed walls of corries on the northeast flank of Mount Usborne. One clutch of four smaller corries could be seen and four at least held small tarns. So this, and the possible corries on Mt. Maria which is only fifty feet lower, was the extent of the glacierization of the Falklands! What a tasty tit-bit for a geomorphologist to finish off with! But Jim Kerr had a tasty morsel of his own to finish off my grand tour. As we flew on past quartzite ridges and stone runs in plenty we gradually lost height until, when we reached Berkely Sound we were only feet above the sea. Still we continued to drop and at last when we came to Kidney Island, at the entrance to the sound, I had a splendid view of the rookeries of Gentoo penguins only just below me. We turned towards Stanley and as we turned over a sandy beach we could see a hurried scramble as two or three dozen penguins, disturbed by the noise of the beaver, made for the water and safety.

After all this the rest of the day might well have been anticlimax, but it was nothing of the kind. H.E. and Mrs Arrowsmith had arranged a formal dinner party for Captain and Mrs Blackburn, Mr and Mrs Sutton Thompson, Mr and Mrs Harding, Mrs Pitaluga and myself, and after dinner we went to the Town Hall to join the rest of the town in their Poppy Day Dance – one of the main social events of the Stanley year. At the Governor's entrance the National Anthem was of course played after which we followed H.E. a little self-consciously up the length of the room. We stayed for two or three dances, and the next being a Paul Jones the Governor elected to stay for that as well. Then we repaired to the Colony Club – being driven there though the distance can only be three or four score yards. The Club has premises in a terrace of two-storied houses looking out over the bay, and in size, appointments and

Fl19 : Embayed peneplain : 7 Nov 58

atmosphere is rather like a small country pub in the Home Counties. There I got whirled into a darts match and then into a spate of introductions to pleasant people and the Arrowsmiths had long since left when Mr Ashmore finally drove me back to Government House.

November 8th

A quiet and rather lazy day. In the morning I enjoyed a little shopping to find a small gift to take to Betty Richardson on her birthday. I then had the much greater pleasure of seeing her face light up at receiving a wholly unexpected gift and of drinking to her health and happiness.

In the afternoon a cricket match had been arranged between Stanley and Shackleton. The sun shone brightly and the cricketers' whites looked well. But the wind was chill and I for one went indoors for a coat. Little wonder that

some of the players who were overheated and chilled by turns contracted colds. For me the interest of the match was all in the first innings. Captain Blackburn won the toss and elected to bat first, sending in two of the FIDS – Barry Wilkinson and Mike Kershaw. The latter was surprised to find himself out LBW before scoring but Barry and Ian Jackson then proceeded to put on thirty runs or so for the second wicket. Derek Searle followed at the fall of that wicket and played with the kind of strength and correctness that I should have expected. With his going Tom Woodfield went in and began to take command seeing the ball well and hitting hard. Tom evidently does many things and does them well: it was clear that he enjoyed this innings. Jack Richardson joined him and survived two or three balls a little stiffly, only to depart LBW without scoring. Captain Blackburn in his turn towered over the wicket and took a few singles with a casualness that told of much past skill. But past skill did not long meet the present need and he gave a simple catch. The tail did not wag long and Shackleton were all out for 117. Then came tragedy. Shackleton had no

Fl21 : GH Port Stanley

bowler who was better than innocuous and after two or three scary moments John Green and Stanley Youngster had no difficulty in hitting their way to victory.

November 9th

Remembrance Sunday is one of the three or four important public occasions in Stanley, occasions which require the governor to wear his ceremonial dress – his blue and scarlet uniform with frogs and ….. and silver braid and massive silver epaulettes: and, of course, his plumed cocked hat. At the cathedral service he read the lesson - " Now let us all praise famous men and our fathers that beget us" – and read it very well. After the service we all made our way to the war memorial which stands on a massive platform of stone just outside the cemetery wall on the eastern side of the town. The girl guides, boys' brigade and the Falkland Islands Defence Corps were already lined up when we arrived. Shackleton's officers took up positions behind the memorial facing the sea. Punctually at 10.54 H.E. and Mrs Arrowsmith ascended the long flight of steps between the unnaturally solemn faces of the uniformed boys and girls. The service was conducted by three clerics of the Anglican, Roman and Scottish churches and wreathes of poppies were placed on the memorial by H.E. and others. A gun boomed out and for a long two minutes there was a rather self-conscious silence. Then the gun again and three bugles blowing the Last Post before one of the clerics began the National Anthem in a rich carrying voice. At last with another "Royal Salute" by the Defence Corps, the governor departed and all was over: the people hurried away to warm their chilled bones, leaving the insidious thin wind to blow wave patterns in the dry white grass and to flutter and pluck at the paper blossoms of the poppy wreathes.

No better than the others I was glad to be taken into the Hastings' hospitable house and offered a whisky and soda and to stand in front of a blazing peat fire talking to kindly people. And it flattered my vanity inordinately to be made much of by everyone.

By afternoon the grey skies had given way to bright sunshine and if one sought protection from the south wind one found the sunshine quite warm. I went out to watch the football match between Stanley and the ship but it was altogether a one-sided affair and in fact Shackleton lost 11-3. I returned to my room to write Christmas cards – Christmas cards which are not likely to reach their destinations in Britain until the New Year., for they cannot leave the Stanley until the Darwin sails for Montevideo on Nov 23rd. As I was writing I heard the patter of raindrops on the bushes outside the window and looking out I saw a cricket match in progress. I learned afterwards it was quite an exciting match, each side batting through twenty overs and both ship and town doing well. So keen were they that they did not come in for the rain, but when next I looked

the field was empty. An hour later the sky had cleared again and the setting sun was turning the whole horizon into luminous gold. This seems to be very much the nature of Stanley weather – with many quick changes, much low cloud and wind driven drizzle, but little really heavy rain, and brief periods of sunshine. The one thing that is constant is the never ceasing wind.

November 10th

A day of meetings. In the morning a conference in the Governor's office between H.E., the colonial secretary, John Green, Captain Blackburn and myself to discuss the programme of the Shackleton. John Green explained the programme he had worked out and the reasons for changing radically the provisional programme envisaged when the Shackleton left Southampton. In essence because of ice conditions, the order in which the bases are to be visited has been changed and we are to go first to Signy Island which is ice-free, and then, if possible, to Hope Bay, which is ice-free at the moment but may be closed at any moment by movements of the Weddell Sea pack ice. Then, because men have to be collected from several bases to carry out summer work elsewhere, the ship must visit several bases as quickly as possible, carrying out routine unloading of stores at the same time. With these tasks accomplished about Dec 10th-12th, Shackleton can give time to my research programme and hydrographic survey of its own. We shall, no doubt, spend Christmas at a base – possibly at Deception Island. Then we work south to further the remainder of my programme and, if the ice conditions permit, to relieve the base at the Argentine Islands. I could hardly have asked for a more generous allotment of time and opportunity, and hope now that weather and ice conditions will allow me to make the most of it.

In the early afternoon I joined the FIDS while John Green explained to them the itinerary to be followed by the ship, and the particular work to be done at each of the bases during the coming season. At 4 o'clock I slipped away to keep an appointment with Mrs Cahell at the Broadcasting Studio. She asked me about a talk about my work for FIDS, but fearing that if I prepared a script it would be too formal and didactic I had suggested that she should interview me – if she asked me questions about myself I could, in fact, indulge my vanity to a degree that decency would not permit in a scripted talk. She had never done this before and was obviously reluctant to do so now but she consented. We went to work and proposed some questions and then talked for about five minutes. After playing our dialogue back on tape we essayed another five minute burst and after that a third. At the end we both felt fairly pleased with ourselves and hopeful that the product will be acceptable when broadcast.

The day closed with the cocktail party given by the Captain and Officers of SHACKLETON and the FIDS on board ship. Captain Blackburn was waiting on the jetty to receive guests and Mrs Blackburn on the foredeck. FIDS in smart suits posted at strategic points directed guests in the way they should go. The decoration of their lounge was as attractive as their arrangements were efficient. Of course the pressure on space was terrific, but I have no doubt I was in Parkinson's main stream for there I met H.E. and Mrs Arrowsmith in due course. And there I was invited by Mrs Ronald Stokes, whom I seem never to have called anything but Audrey, to her house for more drinks. I said yes as we parted. Before long she came to claim me and so to her house for what she herself described as a mad party with drinks, dancing and laughter

November 11th

Perhaps I should not be surprised that I got no sleep last night. Without being either restless or disturbed I watched the hours go by and the daylight come behind the curtains, now reading a bit, now daydreaming. I rose and bathed not feeling tired or in any other way the worse for the previous evening's gaiety: but I knew that would not be so later in the day, for I had asked Derek to accompany me in a day's field work on the stone runs.

We began with the run that is being used as a quarry, and were at first more puzzled than illuminated by what we found. We were impressed by the size of the surface stones, by their intricate arrangement, and by the rounding and iron staining of the lower stones. But when we examined the degree of weathering we encountered puzzling features, so we recorded them in our notebooks and moved higher up the run to eat our sandwich lunch. As we sat there we gave thought to our surroundings Where we sat there were tongues of heath vegetation (with the diddle dee berry (Empetrum Rubrum) and the fern (Blechnum) growing on a thin peaty soil between ribbons of stones. The latter were obviously drainage lines – they had the convergent pattern of confluent streams, and even more convincingly, one of them was dammed to provide part of Stanley's former water supply. A little further up the valley white grass vegetation grew on thinner peat soil and the ribbons of stones became less marked and partly covered by heath vegetation. There seemed indeed good evidence that the area of stones has been growing by removal of the finer

material which could form soil and nourish grass vegetation but has been progressively washed out from between the stones.

At the head of the valley were many outcrops of quartzite which astonished us by their weathering features. The effects of frost weathering were clear enough in a few places – but always beneath overhanging rock masses. Surfaces exposed to the sky, especially to the south west, were heavily encrusted with lichens and deeply rotted along bedding planes and joints. Cups and hollows pitted the surface. Cavities had been etched out on the sides of blocks. In places we could pass a finger behind an isthmus of still unrotted rock: in others the uppermost layer of a rock mass had become weathered away above and below till it was reduced to a completely detached piece of irregularly shaped stone resting on its base only at a few points. Manifestly chemical and equally manifestly going on today under the atmosphere, I can only conclude that the organic acids produced by decay of the thick lichen crust must play an important part. But at once a new problem is posed: if sub-aerial weathering is so intense, how could any block have found its way down the stone run we had just examined without being weathered out of all recognition? It becomes almost necessary to suppose that they were not in fact exposed to weathering during their descent.

FI22 : Section at Port Stanley

Next we ascended Tumbledown Mountain – a mountain indeed though only 884 feet above the sea. The crest is a quartzite ridge of raggedness and ruggedness unequalled in my experience. In places huge irregular masses, weighing hundreds of tons, rest, without attachment, upon steeply sloping, bedding planes of stripped quartzite. In others the crest has been pierced by holes that one may creep through. Everywhere are deep clefts and irregular broken masses. Here, again, is evidence of very intense attack by the elements upon the solid rock: yet here too is a paradox. Below the fresh-riven crags of the Dolomites or the slates overlooking Wastwater are great accumulations of fallen debris: the lower slopes are entirely buried in scree. Below Tumbledown Mountain the steeply sloping quartzite slabs give way at once to vegetated slopes: the vegetation covers boulders it is true, but there is no talus in the ordinary sense. Yet further down hill where the slopes are gentler bare stones are abundant in the form of stone stripes. We found that, on close inspection, they greatly resembled the ribbons of stones at the place where we had eaten our lunch. They were more regular but in essentials the same: ribbons of boulders ten to twenty feet in width alternated with ribbons of grass and diddle dee shrubs of the same width. With flat stones and our hands we tried to dig through the peaty soil of one of the vegetated belts, and after much trouble getting through the tough woody roots and the diddle dee our progress was arrested by a large stone. We did not try again but believe that below the vegetated zones lies fine grained matter that has been washed out from the stony ribbons. Passive washing however is not the whole story. For in some cases a stone ribbon comes to an abrupt end towards the valley: in all such cases that we saw the cause was plain. A vast boulder the size of a room, or an outcrop of solid rock barred the way down hill and on the upstream side the stones were driven against the obstacle with their long dimensions parallel to it and each other, and in some cases even piled one upon another above it. Such an arrangement speaks clearly of a mass movement of the stones downhill: but it does not tell us whether that movement is something that ceased long ago or whether it goes on today.

By this time I was feeling the effects of my sleepless night. Well content with our observations and with plenty to think about before all would fall into some ordered explanation we turned our steps for home. The sky had long since clouded over and the rain overtook us on the last hill. Derek turned aside to visit his old companion at Base Y: David Jones. I, after changing, repaired to John Green's house where he and his wife entertained three of the FIDS and myself to a most pleasant evening.

November 12th

Audrey's birthday, and so to her house in the morning in the rain to take her a small present and wish her many happy returns of the day: only to be caught up in what became a pre-lunch birthday party!

In the afternoon I walked along the shore of the bay and was delighted to find there, where the waves had cut little cliffs, sections that fully confirmed the conclusions I had drawn from the small exposure above the playing field. The evidence of sludged material with unweathered quartzite blocks, overlain by the peat, or in turn lying upon a layer of deeply weathered base rock was particularly convincing. So pleased was I with this that, coming back to Government House, I infected H.E. with my enthusiasm and he asked me to take him to the exposure above the playing field and show him what I saw there. This I did most willingly and found him very appreciative of the facts and the inference I put upon them.

After dinner we listened to the broadcast of my interview by Vivien Cahill. Both H.E. and Mrs Arrowsmith obviously enjoyed it and assured me that others would too. And when Mrs Arrowsmith had retired H.E. sat talking and questioning me as he had done on the evening I first arrived. He has given sailing orders to Captain Blackburn, which give great prominence and opportunity to my physiographic work, and for this I am very grateful. On my side I can do something to further his (and my own) desire to see the Royal Research Ship SHACKLETON living up to her title, by making the most of the opportunity he has put in my way.

November13th

The wettest morning we have had in Stanley. A pitiless wind from the southeast driving a thin small rain that penetrates everything. FIDS arriving at the FIDS office had to stand in front of the fire till their trousers dried. A day to stay within doors, and one to make me glad of my pleasant room with its electric fire and its writing desk beside the window. There I wrote the rest of my Christmas cards and my letters for home. The sailing of the SHACKLETON has been delayed to await the arrival of the DARWIN from Montevideo, bringing mails for the bases. But the DARWIN arrived this morning and we shall sail at 8am tomorrow.

To the post office in the morning with all my mail – though to be sure I could not remember it all at once and had to make two journeys. Fortunately the rain had much abated. At the second journey I went on to the F.I.C. West Store for some small purchases and on the way back met Ron Stokes. So I came again to Audrey's house and from there was taken to that of their friends and neighbours Mr and Mrs Crease. Although they had arrived only that morning after a year's leave in England and a tempestuous journey on the DARWIN they seemed only too pleased to entertain a stranger, so that I was all but late

ANT 1 : Wave thrown from bow of RRS Shackleton :15 Nov 58

for dinner at Government House. And how pleasant that meal and how friendly my host and hostess. As we lingered over coffee and a last liqueur they suggested I should leave behind the clothes I should obviously not need in the Antarctic and they would be pressed and laundered for my return. So we parted looking forward on both sides to meeting again when SHACKLETON returns in mid-January.

November 14th

A *dies non* – a day of general misery and unhappiness. A grey sky, wind and rain were our lot when we came to Stanley and again when we left it. Neither Mrs Blackburn nor Mrs Richardson were happy at having to leave the ship and join the little group assembled on the jetty, and I felt particularly sorry for Betty Richardson who has contributed something to the life of the ward room which we shall sadly miss. I went onto the jetty to shake hands all round and should have been gratified, when the ship had actually cast off, by the warmth of the waving from all who were there when somebody shouted "Goodbye Prof." But had Tom Woodfield not pulled my leg about it at breakfast I fear I should not have realised or remembered that I had been specially favoured. He alone seemed to have any spirit or appetite. At lunchtime matters were even worse. We were butting most uncomfortably into a southerly gale. Thanks to a dose of Avomine taken before sailing I felt able to eat a square meal, but both Tom Flach and Jack Richardson sent away their plates untouched, and the radio officer, Reynolds, dined on dry bread and water. After lunch I believe we all took to our bunks and after a dinner that was as unrelievedly gloomy as lunch I suspect we all went early to bed.

November 15th

Betty Richardson's place at table has been taken by a new passenger – Peter Canning, the senior meteorological officer at Stanley, who will make a tour of the bases. He seems to have more appetite than the others but I feel almost guiltily gluttonous in being the only one beside Alan Bosher to eat a full meal: especially when I know that were my stomach not lulled by narcotics it would be more rebellious than any! However I have eaten well and spent a most enjoyable morning on the bridge trying to take a photograph of the bow of the ship as it plunges down the back of one great wave and into the front of the next to send up sheets of water that the wind drives stinging across the foredeck and across the bridge.

It has become bitterly cold, and the effect is even more marked because of the strong wind. Air temperature at noon yesterday was 48° F, at 4pm 47° and at 8pm 45°. But during the night it fell rapidly to 37° at midnight, 35° at 4am and 34° at 8am. At noon it rose to 36° and has remained at almost 35° ever since. The only beings that seem at home in these conditions are the birds. An attendance of Giant Petrels and Cape Pigeons has been with the ship all day. The Giant Petrels and Cape Pigeons with their dark bodies and humped backs, their greyish heads like the heads of hooded crows, and their great wing span and gliding flight like that of the albatross, impress me as almost sinister, especially when one glides up from astern and hovers only a few feet above the boat deck. Seen thus close to with a body as big as a raven and a wing span of 6-8 feet they look almost as big as albatrosses.

November 16th

At breakfast Tom Woodfield greeted me with "Well Prof. we crossed the Antarctic convergence last night." The record of the sea water temperatures from the ship's log shows that all through the day the temperature was in the upper thirties though with a dip down to 33° at 2pm. At 8pm and 9pm it was 37.5° but at 10pm and 11pm it was 31° rising to 32° at midnight. During the night it continued to fall and was 30° degrees at 4am, 29.5° at 8am and 28° at noon. Air temperature has fluctuated about 30° or 31°, and since the anemometer is still recording speeds around 25-30 knots, a duffle coat on top of indoor clothing is by no means adequate protection. Derek and I were well content to spend the day in my cabin working on the South Shetland photographs. Just after lunch, however, Derek went on deck for a breather and came back reporting a Snow Petrel and going up to the bridge for a chart a few minutes later I saw it for myself. This practically pure white petrel is surely one of the most beautiful of birds, but our interest in it was mostly because of its reputation of never being seen more than a few score miles north of the Antarctic pack.. We had sighted one iceberg at a distance of four or five miles before breakfast and now all of us were expectant. Nor were we to wait long. About four icebergs could be seen ahead shimmering palely between the grey overcast sky and the sullen sea. As we steamed towards them they became more distinct and could be seen to rise above a white line drawn on the sea. Was this the pack? Gradually the white line became a narrow band with a darker band beyond, and the white band resolved into a sort of boundary to a sea strewn with bergs. When we reached it we found it composed of pieces of floe ice rafted one upon another heaving and falling with the swell. It was not continuous and we steamed through a broad gap in it into a different world – a field of bergs. By coincidence perhaps – but perhaps not – we steamed at the same time out from under the grey ceiling of stratocumulus into blue sky and sunshine.

The next two hours were two hours in wonderland. Bergs of all manner of shapes and sizes seemed to ride towards us from the southern horizon gleaming and flashing in the sun and some lay towards the north. Some were of the tabular form we expected with great cliffs of ice a hundred and more feet high

fretted by the destructive action of the warm water at their bases so that collapse had occurred and given rise to magnificent arched caverns. On their walls and vaults the ice was intensely blue – not “green as emerald” as Coleridge has it, but a clear cold Prussian blue. Most of the tabular bergs showed horizontal stratification and were capped with a white surface layer presumably last winter’s snow. More numerous were the bergs of irregular shape which in some cases had resulted from the break up of the great tabular

ANT 3 : Tabular bergs 58ºS : 16 Nov 58

few vast caverns in bold cliff walls that at the southern end appeared to top 200ft. In the end hunger and cold feet and hands drove us in to dinner, and as dark fell we had passed out of the main concentration. Bergs were still to be seen but none were near us. Nevertheless the master proceeded cautiously and a minor flap occurred when about 9pm the radar apparatus failed and was out of action until “Leeky” diagnosed a faulty crystal and replaced it.

November 17th

I was awakened by the unmistakable shudder of the ship making impact with the ice. Going up to the bridge I found we were proceeding slowly through very open pack – probably only one eighth of the sea being ice covered. Tom Woodfield was giving directions to the helmsman. “Port five”, “Port five on sir”, “Midships”, Midships, sir”, “Midships on sir”. I watched admiringly how well he estimated the way of the ship, the amount of helm to apply and the moment to apply it so that the ship would be turned by the right amount at the

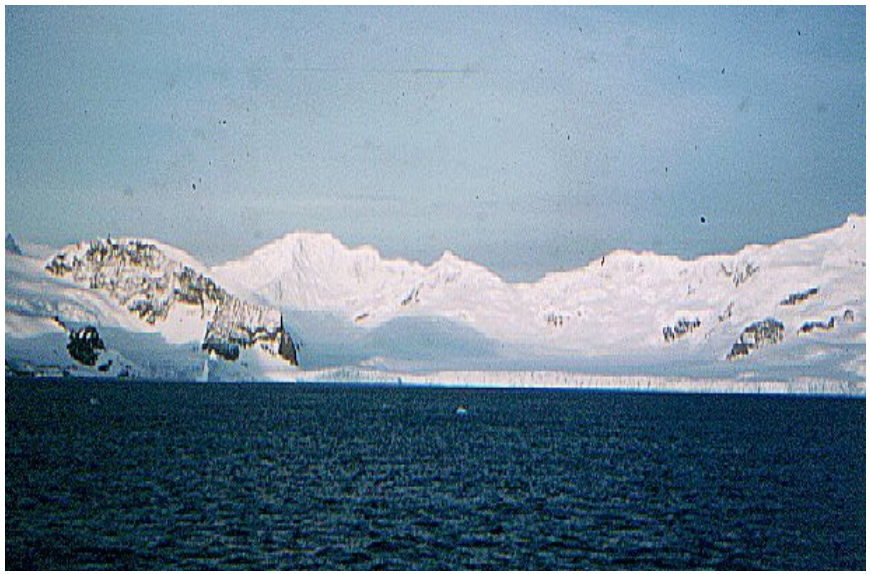
ANT 7 : Landfall – CORONATION IS. : 17 Nov 58

right moment. We weaved our way between the floes and bergy bits. Then ahead lay a continuous belt of floes across our path. Tom scanned it with binoculars, selected the narrowest portion and made for it with reduced engine speed and propeller in fine pitch. Gently, but with steerage way on the ship, we nosed into the gap and shouldered the ice aside. The ship shuddered but the ice being sodden and rotten disintegrated and gave way. Apparently we had entered this open pack about six: by nine o’clock it had given way to another field of bergs with scattered bergy bits and growlers, among which a killer whale appeared now and then to blow and roll over like an oversize porpoise. The sky was overcast and the sea grey and although there was never any lack of subjects the conditions did not encourage photography. But about 10.30 it became clear that the peculiar ochrous light beneath the cloud canopy fine on the port bow was the ice that covers Coronation Island – the largest of the

South Orkneys. We had made our first Antarctic landfall and the occasion surely warranted a photograph with the aid of a long focus lens.

As Coronation Island took shape, the steep bold rock pyramids of the Inaccessible Islands gradually rose above the horizon dead ahead and held our attention. By noon we were astern of them – these outsize haystacks of rock, the two larger rising about 700 and the smaller 400 feet above the sea. Their sides rise almost sheerly from the water, but their upper parts are gentler and carry a capping of snow. These gentler slopes, at 35-45°, may once have been hill slopes grading gently down to the coastlines of much larger islands, but of those coastlines and those lower slopes all trace has been consumed by the waves that are still undermining and undercutting the cliffs.

After lunch the ”Inaccessibles” had fallen astern and all interest centred on the west coast of Coronation as it slowly unfolded itself. I sketched until my hand was too cold to control the pencil. Cloud level was about 2000ft and getting lower and the lighting was flat and perhaps for this reason, or perhaps because of the harsh contrasts between white snow and black rock, everything seemed to possess only two dimensions. I sketched the whole panorama of the Coronation coast with the Larsen Islands in front of it without realising I had drawn any islands at all! As we approached Return Point at the south west corner of the island a fine panorama opened up of Sandefjord Bay, enclosed by rocky points and backed by three snow capped peaks. Through binoculars the



ANT 9 : CORONATION IS from S : 19 Nov 58

peaks appeared to be thickly coated with bulging masses of snow with great open crevasses opened up across their convexities. The contours seemed to have as little relation to what I imagined to be the outline of the hill beneath as those of a diver’s suit have to the figure of the man inside it. From these lollipop mountains ice descends in an almost continuous apron steepening in places to ice falls, to the coast. Out of this apron project the seaward remnants of rock divides, like those at Return Point, with a moraine line to mark its buried course uphill. I suspect that snowfall and discharge here are both heavy and that divides did exist here formerly but have been almost entirely eroded away.

As the south coast opened up new features were disclosed – the long ice cliffs of Norway Bight, a shapely pyramidal peak formed by the sculpturing activity of three corrie glaciers almost at sea level, and then the rocky forms of Signy Island conveying a suggestion of coastal benches. On the south coast of Signy two more amphitheatres at sea level, appeared to be corries, and a little beyond a hill glacier with a well-marked medial moraine broke away in ice cliffs in which the moraine was exposed in massive section. So round the low ice-moulded peninsulas and islets of the southeast corner, past the drowned corrie of Paal Harbour toward our anchorage in Borge Bay. There was the flag flying from the anemometer mast on the hill, and another above the base hut lower down. We crept in between two rocky islets and let go first one anchor and then the other. It was six o’clock, and we had arrived at our first Antarctic port of call. Low rocky knolls rose behind the bay as they do behind many a bay in Sutherland or Wester Ross: but vegetation – at its most abundant for the Antarctic – was limited to a velvety green-brown sheen of moss on some of the slopes, while great snow patches or even what might be called “snow patch glaciers” filled quite casual seeming hollows right down to sea level. In the other direction the south east coast of Coronation Island stretched out a twenty mile panorama of glacier and rock. I thought I could read some order into its awe-inspiring grandeur and diversity and promised myself I would work out that order by making a section – tomorrow. Derek and I looked with great interest at a sea-level corrie behind Hansen Point[17] that appeared to be both interesting and accessible and promised ourselves we would examine it – tomorrow. But at the moment we looked impatiently, and in vain, for some sign of life from the base on shore. In the end, growing chill, we went below to take off our outer garments and get warm. In due time the motor boat was put over side and in due course returned with the base leader, Paul Richards, a hefty young meteorologist in the best of rude health. Soon he was introduced to the new faces and grinning at us over a double whisky. All was well at the base. The chaps would come aboard tonight for a film show and unloading would

begin – tomorrow. One of his men had busied himself on matters that might be of interest to me and I would see him tomorrow.

After dinner I annotated my field sketches and read a memoir on the South Orkneys, but later I went back to the ward room and Tom Flack and I prepared ourselves some coffee and biscuits. Tom said he must reset the anchors in the morning – the glass showed signs of falling and he was never happy in this rocky anchorage. I turned out the light and put my head out of the port. The water was lapping gently against the silent ship and the land loomed darkly ahead with the snow patches visible as a lessening of the darkness. Sometimes the warm air from the cabin and sometimes the air fanning gently across the ice cold water brushed against my cheek. Away in the distance was a faint clamour. Was it the yapping of birds in a rookery? Suddenly near at hand was the hoarse bark of a seal. Tomorrow I would make my first landing in Antarctica.

I went to bed but not to sleep. About two o'clock the sky became pale blue behind the cabin ports and there was a little noise of wind and water swishing past. I must have slept.

November 18th

About six Iwas awakened by the vibration of the ship's engines and the raising of the anchors. I looked outside. A wild wind had whipped up white horses in the bay and low cloud and sleet all but obliterated the land. Flack had been quite right and he was now shifting our anchorage. All morning the weather continued much the same though some 230 bags of coal have been transferred from ship to scow and from scow to jetty. The captain, Jack Richardson, Pat Cumming and the radio officer have all made visits of inspection ashore. I planned to go ashore after lunch but the wind at 2 pm was about 35 knots and raising a nasty sea and as the motor boat is apt to ship water under such conditions I agreed to wait to see if conditions should improve later.

About 4.30 the wind had dropped considerably and Derek and I dressed appropriately and were put ashore – or rather (were) taken to the very substantial jetty that the lads have built on a sunken scow. The base leader took me up to the hut and introduced me to Jim Stammers who first produced for me the report by the geologist who was at Signy last season, and then came out with us to show us around and see we did not get lost in the mist that still shrouded everything above 200ft. Immediately above the base hut we found ourselves confronted with a magnificent series of vegetated stone stripes, each stripe about a yard in width, the fine material being clothed in a thick fill carpet of liverworts and mosses, the runnels of coarse stones with a shaggy carpet of buff-coloured lichens and pale yellow-green reindeer moss. A few score yards up the slope the stripes gave way to a different pattern of talus tongues, and a little further brought us to rock outcrops of quartz schists and a big snow patch from which we looked down into the amphitheatre of Paal Harbour. But cloud was below us and around us and we could learn little of its origin. We followed the ridge and came to a flat col where the ground was patterned with polygons in which a centre portion about a yard across of fine water-holding weathered debris was surrounded by a yard wide band of coarser stones. A little further on was a band of close-packed stripes in which ribbons of frost shattered schist with split laminae standing on end alternated with coarser and more blocky fragments. Everywhere the hills seemed covered by a mantle of weathered debris which had been thrown into some sort of pattern by freeze-thaw processes. We descended to the margin of a small glacier and here were rock outcrops with ice-moulded forms – whale backed towards the ice and abrupt and shattered away from it. But even these forms which had presumably only recently been exposed were covered with lichens and already sufficiently weathered to have irregular detached stones lying upon them. A fine moraine margined the glacier with an outer bank overlooked by a very fresh inner bank: snow lay in the vallum between. Here we found large slightly rounded boulders as well as an assortment of glacial rubbish of smaller sizes that is already being sorted to produce the beginnings of soil polygons. We were interested in blocks of foliated gneiss bearing large red garnets, and in a dark green hornblende schist or amphibolite that was clearly erratic. On the moraine we put up a black-backed gull from her nest with three eggs, and stumbled upon a tern's nest with two. Descending to the shore we crossed the tide cracks onto bay ice and looked back at the ice cliffs of the glacier which by its regular banding and morainic layers appeared to be of simple structure. And so back over the hill with another fine display of stone stripes and down to the jetty where the boat was waiting to take the FIDS from the base to enjoy a meal on the ship and bring us home. Thus my first Antarctic shore excursion revealed a land with many features that could be matched in Iceland, much less vegetation and a greater intensity of weathering and more active patterning of the ground than I have previously seen anywhere.

November 19th

(The) weather was still indifferent this morning with cloud lying low over the hills and a westerly wind raising a chop on the sea and driving showers of sleet and snow before it. But it was not so bad that stores could not be offloaded and

when I was asked if I would like to be put ashore I said yes. So when the scow had been towed ashore and the shore party were unloading her, the motor launch returned to the ship for Derek and myself and took us northwards to the shore of Coronation Island. There I had noted a bay just east of Hansen Point[17] which looked to be a sea-level corrie with a small remnant of the corrie glacier still in it and a lip of rock showing beneath the glacier ice. As we approached the lip of rock turned out not to be just beneath the ice as it had appeared through binoculars from the ship, but an island in the south of the corrie. The floor of the latter, in fact, was below sea-level and the island could best be interpreted as a remnant, spared by the waves of the rock bar at its mouth. The glacier occupied only a recess at the inner end and another, more shallow recess on the south side was occupied by a snow patch. We found an excellent natural jetty made by a boldly jointed rock outcrop and were put ashore with our tent and sleeping bags and – incredible enough a radio telephone. As the boat stood off we carried these things to a suitably high, dry and sheltered spot, weighted them with stones and set off up the hill. First, however, we had to go through a rookery of Adelie penguins, with nests of heaped up stones and a couple of eggs. Some squawked at us as we disturbed them, others were craning their necks with their mates and squawking at each other. But the noise was less unpleasant than the sickly sweet pervasive stench of the place.

We climbed up a slope littered with the debris of past falls of rocks from the ice-worn cliff above us. Each stone was coated with pale green, grey and yellowish lichens, and in places reindeer moss grew shaggily straight, it seemed, from the stone. We climbed up to the right arm of a long snow patch to come out on the ridge crest and this we followed over ground covered with fresh debris and carpeted with mosses. At about 400ft the ridge was interrupted by a small cliff which provided an excellent viewpoint and shelter from the wind. Here we ate our sandwiches looking out over the lower slopes of the corries descending to Iceberg Bay, and regaled, whether we liked it or not, by the powerful belching of elephant seals we could see far down on the beach below. As we ate we heard a quite different noise on the cliff behind us and then, when we looked, we found first one snow petrel and then another sitting on her nest tucked far away in joint cracks in the rock.

My intention was to climb the steep end of the ridge on to the flatter ridge top and work round the lip of the corrie to the head of the little glacier and learn whether ice had descended into the corrie from outside. We clambered round our little cliff and kicked steps up a steep snow slope onto the ridge proper and followed this upwards. In places it was covered by a thick continuous carpet of mosses, frozen hard and dusted with frozen snow from the showers of early morning, and on a 30 degree slope this did not seem very safe going – but it went. Then we clambered up a rocky bit and found ourselves suddenly at the beginning of a notch in a knife-edge arête. On our right the ground fell away in a cliff whose existence we had not suspected: on the left was the one we knew. Between was the edge of well-jointed fresh shattered stone. One block we could see, about the size of a chest of drawers, was perched quite loosely, adhering simply by friction to a strongly inclined bedding plane. Fifty feet higher up the two slopes appeared to draw apart leaving room for a piece of smooth ground – the possible pre-glacial surface I wished to examine. But we deemed the notch between, with its icy surfaces and loose rocks to be more than a little unwise and reluctantly descended.

We retraced our steps to our lunch spot and then continued down the further slope toward the western corner of Iceberg Bay. Soon we were intrigued by a flat shelf about 15 yards across and 50 or 60 yards along the hillside and about a hundred feet above the sea. Could it be an ancient wave-cut platform, now elevated? We could not find evidence to settle the matter, but descending a little further found ourselves on a tiny remnant of a shelf cut in the rock and encroached upon by the modern sea cliff. The height was 45-50 feet above the sea. From this point we could see other fragments of the same shelf near at hand. Here we felt was a clue to follow, and some recompense for our disappointment on the ridge.

While we had been thus occupied the clouds had shown signs of breaking up and the wind had become very strong and gusty. Now the clouds broke finally apart and the sun shone through. The wind was very strong and cold and for a short time round to the south west. Clearly a very marked cold front was passing and we could expect clearer skies and good visibility for a few hours at least. Now that the sun was shining our attention was drawn up to it and so to the cliff above us, and on the top of it the ridge we had recently left. We could easily identify the point we had reached and the notch in front of us. To our horror we found that the ridge was even more shattered and precarious than we had thought – we could see the sunlight underneath some of the wedged blocks!

We wandered down to the beach partly to erect the aneroid barometer, and partly to look at the elephant seals. They lay in clusters like enormous slugs breathing stentoriously while dozing, and from time to time emitting their reverberant belches with head and neck raised and mouth wide open. A vast bull, fifteen feet long or more, lay by himself: he was half or three quarters of a

century old but Harrison Matthews in his account of the natural history of the elephant seal tells us that they are mature at two years old: cows are impregnated at this age and bachelor bulls would cover cows if they were not kept away from them by the old bulls that jealously guard their harems. Their rate of growth is truly remarkable. When we disturbed him our old man raised himself on his fore flippers, pivoted round on his belly and ambled down to the beach. Putting his fore flippers forward he raises his shoulders on them and then shrugs himself and his vast bulk shuffles forward like an immense bag of jelly. But having covered the ten yards to the water's edge in record time he seemed utterly exhausted by the effort and sank down in his tracks and to all appearances went to sleep.

Leaving the elephants on the beach and in their wallow on a rocky platform above it, we made our way through another large penguin rookery where the Adelies were sitting on their eggs, but the Gentoos were wandering around without any thought at all for nesting and parental responsibilities. Perhaps their nesting time is not yet.

We returned to our remnants of the elevated wave-cut platform and resolved to follow it round the headland if possible. This in fact could not be done since present day wave attack has opened up inlets that cut back through the rock shelf to the cliffs behind. But going once more over the crest of the ridge and descending to the point we were rewarded by finding the shelf very well developed indeed.

While thus engaged we heard a rifle shot and soon located a boat party under Tom Woodfield killing seals on the ice floes in the bay. These were required for dog meat for the teams at the Hope Bay base since seals around the base were becoming very scarce following an epidemic disease last year. When seven seals had been shot and gutted they were left on the ice and the boat party came to take us back to the ship. The wind was still fresh and the sea lapping considerably: but the sky was clear and the main mountain axis of Coronation Island stood out for the first time white against the sky. Yet when we passed a berg floating in the bay with its wonderful tints of green beneath the water and intense ultramarine in the deepest cracks and fissures of the berg, the white snowfields were cream coloured by comparison. An hour later the cream had deepened and become tinged with peach on the upper peaks, while already the lower slopes were shadowed by the violet grey of twilight. How lovely is this landscape.

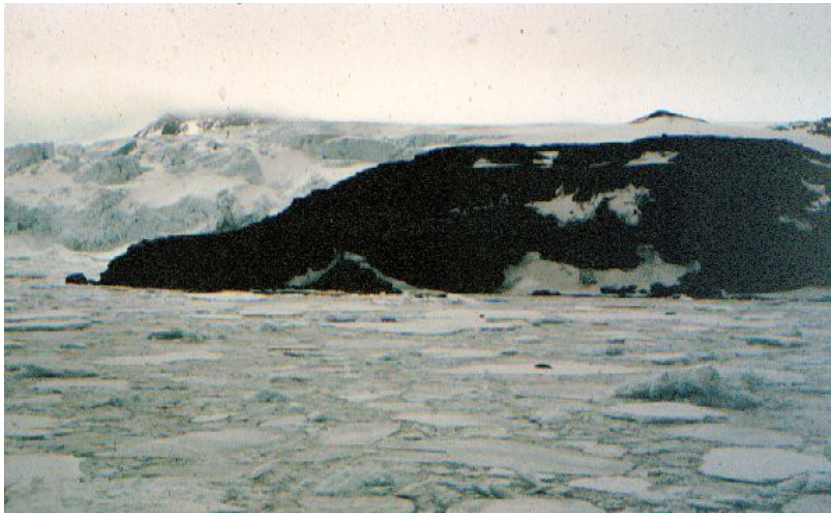
November 20th

Even before we went to bed the wind had gone back to the north and the barometer had begun to fall. In the small hours I woke and looked out. The wind was whistling and the sea slopping against the ship. In the twilight the hills of Signy Island that had yesterday been powdered with fresh snow were now as stark black and white as a Friesian cow. The warm north westerly wind had melted the powdering of snow leaving a landscape of old snow patches and dead black rock. At breakfast the cloud was down to 500ft and at times sleet or snow was blown by in the wind. Nevertheless when I was asked whether I wished to be put ashore I quickly said yes. The motor launch was busy so the motor boat was lowered but unfortunately the cooling system of the engine failed to function: after an hour of attempts to remedy the defect the motor launch returned – for lunch – and the boatswain took us away in that. We rounded Cape Hansen hoping to land on the further side and reach from the back the top that was denied to us yesterday. It was denied again today. The wind had packed all the broken up winter ice and stray bergy bits from Normanna Strait against the westward facing shore and nowhere could we approach the rocks to land. We approached the next promontory and immediately in its lee found a place where we could get the boat against the rocks. Quickly we got the tent and sleeping bags ashore, and as the boat chugged away, looked for a way up the rocky cliff. This we found up a snow gully, but as the top was icy Derek went down again and carried up the gear treading in our steps in the snow till he came to the icy part. Here he attached the gear to our rope and I hauled from a rock above. Having got everything up we found a sheltered spot, sat on our sleeping bags with our backs against a rock and ate.

Our promontory turned out – as I feared it would – to be an island, so all thoughts of reaching the Cape Hansen ridge were quite vain. Yet our island proved to have plenty to offer us. It was not long before we found ourselves on our 50 foot wave-cut platform and during the afternoon we traced it right round the island and located it on Cape Hansen, on a …… promontory in Marshall Bay, and across Normanna Strait at the north cape of Signy Island. At the latter place we could see a higher bench and apparently at the same level as a higher bench we examined on our own island.

From the western end of the island we saw an absorbing spectacle. Two great flocks of shags were fishing, the birds settling on the water and then after half a minute or so a series of plops and splashes would mark where birds had dived for fish. In one case the fish must have been in a dense shoal just beside a little

berg: the shags were so thickly clustered that we could hardly see the water between them till they dived and, as the fish shoal moved slowly round the berg, so the flock of shags moved with it. The second flock was arranged in much more open formation and their quarry evidently moved along shore and became strung out in a long line which was marked by fishing birds over at least two hundred yards. Most intriguing of all was the way in which the birds at the rear of the flock having got their fish would leapfrog the diving birds, and the newly settled birds in front of them, and alight at the head of the queue, only to be leapfrogged in their turn by the birds now in the rear.



ANT 10 : CORONATION ISD : RB platform in Marshall Bay

As it was now approaching the time of our rendezvous with the boat we returned to our landing place and were a little concerned to find that more ice had come in and lodged against the shore since we landed: in fact our actual landing spot was not now accessible, but looking down from a high rock above we could see an even better spot a few yards seaward that was still clear and likely to remain so since a largish bergy bit had grounded a few yards to windward. This kept a little space of water clear in its lee, but a constant stream of brash ice was settling into the bay. In it was a small floe with a solitary penguin passenger. We watched him for some time. He seemed most intent on something, but we could not for the life of us see what it was. He walked up to the forward end of the floe and stood there craning his neck this way and that, as though looking for his lost love. Before long the floe reached the end of the brash accumulation in the bay and began to plough its way in. Almost certainly the tidal current was carrying it forward by virtue of its underwater bulk, but the wind no doubt helped. Still the penguin strode his deck, peering about for something he could not find. Then, seeing three of his friends porpoising in the open water, he abruptly dived off his floe and disappeared. Passively waiting for the boat was likely to be a chill business so we moved off to keep warm and shortly raised a dozen or more skua-gulls that wheeled about our heads mewing in agitation. Clearly we had wandered into their rookery, and sure enough, there were their nests. Built on little rock eminences, rather than in hollows, of heaped up stones and elaborately lined with the moss that grew abundantly here, the nests each contained three large olive brown eggs speckled and flecked with purplish brown. We withdrew a little and watched the gulls wheeling. Not for a long time would they settle, and we wondered if the eggs would not suffer from the cold by being so long uncovered. At last one by one they settled, yet even then not on the nest but on a nearby rock, and in many cases only to take wing again. So we left them, but when we returned and all was once more quiet, we saw that each bird had an attendant lookout standing on some rock nearby.

We descended to the beach and amused ourselves by disturbing some elephant seals. From the vantage point of an overhanging rock Derek prodded the back of a large bull with the point of an iceaxe. The bull at first paid no attention, then suddenly pulled himself clear of the rock and swung round on his belly rearing up his head and the forepart of his body and belched ferociously at the intruder: presumably not liking what he saw he propelled himself rapidly across the few yards of shingle into the water and took himself off. The bay being full of ice he came quickly to an obstruction, and attempted to climb out onto the ice. Head, flippers and forequarters came up but as he attempted to raise his centre of gravity over the ice edge his progress became doubtful. For long seconds he was poised half in and half out. Then gravity took charge and he was slowly engulfed, shoulders, head and finally the tip of his nose. He disappeared for minutes while we

turned our attention to a Weddell seal that was lying across a yawning crack in an ice floe. No doubt the crack, like one that I inadvertently opened up by

ANT11 : CORONATION IS RB platform in Marshall Bay : 20 Nov 58

giving a sharp prod with my ice axe, had developed as the tide had gone down and left the floe perched and strained across some submerged rocks. Then our elephant bull re-surfaced and again attempted to climb the little ice barrier that lay in his way. He heaved and struggled and one felt like cheering his inch by inch advance. Betting men would undoubtedly have been unable to resist a wager on the outcome. Slowly and with seemingly immense effort the impossible was achieved. His centre of gravity was brought over the slippery edge and his vast bulk oozed out over the ice surface, but all to no purpose. The ice itself would not support his weight and cracked and split under him and back he was in the water.

We clambered quickly up the rocks to a high point but still there was no sign of the boat, so we set about selecting a suitable site for the tent. Flat sites were plentiful, but either they were all bare rock and exposed or, if in enough of a hollow to give some shelter from the chill wind, the surface material had been pulverised by freeze and thaw and was saturated with water and covered by frozen wet moss. We found a reasonable compromise where the ground was covered only by rock chips with a shaggy pale yellow-green fuzz of reindeer moss, marked it with the ice axes, and returned to our lookout.

There was still no boat but below us two penguins looked up at us with interest and moved off. I tossed a stone to fall ahead of them but to my astonishment and theirs, although it fell as intended, it hit a slanting rock and shot off horizontally at great speed and straight at them. This sudden attack from an unexpected quarter made them decide this was no place for them and they dived into the sea. Nothing could have been more fortunate. From our high rock, fifty or sixty feet above the sea, we could clearly see them winging their way with incredible speed under the water. However ungainly penguins may be on shore, they are birds of speed and grace under the water. These two seemed to fly through the water with a lilting movement of the belly, almost like swallows through the air. They came to the surface almost a hundred yards out and disappeared.

The minutes passed and we walked up and down the rocks to keep warm. At seven o’clock the boat was two hours overdue, and though we could think of many reasons why it should be delayed it was clear that the time had come to put up the tent. This would mean that we would be out of sight of the sea, so before doing so we returned to our lookout for a last check that the boat was not in sight. And at that moment, a black dot in a smother of foam, it came round the point.

November 21st

After dinner yesterday evening, the wind being some 30 knots, Captain Blackburn decided to switch anchorage back to the more sheltered water of Borge Bay in the lee of Signy Island. When we had done so the familiar slopes behind the base hut were once more powdered with snow and snow was being driven by on the wind. By morning the depression had given way to the following anticyclone and we rose to blue sky and sunshine and a resplendent panorama of the coast of Coronation Island. Yet even now the higher mountains were still swathed in drifting cloud. As it was so fine a day I asked if the ship might sail eastward to the extreme point of Coronation Island, northward through Lewthwaite Strait so that I might see the east coast of the island, then round the northern end of Powell Island and south through Washington Strait to allow me to see the western coast of Laurie Island before we set course for Hope Bay, our next port of call. To this Captain Blackburn readily assented, and the next few hours provided me with a geomorphologist's feast. As the grand features of the south coast passed by in stately and austere calm I filled page after page of my sketch book and field note book. Lunchtime came and went. As we rounded the south cape of the Rotaroan Islands Derek brought me a welcome cup of coffee and told me the mess boy had put some food in the oven for me.

ANT13 : CORONATION IS. E. Coast : 21 Nov 58

Now new vistas opened up. Near at hand the steep and splintery cliffs of the west Robertson Islands were surprisingly replaced by smooth tabular forms on the north eastern islands. Further away John Peaks on Powell Island reared up a bold and truly mountainous form which one can hardly believe barely tops 1300ft above the sea. A light mantle of ice adds much to the grace of this shapely mountain, but does not conceal the tell-tale breaks of slopes which reveal its origin. Once the meeting point of divides between corrie glaciers it has been reduced, by the complete erosion of those divides, to a bold upstanding remnant, a sharp pointed tooth. Perhaps the sharp steeple-like forms we could see away to the northeast on the Mackenzie Peninsula of Laurie Island and on Saddle Island still further off have a similar origin.

Now we had truly entered Lewthwaite Strait the view westward of the extremely bold eastern coast of Coronation Island claimed all attention. It is of positively Norwegian aspect, recalling the fjords and mountain forms of the so-called Sunnmore Alps though some of the summits we could see reached as much as 2000ft. Glaciers have taken charge of the landscape.

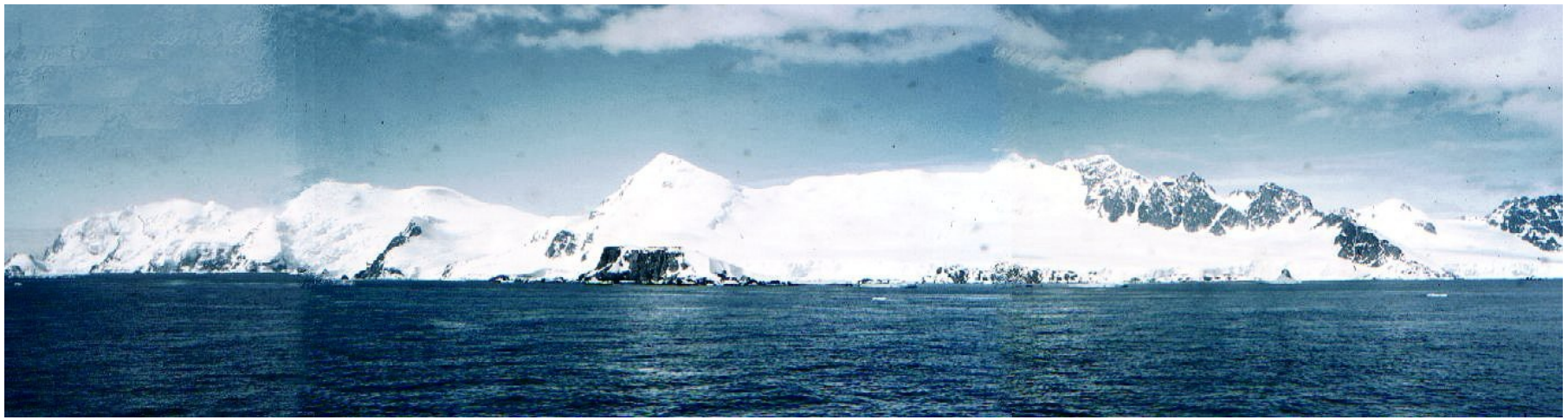
They have not merely cut down their troughs but they have so far widened them that the ridges between neighbouring glacier troughs are reduced to narrow knife-edged divides with greatly over-steepened slopes. Not merely the back walls of the corries leading up to the peaks but every trough wall and every truncated spur end must be a major mountaineering problem. These mountains are well nigh impossible to access. So we passed by Petter Bay, and Spence Harbour, where Powell and Palmer first anchored in December 1821, to the impressive stretch of rocky coast where cliffs and hanging glaciers impend formidably above the ship yet are surmounted by the peak called "The Turret" which is only some 1450ft high.

As Gibbon Bay opened up beyond, attention swung back to Powell Island on our starboard hand. John Peaks were now on our quarter, the fine unnamed central peak on our beam, and the northern peaks behind Cape Faraday on our

bow. From this vantage point it was clear that the northern peaks are more heavily invested by ice and snow than the southern. Indeed while John Peaks show some true rock ribs, and nowhere possesses an ice cover thick enough to conceal the form of the mountain proper, the northern peaks show the bulbous and bulging forms which I first noticed on the air photographs of Mount Bransfield and other nunatuks in northernmost Graham Land, and have since seen on the mountains of the western coast of Coronation Island. I have come to associate these forms in my mind with deposition of rime ice direct from stratus cloud blowing against the frozen slopes, and as I watched a truly remarkable meteorological demonstration took place. Cloud had never wholly left the higher mountains of Coronation Island all day. But now wisps and streamers of cloud appeared at levels below a thousand feet. In a very few minutes we were sailing beneath an overcast layer that cut off all the mountain tops. Further north it descended to sea level: southward it rose to perhaps 800-900 feet on John Peaks. Uncertain whether the weather was really closing in on us Tom Flack turned the ship eastward. For a moment our hopes were raised by the appearance of the summits of the northernmost mountains of Powell Island above the cloud and against a background of blue sky, but even as we looked the fog closed in around us. Suddenly Tom Flack put the engine astern to take

in less than a minute. Fortunately it shoaled no more but plunged with equal steepness back to sixty fathoms. We had in about 90-100 seconds crossed a submarine ridge about 300 metres high: true in 90 seconds the ship steams about a quarter of a mile, so that could we see the submarine hill we had just crossed it would not look so precipitous as its representation drawn on the endless paper roll of the echo sounder. Yet even on land a hill that rises and drops 300 feet in a quarter of a mile is by no means so common: one has to think of something like Edinburgh Castle rock or Calton Hill. Now it is significant that these are both ice-steepened bases and one suspects that the same may be true of the submerged hill we had just crossed.

It was clear that with stratus cloud locally down to sea level obscuring all landmarks and such accidentation of the sea bed to reckon with it would be pointless to proceed into Washington Strait and Tom turned the ship first north and then west-nor'west. In five minutes the bottom shoaled suddenly from 62 to 22 fathoms and then, after oscillating between 20-30 fathoms for two minutes, plunged back to seventy fathoms. Clearly we had returned across the broader, lower and more irregular continuation of the ridge we had just crossed. It is hard not to think of it as a divide between two former ice streams,



ANT 12abc : CORONATION IS. SE Coast : 21 Nov 58

way off the ship: the bottom had shoaled from sixty fathoms to twelve fathoms

eaten away from both sides till at last it was broken up and overrun. Twenty

minutes later – that is about 3 miles further on and to the northeast of the northeast extremity of Coronation Island – we crossed another such divide. This time the bottom rose from 60 to 27 fathoms in just over a minute and dropped back to 61 fathoms in about 30-40 seconds, and both before and after the rise the bottom was almost level at 60 fathoms. This contrast between the abrupt rise and fall and the generally level bottom strongly suggest the kind of contrast one would expect between the rock walls of an ice secured divide and the floor of a wide glacial trough mantled in glacial and marine sediment. Later in the day – just before 8pm – the echo sounder revealed yet another of these abrupt features, when the bottom rose sharply from 51 to 27 fathoms and dropped away equally sharply to 54. This was in a position north of the Despair Rocks, and suggests that a long ridge running from the Larsen Islands to the Despair Rocks and on northwards to the Melsom Rock, is separated from the northwest coast of Coronation Island by a deep embayment where over 300 fathoms have been found.

All afternoon and evening the cloud lay right on the sea – though we could locate what I supposed might be glacially eroded divides on the sea floor we could only watch our progress along the north coast of Coronation Island in the radar screen. But by 9pm the unmistakable pattern of the Inaccessible Islands was abeam of us and course was set for Hope Bay.

November 22nd

An evil day outside. I was very content to spend it in my cabin sorting out my impressions, annotating my sketches and attempting to construct a sort of panorama of the south-eastern coast of Coronation Island.

The weather was precisely what I had expected and feared would be our lot in these latitudes (almost 62-63 degrees south). A grey low overcast day of scudding clouds driven by a furious north wind that combed the tops of the waves. Yet the waves themselves were less than we might have expected and we wondered whether a considerable body of pack lay to the north and gave us a measure of protection. Shackleton however lifted to the swell and rolled in the waves so that she was not a very comfortable ship, and despite avomine, I wondered at times whether I would give up working and lie down.

After dinner I went up onto the bridge. The anemometer needle hovered continually about 45 knots: occasionally it dropped to 37: often it rose above 50 and once to 58 knots. When the ship rolled into a wave on the starboard side the water was shot vertically upwards only to be caught by the wind and flung violently against the bridge. The third mate tried opening a window a little to enable him better to distinguish icebergs in our path, but a stinging shower of seawater that came in and drenched the sounding machine on the other side of the bridge made him think better of this. Bergs could be seen on the radar screen but one also needed to go frequently to the open window on the lee side of the bridge to see what could be seen for oneself.

November 23rd

ANT 37 : Antarctic Sound Mount Flora and Hope Bay : 23 Nov 58

ANT 38 : HOPE BAY Andersson Nunatak : 23 Nov 58

During the night the barograph trace reached the bottom of the depression and began to turn upwards. The wind lulled and we woke to a fine fresh morning, though a good deal of low cloud covered d'Urville Island and made it difficult to locate our position off its rather featureless coast. I brought out the photographic lay-down and by comparing this with the radar plot we fixed our position, yet not before an uncharted rock appeared at only a cable's length on our port hand. I went back to my cabin and examined the detailed vertical photography: I found not one rock but a dozen or more, some charted and some not, lying in a long string northwards from the western point of the island. When I returned to the bridge we were well into Antarctic Sound – the name has historical but no geographical significance; the sound was called after the ANTARKTIK, the ship that carried Nordenskjold's Swedish expedition of 1903-5 and was crushed in the ice in the Erebus and Terror Gulf at the southern end of the sound – and the sun was shining brightly. But the wind had freshened again to 30 knots and was raising a nasty sea with high waves of short wave length – a more disturbed sea, in fact, than we had had during the previous day's gale.

Captain Blackburn declined to enter Hope Bay under the conditions and hove to in the Sound. For several hours we lay there, head to wind, with engines full ahead. We moved so little that I was able tom

make a very leisurely sketch of the mountains south of Hope Bay, though I believe that when I began it more was visible of Mt Carroll than I could see when I actually came to add that mountain. Probably that was because at one point the ship's head fell away from the wind and she would not answer to the helm until more power had been applied and Jim Martin was able to sail her back into the wind.

About six the wind abated and we rounded Sheppard Point – which is a modest lump of rock protruding from the impressively long and high line of ice cliffs that form the termination of a low ice dome. Similar ice cliffs and a similar ice dome lies to the south of Hope Bay and beyond that again we could see the tabular mass of Brown Bluff which is actually black above and red below and capped by a layer of ice that nobody can see without being reminded of the icing on a cake that has in places spilled over and run down the sides. Inside Hope Bay the view is entirely different. Hope Bay is an inlet about three miles long whose head is ringed round by mountains and is almost fjord-like in character with a fine glacier – Depot Glacier – descending to the sea in a long ice cliff. On the glacier I could see some striking moraines and I wondered if

we should be able to make their acquaintance at close quarters. Towering above the glacier stands Mt Taylor, no higher than Snowdon but looking vast and alpine with a precipitous face towards us scoured by deep snow-filled gullies and with a plateau-like top covered by a layer of ice that is perhaps 200ft thick. In front of Mount Taylor and only about half its height is a narrow ridge – Blade Ridge – that is in the literal sense "serrate" or saw-like, with a series of sharp pyramidal peaks joined by a beautiful knife-edged arête that sweeps from peak to peak like a hanging chain. Blade Ridge would be beautiful if it stood by itself, but is doubly so as it stands with its slender grace backed by the impressive bulk of Mount Taylor. But to me there was an added excitement in this view. In essence it resembled the one glance I had had in the evening light of the bulky plateau-like mountains that form the main axis of Coronation Island, towering above the shapely serrate hills that the surveyors of Signy Island call the Cuillin Hills. It is as though the Cuillins of Skye itself were backed immediately by the high Cairngorm plateau. Such a view, combining plateau-like massive mountains that have only been scalloped and indented by corrie glaciers along their margins, with serrate mountains that have been bitten right to the bone by the gnawing corrie glaciers, cannot fail to give rise to a realisation that once the lower mountains were once as bulky and perhaps as high as those that stand behind: one has a graphic demonstration of the effectiveness of mountain sculpture by corrie glaciers.

ANT 40 : HOPE BAY The Pyramid & Mt Flora : 24 Nov 58

On the southern rim of Hope Bay and Depot Glacier stand the mountains whose shapeliness had so attracted me as I sketched them from the ship – Mount Flora, 1708ft, called after no woman but to commemorate the finding of fossil plants in its rocks, Mount Carroll, 1752 ft, and The Pyramid, 1859ft.

Here also I found something to think over. On the south western shoulder of Mt Flora there lies a smooth, brown-coloured slope that contrasts greatly with the glacier cliffs and deeply gullied slopes of the other mountains. Could it possibly be a remnant of a pre-glacial hillside that had been buried by the ice but spared the ravages of ice erosion?

November 24th

I write this as we sail from Hope Bay to King George Island after four days and three nights spent ashore – four days of good workable weather (one of them a beauty) and three nights of warm hospitality at the hands of the fourteen men at Base D. Both Derek and I will carry away very happy memories of Hope Bay.

We were put ashore on Monday morning at about 10.30 and met by Don McCalman the base leader. He is a tall, tough rather saturnine man in his later thirties, and a thoughtful, courteous and serious minded Scot. At once he put all the facilities of the base at our disposal – and indeed I had to accept help at once. For the base hut is built on an ice-moulded and frost shattered rock outcrop at the margin of the ice and is separated from the landing place by some 400 yards of snow slope which is seamed by melt water channels, some on the surface and some on the solid ice under a foot of snow. Unsuspecting I trod through a crust of snow into an ice stream below: but worse than that my foot became trapped in a crack in the ice. It took all three of us to pull it free and by that time I had a bootful of melt water to carry up the hill. Then I very willingly accepted the loan of dry socks and sea boot stockings.

At the door of the hut we found a group that included Roy Koerner, who is senior meteorologist here and in his second season after two years post graduate work at Sheffield. He and Derek are three years apart. McCalman had already told me that he would be free to come out with Derek and myself, so we should be an all-Sheffield party. He would not be available immediately as Pat Canning would naturally wish to talk to him about his meteorological responsibilities so Derek and I took ourselves off for a couple of hours to explore the nearby ground with its occasional rock outcrops, its cover of frost-shattered debris, its very extensive penguin rookeries, and at the limit of our rambling, its moraines. We came back at one to take seats at a large L-shaped table for a lunch of soup and bread, followed by figs and prunes with custard. We were at once made to feel very much at home by being included in the conversation which nevertheless continued its natural course. After the sweet mugs of tea were served and these we carried to chairs round the stove. For this the base has a term – they "return to the living" this being a misremembered phrase used by an Argentinean visitor who prided himself on his use of idiomatic English. The room itself is also L-shaped with the table and the "living" in the large squarish portion. Round the wall are twelve bunks and since each carries the personal possessions of its owner on shelves on the walls (photographs of girl friends, family, and the home town and homeland with a few pinups) or in the space below, which is curtained off with a bright red and white checked cotton cloth, and the whole has a well-lived in air. Some are untidy but the general appearance is one of order, and in the working parts of the hut, the kitchen, the sledge workshops, the surgery and particularly the diesel generator room, the orderliness is a matter for comment and congratulation. While we drank our tea "in the living" we were regaled with light music – Michael Flanders and Donald Swan in their farrago "At the Drop of a Hat": no doubt the record was newly arrived in the parcel post that we had brought with us on Shackleton. After one side the record was turned but few stayed to listen; one by one they got up and set about the afternoon's work.

ANT 41 : HOPE BAY rusty weathering on Mt Flora : 24 Nov 58

It was almost three o'clock when Derek, Roy and myself were lined up and ready to set out on skis up the steep snow slope that covers the terminal portion of the low ice cap which reaches to within fifty yards of the hut. Since this slope faces north it was by this time terribly wet and even skis did not prevent us breaking through the crust into the slush and water below. At the top of the slope the ground flattened and the sun had been less effective and the going was better. But here we were exposed to the full force of the wind which was lifting little bits and chips of ice as well as snow from the ground. At one moment a squall caught me off balance and I had great trouble to regain my feet. At others we had all three to stop and crouch with our backs to the wind while our anoraks were subjected to the noisy bombardment of wind driven snow and ice. When they had served their purpose we deposited our skis on a moraine and proceeded up the spur of Mount Flora to the rusty coloured slopes I wished to investigate. We found it deeply mantled in frost shattered fragments of all sizes and in the flatter places these are being arranged in crude soil polygons and on the slope in stone terraces. Except near the top bare rock was rare and one could at once conclude that the slope had been ice free for some time to permit this degree of weathering and re-arrangement of the weathered debris. But two things seemed to imply more than this. Many of the larger blocks were in a deeply rotted crumbly condition, and almost all the material was stained by iron compounds, most of it rusty brown but some of the rotted blocks seemed permeated by a haematite red. The evidence of the rotted rocks was magnified when we reached the upper part of the slope.

There is a small cliff feature made by a resistant stratum: it was all very brown, mostly very rotten, and most distinctive of all the weathered blocks showed the rounded outlines like piled bolsters and mattresses that I associated with Dartmoor Tors and our Pennine gritstone edges. Here I felt sure there was

ANT 42 : HOPE BAY rounded rocks and rusty weathering Mt Flora : 24 Nov 58

evidence of a phase of weathering by rock rotting under temperate conditions that could not be either recent or glacial and must be either interglacial (if there were any interglacial periods in Antarctica) or, more probably, pre-glacial. A little higher the top of this particular slope is encroached on by the corrie walls on both sides, and in the rock buttress thus exposed I noted that though frost shattering was active in splitting of fragments about the size of roofing tiles at all levels, at the base of the rock face the "tiles" were of pale-coloured fresh rock while ten feet higher up they were rusty coloured and in a crumbly gingerbread condition. This made me regard the iron staining as probably associated with crumbly weathering and a possible indication of the presence of pre-glacial weathered material. What I have seen in the three days that followed has led me to second thoughts on this point.

When we clambered out onto the ridge a fine view awaited us and we proceeded a few hundred yards or so along the arête to the best view point.

Here we stopped and took our photographs and ate some food in the shelter of a rock. The sandwiches we had brought from the ship went down very well and as we ate I drank my fill of this lovely and exciting landscape. From our lofty perch we could see across the ice field northwards to the Mt Bransfield nunatuk group and across Antarctic Sound we could see some of the nunataks of Joinville Island. The wind was still blowing "whirlies" across the ice surface and great clouds of driven snow were streaming down the ice slopes and far out over the Sound so that the ice cliffs of the coast were quite hidden. But the nunataks stood up clearly and both in the Bransfield group and on Joinville a contrast was to be seen between the NW and the SE. In each group the more nor'westerly nunataks were completely mantled in ice and showed something of the bulbous forms I have already mentioned as probably due to the deposition of rime ice. in each group also the ice cover thinned to the south east and the most south easterly nunatak showed bare rock faces. I pointed out the contrast between the weather and lee sides of the mountain groups to Roy and suggested that as glaciologist and meteorologist to Base D he should make a journey to Mt Bransfield and attempt to find out something about the deposition of the rime ice by digging into one of the bulbous masses. He said he would like to and that McCalman was arranging a survey journey to Bransfield, but he did not know if he would be one of the party.

ANT 43 : HOPE BAY Mt Taylor fr SE ridge of Mt Flora : 24 Nov 58

ANT49 : HOPE BAY Brown Bluff and Pyramid fr Mt Flora : 24 Nov 58

On the way down Derek and Roy put on their skis, but the surface of the ice being now refrozen and very bumpy I decided it was no place to make my first attempt at downhill running and carried my skis. After half a dozen falls Roy did the same but Derek, with evident expertise, thoroughly enjoyed his run down.

Back at the base we were asked by McCalman if we had had a profitable afternoon. I replied that we had and explained where we had been and what had interested us. He too was interested, so I went on at once to make two requests. The first was that a dog team might be made available to us next day, for I knew that Derek would give anything to drive a dog team again. The second that Koerner might be included in the party to visit Bransfield in order to investigate the question of rime ice accumulation. Both were very readily acceded to.

It had been supper time when we were still on the ridge of Mt Flora, but some had been kept for us and we sat down to plates heaped with fresh Argentine beef (a present from the Argentine base nearby) washed down with Argentine white wine. We then "returned to the living" for cups of tea and relaxed chatter.

After a while the geologist of the party – J.S.Bibby – and I retired to his office so that I could learn from him the local succession of rocks and show him some of our weathered specimens. He became much interested and I am sure will look for similar features while working further south on James Ross Island.

So a most enjoyable and profitable day closed and Derek and I bedded down in fair luxury – with an air bed, a sheepskin and a sleeping bag – he on the floor of the geologist's office and myself on the floor of the survey office beside the generator room. I slept little at first since I knew the generator had to be started up at 3am for the transmission of the "weather ob". But after that I slept more soundly and though the generator must have woken me again at six I must have gone to sleep as soon as they were switched off at 6.15.

November 25th

Base D has a rather pleasant custom of taking breakfast standing in the kitchen. This saves the cook fetching and carrying from one room to the other and it ensures that people do not sit around after breakfast, since there is nowhere to sit and little enough standing room in the kitchen. Even so it must have been 11 o'clock before we had our sledge loaded and dogs in the span. The load was simply what we might need if bad weather prevented us returning that night – tent, personal bags (each with air bed, sheepskin and sleeping bag) - rations for ten days, pots and pans, a box of dog food and our skis and ice axes, a light load of 500lbs altogether. On the trace were nine dogs – Hector the head dog, followed by two pups, Hardy and Emma, and then Ted, Jim, Bimbo and Angus, Louise and Bonzo. At last Derek called "Now dogs" and in a moment we were off. Despite the steep uphill gradient the dogs went off faster than a walk and I found myself plunging along in the wet snow to keep hold of the sledge. After two hundred odd feet of ascent I could not find breath to go at this rate and had to jump on the sledge: how Derek had breath enough to shout commands to the dogs and to pick on the slackers by name I could not imagine. At the top the dogs were rested before we set off for Nobby Nunatak, 676ft above and one and a quarter miles from base, and just visible below the continuous overcast of driving stratus. As we approached the nunatak Roy told Derek to keep over to the right to avoid a big cauldron shaped hollow in the ice that had appeared last summer. As we skirted it in the mist and uncertain light it seemed a fearsome place with a yawning crevasse at the bottom. In many ways it resembled the sink holes which pit the millstone grit outcrop on the northern margin of the South Wales coalfield: they have been produced by collapse of the grit stone into caverns produced by solution of the underlying limestone by percolating waters. This cauldron in the ice appeared about the same size – about 50 or 60 yards across and about as many feet in depth – as some of the larger grit stone swallows, and probably has an analogous origin – collapse of the rigid layer of surface ice into a cavern produced by the removal of the deeper ice by melting by percolating water.

At Nobby Nunatak we halted to examine the rock outcrop which is of gabbro and gives rise to a gabbro moraine and the parallel moraine about 60 yards to the west which contains no gabbro blocks but only rocks of the kinds we had seen on Mt Flora. Here we were opposite a big embayment between that mountain and The Pyramid, and evidently the glacier nourished in this embayment had brought its debris thus far to find in front of it not merely the nunatak but also the larger ice stream from the higher parts of the ice dome.

Now we were in cloud and I simply sat in the sledge and kept a compass course as the most useful contribution I could make to our progress. Soon the spur of

ANT 47 : HOPE BAY from Mineral Hill : 25 Nov 58

The Pyramid loomed up with two little glacieriets sunk into it and then the larger embayment that can fairly be called a corrie. In other conditions all these might have been worth examining but as it was so misty we drove on. In rather more than a mile from Pyramid we reached the summit of the route across to Duse Bay, 1136 feet above the sea. At this point the arête that once extended southeastward from Passes Peak has been so gnawed away and lowered by the ice that the latter now laps right across it. The detached portion, apparently of dioritic rock, has been moulded by the ice that has streamed over it. On it the Argentinians have built a refuge hut – a little cabin about ten feet square. Now the route dropped down and rose again to a small nunatak where we halted, picketed the dogs, and climbed onto rocks to eat our lunch – it must have been about 2 o'clock. Here the cloud was much more broken and above was blue sky so that from time to time we were in sunshine. As we ate, conditions so far improved that we could see below us Duse Bay, still firmly frozen, and down Crown Prince Gustav Channel[1] to Bald Head and Egg Island. It was perhaps

not so good a view of this country as I had hoped for, yet it was better than had looked likely when we left base.

ANT 45 : HOPE BAY Erratics on Scar Hills : 26 Nov 58

From our lunch spot our attention was attracted to a nearby hill that was in marked contrast to all the other nunataks in being round and smooth instead of sharp and angular, and of being a strong rust red colour instead of dark grey. Later we learned that because of this rusty colouration this hill is called Mineral Hill. So we drove the dog team to its foot and picketed them there while we ascended the ridge. At first our way lay over frost shattered diorite in large slabs, light coloured, fresh rock, newly emerged from beneath the ice. Then beyond a snow patch we came to the rusty slopes, completely covered in a mantle of rusty coloured angular fragments of the banded and silicified rocks we had seen on Mt Flora. Here, however, they were so much iron stained, and sometimes deeply reddened that Derek was reluctant to believe that they were the same rocks. We ascended over a sort of scree of blocks 3 or 4 inch cube that covered the whole hill, slopes and summit, save only when some other rock outcropped and provided debris of a larger size and different colour. The summit proved to be a flat topped ridge which provided a delightful high level promenade in bright sunshine, about 400ft above the sea. To the south Brown Bluff bulked quite large and when we could see it most intriguing, but for the most part cloud streamed over and past it. To the north we could see Passes Peak but rarely The Pyramid and to the northwest Mt Carrel dominated and for a time stood clear of cloud. Further west and southwest the edge of the high interior plateau of the Trinity peninsula, though itself invisible, was marked by a great bank of cloud and below this descending towards Crown Prince Gustav Channel[1] we could see some of the mountain
t appear to be the only vestiges of the spurs that once ran from the
au toward the pre-glacial sea. We felt that Mineral Hill had served us
oviding us with so fine a viewpoint and so much of intrinsic interest,
me of the questions it raised had to remain unanswered.

e dogs about 40 minutes to take us back to the summit with myself
st of the time, Derek on skies and Roy running or riding downhill.
ne summit we were in cloud again but as the dogs followed our
racks our landmarks came into view one by one. At Nobby Nunatak
eam was released to run home on their own and at the top of the steep
ird more. Derek took the sledge down while Roy and I walked, and
back just in time to return the dogs to their lines and unpack the sledge
pper. Derek I know had enjoyed the day, for he is a good dog driver

ANT 48 : HOPE BAY dog team near Mineral Hill : 25 Nov 58

and had hardly dared hope that he would have a chance of a day with dogs on this trip. The team had surprised him by being so well-behaved: even I had been surprised that they had waited so contentedly while we lunched and for the hour that we were on Mineral Hill. For me it was an experience to

remember, one I had never really thought would come my way. And now it has I shall always carry a regret that it did not come earlier, for I now know what the thrill of a long sledge journey with dogs must be.

After supper we had intended to return on board but Tom Flack, who was also dining at the base told us that the ship could not possibly sail before the next evening so we accepted McCalman's offer to become the very willing guests of the base for a second night.

November 26th

We could hardly believe our eyes next morning: the sky was cloudless and blue, the sun shone and there was no wind. Breakfast was late and leisurely

ANT 44 : HOPE BAY Mt Taylor : 26 Nov 58

since most members of the base had been at a film show on the ship until a late (or early) hour following a hard day's toil unloading coal and stores. Derek and I set off with the intention of examining the Scar Hills near by and making the close acquaintance of the moraines of Depot Glacier. In the event we never got beyond the Scar Hills we found so much interesting by the way. We took our lunch at the nearer end of the hills after examining the soil polygons that are a feature of the valley floor below, and from our lunch point till we turned for home about 5.30 we covered little more than a hill almost every step of the way offered some new feature of interest. The Scar Hills are an ice scoured ridge of steeply dipping, well-jointed and slightly metamorphosed and silicified paleozoic elements, and rise in a series of steep-sided whale backs to a height which never attains 300ft above the sea. (They are indeed rather what I imagine some of the submarine ridges we found by echo-sounding off Coronation Island would look like if they were dry land.) These whale backs have not long been laid bare by the wastage of the ice away from them and their smooth surfaces carry abundant striations made as the ice charged with rock debris moved across them. At the northeast end of the hills, which were doubtless ice-free first, the whale backs are much broken by fresh frost fractures and the ground much littered with frost debris. As one goes southwestwards the whale backs survive intact and instead of a mantle of debris prised off by frost they carry only a scattering of erratic blocks, some of them large masses of a conspicuous white-weathering microgranite. Now these erratic blocks, and some of the bed rock sandstones, show a striking increase in the weathering of their surfaces as the frost shattering of the bed rock decreases. The first examples we came to exhibited slight pitting and honeycombing, but as we worked southwestwards towards the present day glacier the pitting became deeper, more extensive and more frequent. At the last we found an erratic broken by frost and one of the great slabs a yard long and a foot wide which should have been beyond my power to lift was so hollowed away that I could lift it and wield it like a club, bringing it down on the sharp edge of another rock to break off a couple of fragments which we carried home.That wind had something to do with the matter we both realised from the outset, and I urged abrasive action by sand grains. But I also mentioned to Derek that American workers had recorded wind etched rocks on the nunataks east of the Ross Sea and had attributed the action to wind blown fragments of ice. As we worked along the ridge and found the etching of the rocks increasing as the available supplies of sand and grit diminished it seemed that perhaps the hypothesis of etching by ice crystals in blizzard conditions had more weight than I had been inclined to give it. But there we had to leave the matter and return, little knowing that Fate intended to be kind to us and give us a chance to resume our inquiry on the morrow. For although we again intended to go on board that evening the weather deteriorated and it came on to snow so that the boat work was cut down to ferrying back to the shore those who had spent the evening on board ship. So once more we spent the night at Base D.

November 27th

After breakfast I was called to the RT and had a conversation with Tom Woodfield. I learned that the tide – which is here a diurnal tide with high tide in the evening – would not be suitable for the remaining work of unloading sacks until well on in the afternoon so that we could spend another day ashore if we wished, but a boat would come and collect us at the jetty belonging to the Argentine Base if we preferred. I asked if the boat could then take us to the head of Hope Bay and collect us later, and when told that it could I elected to go on board for here was a chance to carry our investigation of yesterday on to Depot Glacier itself. So we said good-bye and thank you most warmly to our friends at the base, and especially to Lee Rice to whose good nature and his great competence as cook for the week we owed much of the enjoyment of our stay, and to Don McCalman who had so unreservedly put all the facilities of the base at our disposal. We shall look forward to seeing some of them again when we return in two or three weeks time, but several will then be away on their summer journeys.

It was almost one o'clock when we were landed on the rocks on the south side of the bay just in front of the impressive half-mile long ice-cliffs of Depot Glacier. A chill wind was coming off the ice, an overcast sky hid the sun, and we were both cold from our 30 minute journey in the lifeboat so we elected to scramble up 80ft of scree to gain the shelter of some rocks on the slope above and there we ate our lunch. From our vantage point we had an excellent view of the ice cliffs and realised that no bergs had calved from them this season for the snow of last winter forms a continuous selvedge to the cliffs at water level along much of their length, and is still banked thickly against them at many points. This argues that motion in the glacier is slight – a conclusion quite compatible with the freedom from major crevasses that we found, gratefully, to be its outstanding characteristic during the afternoon.

To get onto the glacier we had to clamber over the last rock outcrops and here Derek noticed that one of the steep ice-smoothed surfaces facing the glacier was pitted and pocked in the manner we had seen yesterday and that in several of the pits were little accumulations of rock chips, sand or fine rock flour. So this was the abrasive agent – the hollows are in fact analogous to the pot holes in the rocky bed of a swift torrent: they are wind-eroded pot holes. A moment later my eye lit on an erratic block with one face cavernously hollowed away, and in the pockets this formed were large fragments of rock. Some were pieces of the sandstone block, but one is an angular fragment of quartzite weighing (blank)oz. and whose longest sides measure 2.2 and 1.9 inches. That the wind could lift such fragments 25 or 30 inches off the ground to deposit them in the hollows where we found them seemed incredible, but belief was compelled by the evidence before our eyes. We took photographs and collected the stray contents of one of the larger pot holes. Later when I showed these to Tom Woodfield in my cabin he told me that ships lying in certain anchorages in South Georgia are bombarded by quite sizeable stones when powerful katabaric winds blow down the glaciers. Evidently I have underestimated the transporting power of these glacier winds.

The moraine beside us was made of all the local rocks we had so far seen, but seemed destitute of the granite blocks we had found occasionally further down the valley. This, however, was far from being the case with the moraine a hundred yards up in the glacier: this was made almost exclusively of granite debris, and almost certainly this is the same moraine that is fed by the stone shoots that descend the very rugged south wall of the corrie of Mount Carroll. No doubt this face is the source of the granite and diorite material. We turned along the moraine, thinking to use it as a highway, but had not gone more than fifty yards when we were halted by a crevasse that cut right across the moraine. Derek led across it with some care and then we turned to examine it. It was open for twenty feet or more and I was surprised to find that beneath the surface moraine, which is a conspicuous enough feature, there was clear ice. This is not wholly true where the moraine crops out in the ice cliffs of the seaward margin, yet even here there is not much more than a vertical zone of dirty ice extending down the cliff beneath the heap of boulders and stones on the ice surface.

We found that the moraine was crossed by crevasses every score or so yards, and in fact the crevasses seemed more marked in the moraine belt than on the open glacier. One at least seemed to behave like a fault dislocation – the severed ends of the moraine being displaced a yard or two relative to each other. After this we thought it better to leave the moraine and found the going on the glacier much better. So good indeed that we were able to think of crossing the glacier tongue that comes out of the corrie of Mt. Carroll and "landing" on the rocky spur that separates that corrie from Depot Glacier. The downstream portion of that spur is a boldly rounded mass, moulded by the ice in the past and fairly recently uncovered: the upper part is in striking contrast, a lofty arête, thinned away on both sides and ending abruptly towards us in a great steeple-like face six or seven hundred feet high. We climbed up the spur on to the rounded top, finding on the way that however recently the rock had been uncovered by the ice, it was not so recent that quite extensive, if localised, attack by frost and thaw water had made inroads into the newly exposed

surfaces. From the top we had a fine view. Before us the spur on which we stood fell away to a rounded col over which the ice had moved energetically, lowering what remained of the one-time corrie wall. Beyond the col the great steeple-like end of the undestroyed remnant of the divide rose even more impressively than before. To the right and below us was the ice fan of Depot Glacier and beyond it the sharp granite slopes of Blade Ridge scarred by innumerable snow-lined gullies: to the left and below us the corrie glacier of Carroll with a horrid gaping bergschrund with the flattened lines of snow bridges at its head. Beyond it the gullied granite slopes of Carroll matched those of Blade Ridge. Swinging round we looked squarely at what had been till now the hidden face of Mt. Flora, and to the left of that again a lovely prospect of the termination of Depot Glacier against the deep blue waters of Hope Bay, with the ice –covered ends to right and left, and far away across Antarctic Sound the white ice dome of Joinville Island terminated by virginally chaste snow covered nunataks. It was a fitting conclusion to our field work at Hope Bay and after savouring the moment (and a bar of chocolate) we turned to descend. As we roped up to cross the bergschrund at the upper margin of the ice we saw the boat round the point far off to pick us up at the glacier foot. We would be late for our rendezvous, but there would be no hurrying down the steep ice slope before us or over the glacier. Our footprints certainly helped where the snow had retained them but over long stretches, and in the uncertain light below the curtain of cloud, they could not be found. Nevertheless we seemed to find a way without difficulty and with even less trouble from crevasses than on our way up.

So back to the ship, tired but content. So tired indeed that after dinner I could settle to nothing yet felt too restive to go to bed. I was therefore glad to learn that there would be a ward room film show. An indifferent film, it nevertheless held enough of my attention to make me forget that I was sleepy and my muscles stiff, and when at last I went to bed it was midnight. Before turning in I opened my cabin port and there mirrored in a glassy sea under a flat calm was Mt Taylor and its lesser attendants. There was just light enough for a photograph and I could not resist the chance to record what must be one of Hope Bay's loveliest but most fleeting aspects.

November 28th

The moment of fleeting tranquillity proved fleeting indeed. We sailed from Hope Bay about ten o'clock under a grey overcast sky into a raw northeast wind. In Antarctic Sound a few bergs and bergy bits were all that could be seen to starboard. To port the nunatak ridges behind Cape Dubouzet loomed up but Mt. Bransfield was wholly above cloud base – and probably collecting a new layer of rime ice. By noon we were on our course and in Bransfield Strait with some icebergs and significant floes of young ice. Although there was plenty of sea-room , between these Tom Flack put the ship into the side of one of these floes to test their consistency and when we drew away the ship had left her "bloodstain" where the ice had opened to give passage but had scraped off some of our paint in doing so. By 2.30 the proportion of pack to open water was increasing and the ship had little option but to ram one or two of the heavier floes. For a little the sea became clearer again but now the wind, which was blowing steadily at 35 to 40 knots, began to hurl scuds of snow at us, reducing the visibility seriously. By 3.45 the pack had grown much denser – probably it now covered 9/10ths of the surface – and between the wind, the snow and the pack our surroundings were about as inhospitable as can be imagined. As I sat in my cabin writing I would have the impression that the cabin and all of its contents were moved suddenly backwards by several inches or even a foot as the ship ran into a thick floe and her forward velocity was brought to nothing in a few seconds. The engine note would rise as the screw thrashed vainly at the water astern while the bow remained fixed. Then something would give – the flow would crack or turn – the engine note would drop and the ship would move forward again. As she did so there would be a great scraping and bumping of the floe itself or of its broken pieces against the side of the ship. I went down to one of the cabins on the waterline and found both the noise of the ice bumping along the sides and the sight of so much of our red paint smeared along the sides of the floes most impressive. Twenty minutes later we were steaming at full speed through more open water but by 4.30 the ice and weather conditions were worse than ever. I put on all my windproof clothing and went up onto the foc'sle head to see what happened when the ship met a large floe. I had not long to wait for there were many such. As the raking stern met the ice it would cut its way through the soft upper layers of snow before the portion below the waterline met the tough sea ice at that level. The bow of the ship would rise, sometimes by several feet, and then as the ship slowed almost or quite to a standstill, would subside again. Sometimes in subsiding its weight would start the ice cracking and thin irregular black lines would suddenly run across the floe. As the ship continued her thrusting they would widen to reveal the water, and if the main crack had run the right way the bow of the ship would prise the two sides further apart until there was a channel through which, with the loss of some paint, SHACKLETON could make her way. Sometimes the cracks would run the wrong way but as the ship moved forward the floe would slowly rotate and

allow her to sidle into more open water beyond. Sometimes the floe was a thick one of several seasons ice and would remain intact as the bow of the ship sank down again after first rising at impact. Then SHACKLETON would slowly back away leaving a great wedge shaped scar soiled with her "blood" upon the margin of the floe. Nor was the ship unscarred. The plating near the bow would clearly be seen to be dented inwards, but when I mentioned this at dinner the two Toms, both experienced in ice, assured me that unless the plating became so dented that the form of the frames inside could be seen or unless we heard the rivets springing (with a sharp pinging noise) there was little cause for concern.

At six o'clock conditions were little changed and at dinner the sudden thumps and decelerations, the rising and falling pitch of the engines told as clearly as the noise of the wind what was going on outside. Not before in their experience had the two Toms met ice conditions so bad in Bransfield Strait. Not till 7.30 when we must have traversed some thirty or more miles of heavy pack did conditions improve noticeably. By that time there were only a few floes and brash ice: by eight o'clock we had run into open sea though the visibility was still poor. Half an hour later mountains could be seen towering through the mist as we steamed up Admiralty Bay in (sic) King George Island, though to be sure they are not actually as high as they looked then. At 8.45 we were in Martel Inlet and I could see enough of the Keller Range[2] on its western side to have an impression of a landscape rather like a heavily snow-covered Trotternish, with ledges that I took for the outcrops of lavas dipping northward and pinnacles like miniature Old Men of Storr rising silhouetted here and there against the snow slopes behind. At 9pm. the anchor chains were rattling to the bottom in 30 fathoms in Visca Anchorage.

November 29th

A *dies non.* All day we have ridden at anchor cut off from the shore by storm. The wind has blown from ENE, E and ESE at 40 to 45 knots with gusts up to 55 knots, and even in this relatively enclosed water has whipped up a sea too rough for our motor lifeboat. During the morning the boat was put alongside and Tom Woodfield took the mail for Base G. He had backed before the wind against the storm and landing was impossible so the mail was thrown out to the FIDS on the ice. Returning proved quite hazardous and all were relieved to get the boat inboard with nothing more amiss than some damage to the rudder mounting. So I have done my washing, written my notes and this journal and ironed the clothes I washed in the morning. I am glad to have the chance to catch up on these things, and perhaps too I am glad it is not possible to go ashore. For the sledge trip on Tuesday seems to have "burned" the skin of my nose, forehead and lips, and combined perhaps with a slight cold, has given me a lower lip swollen by the worst herpetic blisters I have ever suffered. I feel I must look like a Basuto woman with a plate in her lower lip, but the doctor assures me that it is much less noticeable than I think, and has painted the lip with Friar's Balsam to reduce and dry off the blisters.

November 30th

Another day indoors. The snow has stopped and we can see the shore today, but the wind and sea are still too high for the use of the boat or scow. Indeed, before any unloading can be done it will be necessary to find a place sufficiently ice-free to get the scow to the shore. So Derek and I have worked at our photographs, while the ward room has played Scrabble or chess. In the evening I dined with the FIDS and afterwards joined them in a most enjoyable party to celebrate Derek's first wedding anniversary. The chief cook, Eric Heathorne, has made a vast iced cake with names, dates and a good wish and it was cut with as much ceremonial and speeches as a wedding cake. A second and smaller cake had been prepared for the ward room where Winston Churchill's 84th birthday was duly honoured.

December 1st

The wind still blows strongly from the east and the clouds hang low over the rocky hills. Indeed one cannot even see the top of the icefalls of the two Stenhouse Glaciers that descend abruptly to the northern shore of the anchorage. But at least it was possible to use the boats again. and while the scow was being loaded Derek and I were ferried ashore in the life boat, and had to jump onto the ice foot. To my surprise I found that it was not solid, but a "shingle beach" made of cobbles and boulders of ice, rounded upon each other by the waves, cast up on shore and partly frozen together again. Nothing of the kind existed at Hope Bay and I can recall nothing of the sort on Coronation Island: perhaps this beach is more exposed than any we have previously visited., or perhaps this is an ephemeral feature that has in fact been formed by the waves that have been pounding broken ice on this shore during the same gale that has confined us to the ship.

As we walked along the snow above the beach we saw a figure coming to meet us – Robin Stephens the base leader. He greeted us with the welcome suggestion that a cup of tea was just about ready in the hut and he would like us to join him and the three other FIDS in base at present. We followed him into a

new hut of the same pattern as that at Signy Island but painted in lighter colours and altogether more cheerful and better kept. This type of hut has a dining table in the kitchen, making it rather like a canteen, a dormitory for the men so divided as effectively to provide five double bunked cubicles (these are more private than the "pits" of the large room at Hope Bay yet less personal) and a separate living room. Here we were given tea and offered fruit cake, chocolate éclairs, meringues and brandy snaps, all of which reflected great credit on the ability and imagination of the cook.

After this kindly welcome we spent an hour just to the north of the hut where there are some old shingle ridges belonging to sea levels slightly higher than the present ones. Indeed the waves of the present sea level have eroded away part of the front of these shingle strips, making a little bluff three or four feet high, and against this they have piled a fantastic accumulation of whale bones. There are vertebrae that look like propellers for small ships, rib bones that stick a dozen feet into the air, great bony joints two yards across that are so enormous that the mind cannot recognise their human counterparts, and in one place a vast skull with great hemispherical cavities a yard across. Surely these cannot be eye sockets? These bones are so numerous that they form a sort of whalebone zantra. Many must have lain here a long while, probably from the middle of the last century whale boom, for they are decayed to the consistency of rotten wood. But a much longer time has elapsed since the waves washed the shingle strips behind the whale bones.

We returned to the ship for lunch and went back in the afternoon to look at similar features to the south of the base hut. Here the dog lines are laid out in a whole series of these slightly elevated shingle strips, the highest corresponding to a sea level twenty feet above the present. Still further on are only two elevated strips, backed by wave eroded rocks. Some of these at La Plaza Point[3] puzzled us a good deal for it does not seem possible to say whether they have been shaped by the waves of the present day or those of the slightly higher sea levels. Moreover on the slopes behind are pinnacles which bear some resemblance to marine stacks but appear to be the result of weathering and erosion acting differentially on harder dyke rocks and the lavas and agglomerates into which they are intruded. How, and when, we wondered, did this kind of selective erosion take place? These pinnacles cannot have been here when the Stenhouse Glacier extended this far, yet surely they cannot have been formed since!

We returned more puzzled than illuminated, baulked of any general views by the low cloud and poor visibility and sure that the newly fallen snow of the last two days has covered a lot of the evidence we have been looking for. At the landing place a different situation had developed. The tide had only just risen sufficiently to float the scow but a belt of pack had moved in with the wind and tidal current and hemmed us in. So first the scow had to be manoeuvred out through the floes into clear water and then we and the FIDS who had been unloading stores had to be ferried out by dinghy to the motorboat and scow. It was a long, cold business and I must confess that I came on board again in rather low spirits. We had learned less than I had hoped, and the wind had got into the sores on my lower lip and made it uncomfortable. And at the back of my mind is a very unpleasant feeling, wholly unbidden and doubtless irrational, that something is wrong at home.

December 2nd

Landing stores at Admiralty Bay has so far proved an exasperatingly slow business – only a bag of mail on Saturday, nothing at all on Sunday, one scow load yesterday and now only one scow load today. The ice remains packed against the western shore of the anchorage and for most of the working day the larger floes are all aground for the tide here is largely diurnal and the high water period is at night. So Tom Woodfield, though prepared to attempt to put us ashore, warned us that he might not be able to bring us off again when the tide was lower. Since the hills above 500ft were quite hidden in cloud and the visibility below this level was very poor with snow in the air there seemed little enough that we could usefully do ashore. Derek and I decided to look at photographs instead, and in fact had no difficulty employing ourselves profitably. Probably too this course was best for my blistered lip: under Neil Orr's treatment the blisters are drying up and forming crusts which, blackened by the Friar's Balsam, are thoroughly disgusting to look at and must appear quite revolting in the ward room and as the crusts crack, the lips bleed and I frankly am not sorry not to be facing a snow laden wind with it.

December 3rd

I finished yesterday most profitably by reading J.C.Masterman's delightful Oxford diversion *"The Case of the Four Friends",* and it was well after midnight in consequence when I put out my light. Outside there was plenty of twilight and I saw at once that the hills were clearer than they had been and the sea was glassy calm. A large quantity of pack ice had set into the anchorage and now filled all the head of the bay toward the two Stenhouse Glaciers. At 3.30am I was awakened by the thump of a small iceberg against the side of the

ship. I looked out of my port – and there it was, immediately outside, but moving sedately off. And everywhere around was pack ice, floes of all sizes, brash ice and bergy bits, all moving silently but quite slowly past the ship. Fortunately the amount was limited to what had accumulated in the bay head and by breakfast time the ship lay in open water. The shore on the other hand looked completely beset, but Tom Woodfield managed to find a way through the brash ice to the beach north of the base hut. When he had taken the laden scow ashore for unloading he came back for Derek and myself, and when we landed we found officers and men of the ship as well as the FIDS manhandling the stores on sledges along the quarter of a mile of snow-covered beach to the base hut.

As the clouds were a little above the top of Flagstaff Hill I had thought we would find it profitable to climb the hill and descend the other side to Mackellar Inlet where I knew from the photographs we should find some interesting beach features. Our curiosity about the curiously spiky outline of Flagstaff Hill led us to choose a route that was by no means direct and by the time we came to the top of the hill the northerly wind that had moved the pack ice during the night had gone back to the east and brought back the low overcast. We ate some sandwiches in the lee of the ridge hoping against hope for a general view, but hope was vain. It was some time even before we discovered the Mackellar Inlet below us with no pack ice. But much of it was still covered by unbroken sea ice from last winter. Bit by bit as we ate we pieced together some of the aspects of the landscape round us but before we had assuaged our appetites we were too cold to stay longer for either food or landscape. We descended two or three hundred feet and then, being a bit warmer, ate some more sandwiches and an apple. Below us we could see a long level black line in the snow that was almost certainly a beach ridge and we now made for this. Arrived then we found it even more obviously a beach ridge than we had expected. Its stones were both larger and better rounded than any we had seen two days earlier near the base hut, yet this feature at an altitude 50ft above the sea was higher, and presumably older, than any of those. This must be a more exposed shoreline, open to longer and more effective waves than those facing the Visca Anchorage. Not only this, but one now perceived other less striking shingle patches at higher levels. We retraced our steps up the hill and found not only more shingle, but behind it a suggestion of cliffing of the rock, and, still higher, some features which could be interpreted as fragments of a wave cut platform more than a hundred feet above the sea. Certainly they had beach rounded stones upon them and this sent us up the hillside to see how high such stones could be traced. The answer surprised us: they could be traced in fair numbers to a line that we marked on the ground with our ice axes and little stone cairns, and beyond this line there were none. On the flat ground our line was the contour of 160ft: round the hill it declined somewhat. If we are to take this evidence at face value we must conclude that after the ice uncovered this hillside, the sea stood against it to a height 160ft above its present level and then stage by stage withdrew leaving abundant traces of its action at several levels. These are especially marked at the lower levels where some of the shingle accumulations seem as fresh as modern storm beaches but are clearly not modern accumulations because they are at present being eroded and are exposed not merely at the surface but in section.

As we descended across the tide crack onto the sea ice to check our aneroid readings we were met by an uncomfortable cold snowy wind. We began to trace the course of our elevated beach features along the shore toward La Plaza Point[3], but beyond the first promontory we found the wind blowing straight in our teeth and full of snow. From that moment on it became too uncomfortable to do anything but put our heads down and plod home: first I followed in Derek's footsteps then for a spell, till we got the wind on one side, he was equally glad to follow in mine. So back to the base hut and a very welcome cup of tea, and the no less unwelcome news that the tide had not yet risen enough to refloat the scow. It was a quarter to eight when we and the unloading party reached the ship, all of us cold, and to a greater or lesser degree soaked by spray. How pleasant at such times to have a cabin with hot and cold water and kept warm by a radiator.

December 4th

ANT 17: S.SHET. West Stenhouse Glacier & pack : 4 Dec 58

Admiralty Bay was difficult to reach, perverse and frustrating when we got here, and now has defeated our efforts to get away. Captain Blackburn planned to sail this morning, but we awoke to find that during the night the easterly wind had completely filled Visca Anchorage with pack ice.

We were surrounded by it on all sides and when we came to lift the anchor difficulties at once began. Fifty or more fathoms of cable were out and led directly to port of the ship's bow. It took half an hour of delicate manoeuvring, first ahead, then astern, then ahead and to port, to get the ship so far turned round that she could bring her bow directly above her anchor and lift it. But by ten o'clock the anchor was raised and we began the slow and patient struggle to free ourselves from the pack. Less than three hours later we were at anchor again and an active lad could have thrown a cricket bat back to our starting point. For some time before that SHACKLETON had failed to respond to her helm – she would turn only to starboard. So during the afternoon an inspection of the rudder was made and it was found to be so far out of truth that it was five degrees to starboard with the helm hard to port. Repair work is going on and Jack Richardson is hopeful of making us fit for sea again.

ANT 21 : S. Shet. Pack in Admiralty Bay Pt. Hennequin : 4 Dec 58

Ironically enough the weather today has been brilliantly sunny with a rising barometer, though with the temperature only 29 degrees and the wind still at 20 knots. After breakfast all the cameras came out of the hiding places where they have been skulking since we left Hope Bay.

And after lunch I spent the whole afternoon with sketch book and notebook in the quiet of the empty bridge, sketching and writing and at last gaining some general impressions of Admiralty Bay and its many extensions. And as I did so I found that even the nearer features that I have seen a good deal of, though under poor conditions of light, became for the first time three dimensional and so for the first time potentially replicable. I am like everyone else much concerned by our present plight, but today I am perhaps the one person on board to whom this ill wind has blown good.

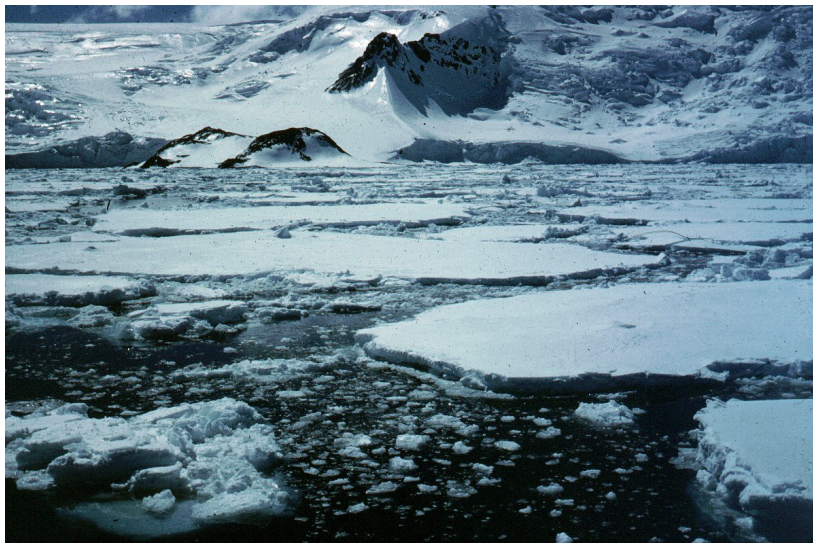
ANT 15 : S. SHET. Base G & Flagstaff Hill Shackleton in pack : 4 Dec 58

December 5th

Vera's birthday. I awoke to the knowledge that already my radio message of birthday greetings would have been delivered with the morning's letters and the certainty that nothing in all your post would make you happier. And happy I hope you are love and that all is well with you, with all the family, and all its friends. I would give much for that assurance. I know how much can happen in any period of four months to cause trouble and anxiety. Illness and accident may befall any of you, house or motor car may require expensive repairs, growing children may grow in ways that cause anxiety, and as the last year has shown us, and even long term friendships are not always secure. I am anxious lest such things should be adding to the burden of responsibilities that I have necessarily had to leave with you. And to be truthful I am anxious also for my own sake, lest when I return to Stanley and your letters I should learn something in the world of home and family and friends should have been lost or changed, not to be restored.

Today to celebrate your birthday the Antarctic wore its loveliest dress. No birthday cake was ever iced like the scene around us, no birthday candles ever shone more resplendently than the brilliant sunshine that has dazzled us all day.

The repairs to our rudder were completed in the small hours of the morning, and tests of rudder and steering gear were carried out in the forenoon. But the pack is as thick as ever throughout the ten or dozen miles of Admiralty Bay that are visible from here, and it would clearly be unwise, as well as rather unfair to our engineers, to attempt to free the ship and its untried rudder through the same pack that defeated us yesterday. So here we have remained, and this afternoon we all made holiday roaming at large over the pack. Some sketched, many took photographs of the ship, some disturbed and chased a sleeping seal, and all enjoyed the excitement of merely getting about, moving from floe to floe across narrow lanes of water or brash ice, often by way of intermediate bits of ice whose stability was by no means certain. And Tom Flack came down with an axe and four members of the crew and cut and collected 2 or 3 tons of snow blocks to be melted down to eke out our scanty water supply. For much of the water in our tanks is frozen solid and only time and temperature will release it to us again.



ANT18 : S. SHET. Stenhouse Bluff & East Stenhouse Glacier : 5 Dec 59 (sic)

ANT 16 : S. SHET. Shackleton beset in Admiralty Bay : 5 Dec 58

After dinner we broached a fresh bottle of Drambuie and eight men – the six officers of the ward room, Pat Canning and myself, drank the health of "Mrs Prof". Tom Flack went to his cabin for his gramophone and the records he selected were ones he knew were to my taste. Some he might have guessed, though he could not know which have nostalgic associations for me. And some of us sat and listened and some played Scrabble while the sun glided slowly south westwards, for a long time skimming and then sinking behind the low domelike cloud sheets that now cover the ice plateaux of the western parts of the island. The lovely summer evening passed gradually into the pastel grey and lavender of the Antarctic twilight while the voice of Kathleen Ferrier sang the most beautiful of the arias in Judas Maccabeus which Tom had, at the slightest hint from me, changed for a record of his own selection. Much though I may miss you and all my loved ones at home I cannot feel lonely in such friendly company. I have the very real satisfaction of knowing myself to be accepted as an integral part of the ward room, as a friend who is always welcome in the Fiddery, and as part and parcel of the ship's life and work by the crew. This morning Captain Blackburn came to my cabin expressly to discuss the effect of our setbacks and delays upon my programme of work, and I don't know whether I was more pleased by his evident desire that he and his ship should give maximum assistance to my scientific work or by the friendliness of his gesture in coming to seek me out in my cabin. My loved ones for whom I write these pages, you know without being told how much I miss you. But on this ship I cannot be lonely.

December 6th

Yesterday the Antarctic was in an unkind yet gracious mood: we were held prisoners yet we might enjoy brilliant sunshine, and disport ourselves upon the floes in a setting of supreme grandeur under the ice falls of the Stenhouse Glaciers. This morning the mood was not just unkind: it was grim. Half a gale from the west was blowing snow before it and even the brash ice in the leads was full of it. The clouds were low and visibility poor. The many coloured scenes of yesterday had given place to a landscape without depth or distance, painted in two flat tones, one dark for rocks and one light for cloud and snow, without definition.

Yet poor as the visibility might be it could not disguise the fact that at breakfast time we were no longer in Visca Anchorage, but lying off Point Hennequin. Apparently, when the wind freshened about 6 or 7 o'clock, the pack began to bear down upon the ship and her anchor chain which was strained out to starboard, the anchor dragged off into deep water. There was little need to do anything about it since all of the pack in a cul-de-sac is on the move it can only go out and with depths of more than a hundred fathoms right across the channel there was little to worry about. So it proved and in the next couple of hours we had drifted three or four miles and open water could be seen ahead. So at 9.30 we wound in the anchor chain that had been hanging like a fishing line from the bow and began to nose our way through the pack. By 10.30 we were in open water and though all the eastern shore of the lower bay was heavily beset we were able to slip in open water under the lee of the western mountains. Once outside we turned westward to lay a course for Deception Island, and it seemed possible that we might find fairly open water between the South Shetland Islands and the heavy pack which filled the centre of Bransfield Strait as far as we could see. We made good progress past the western part of King George Island to the low snow dome of Nelson Island. By two o'clock we could see the rather larger and higher dome of Robert Island almost unbroken by any rock outcrops save the low rocky hills of Robert Point which made a conspicuous landmark line on our starboard bow. But hereabouts our open water failed and the ship now had to fight its way through pack in which the floes were getting larger and the leads smaller and less continuous. The impacts grew more and

more severe and at some of them the ship would reel and roll and shudder convulsively as she met floes heavier than herself and was sheered off to one side. Down in the ward room Jack Richardson was obviously a bit on edge about his engines and the tension written on his face would occasionally be relieved by a caustic comment about what was going on on the bridge. Up on the bridge it was clear that half hearted methods would get us nowhere: indeed we were making very little progress as it was. At 4.30 we were at last abeam of Robert Point and I made a sketch of it which I could not complete because a berg intervened and hid part of the point. So I sketched the bare and jagged outlines of the mountain peaks of Greenwich Island and wondered why there should be such a contrast between this rugged island and the low snow domes of its neighbours Robert and Nelson Islands. By 5.30 we had made perhaps half a sea mile and I could just see the part of Robert Island that had been hidden by the berg an hour earlier and complete my sketch.

During and after dinner the struggle went on but by 9.30 it had become apparent that nothing more could be done tonight. Ahead there lies a floe big enough to carry a football ground: beyond it there are two short leads and then the ice continues beyond as far as the horizon that can be commanded from the masthead. So the engines have been stopped and the bridge left to the night watchman. On our starboard beam, dimly seen under heavy purplish grey clouds, are the mountains of Coronation Island that I sketched four hours earlier. Astern in full view is Robert Point which we first sighted more than eight hours ago. Patience is obviously one of the great virtues in the navigation of Antarctic waters.

December 7th

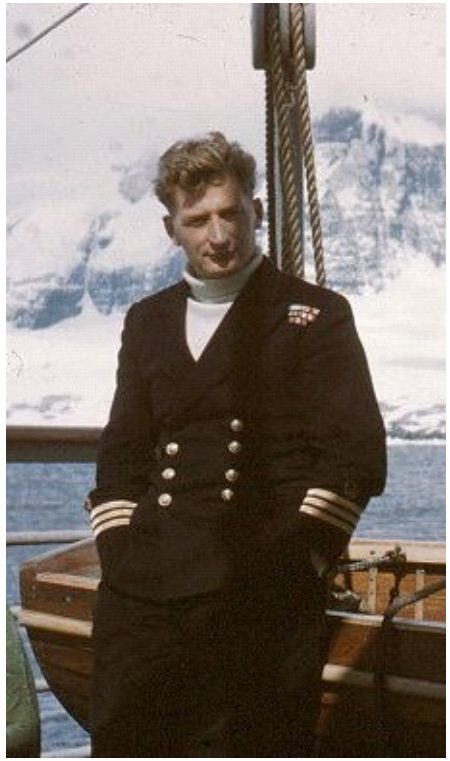
During the night we drifted eight miles with the pack. Out floe as big as a football ground still kept us company but we were back where we had been at lunchtime yesterday, with Robert Point dimly seen dead ahead, Nelson Island on our starboard quarter and Nelson Strait opening out ahead of us. Captain Blackburn decided to attempt to get out of the pack by going through the strait in search of open water and at 9.30 the engines were started and the struggle began afresh. At one time open water could be seen from the masthead six miles ahead, but our hopes of reaching it failed. After two hours in which the ship was all but thrown bodily at the ice it was clear that we could do nothing while the pack remained so close. This ice would seem to have broken up only lately and large unbroken floes are numerous. Between them are smaller floes and brash through which the ship can force a way, but after a short distance she comes across a floe right across her course or two floes in contact without room for manoeuvre. So we have lain here all day truly beset.

There has been Scrabble in the ward room and a western film this evening. I have spent most of the day putting on paper some critical notes on the classification of land ice bodies that I read in Charlesworth's book yesterday, and trying to formulate a classification that would please me better. But ever and anon I had to get up and look out of my open port or go out on deck and look at the pack. Not that I expected anything to have happened to it. But even if it had not changed in position it had always changed in aspect. Visibility has been poor and the sky overcast with only fitful gleams of sunshine yet dramatic effects were not lacking. At one time the low ice dome of Robert Island gleamed like polished metal under the low sun: at another it disappeared completely beneath a slaty indigo cloud while the pack nearer to us lit up in all its immense variety and complexity. For the smooth flat surfaces of unbroken snow of the larger floes are rimmed by hummocks and ridges formed by the buffeting of the floes as they move with wind and current, and here and there smaller bits have been upended or rafted up onto larger floes. Towards evening a vast and shapely three-towered berg appeared some two miles ahead of us: doubtless its five hundred feet or more below water are being driven by the current and carrying it relentlessly through the pack and possibly nearer to us. So after twelve hours of silent drifting, with the shore of Nelson Island now dead astern and only two or three miles away, and the big berg closing on us ahead Captain Blackburn gave orders to start the engines. For half an hour SHACKLETON has struggled again, moving a little forward, then back: but it has been a losing battle and as we withdrew the floe has closed in ahead of us and we have yielded more than we had gained. Then suddenly the ringing of the engine room telegraph and the vibration of the engines dies away and hurried footsteps descend the stairs and I see Tom Flack going down to the engine room. From an open port in the empty ward room I look out and listen to the sibilant murmur of the pack in the still night. A sudden hiss travels through the brash ice in a narrow lead, builds up and is followed by a plop or a sharp crack as something gives way, and then a hissing again with little crackling noises. The pack is never at rest though it appears to be so. Suddenly I am aware that someone has come into the ward room and I turn to find Jack Richardson with two bolts in his hand. He turns them to show me where the ends have sheared off. These are the bolts he inserted when he repaired the rudder on Thursday: they were intentionally made of weak metal so that should the rudder be under strain again they would shear away before any other part should be damaged. Now they have indeed done just that and our rudder is

forced round to port till it stands almost at right angles to the ship. Our situation at this moment is far from satisfactory.

December 8th

I woke suddenly to the realisation that the ship was under way. The engines throbbed and the transmission whined as she was set against a floe ahead. Then a swishing and a cracking noise against the side. I opened my port and looked out at the ice we had disfigured with galley waste, an empty crate, empty beer cans and two empty gin bottles. We were going astern and swishing through the brash ice. Astern of us lay the ice cliffs of Nelson Island – to my eye horribly near. They were further away than I would have estimated – two and three quarter miles, in fact, but underwater dangers extend offshore for more than a mile. And no doubt the big berg was closing in on us ahead. I was as surprised as thankful that the rudder had been repaired and that the SHACKLETON was no longer drifting disabled towards the lee shore. I looked at my watch and was still more surprised – it was only a little after two o'clock. The engineers had done incredibly well to have the rudder serviceable again so soon. The pack must have been easier than it was at midnight for the ship was making headway. She worked past two or three large floes out to the southward and out to sea. In an hour she had gained a couple of miles perhaps and satisfied with this Captain Blackburn finished with the engines and left the ship to drift until morning.



CPO Tom Flack

By breakfast time we had drifted many miles backward toward the east. We lay off the strait between Nelson Island and the western end of King George Island, and could look along the south coast of the island from Three Brothers Hill to the entrance to Admiralty Bay and Martins Head beyond. Robert Point lay far to the west and seemed very small and remote: The mountains of Greenwich Island that I had sketched on Saturday afternoon were almost out of sight. At 9.30 the engines were started again and with great difficulty the ship was worked a mile or two to the westward so that the big berg was now a mile astern of us and would not drift down upon us. But it took two and a half hours hard steaming to achieve this and at noon the effort was given up as too unpromising.

After lunch the Captain and I walked the deck together in the warm sunshine that we hoped was loosening the pack. The glare from the ice floe was excessive and I had to come back to my cabin for goggles. It was apparent to me, though Captain Blackburn was understandably reluctant to agree, that since noon we had lost by drifting the hard won miles we had steamed in the forenoon. And he spoke of his intention of allowing the ship to drift the whole length of King George Island and going north almost past all the South Shetlands to approach Deception Island from the west. Away to the east, southeast and south a hard line formed a very clean-cut horizon between the milk-white pack and a very dark and leaden band in the lower sky. Captain Blackburn was sure it was "water sky" and that at some distance to the southeast lay open water.

At 5.30pm the engines were started once again and we set out with the drift towards the east. Gradually our course became more southerly and we drew away from King George Island. At dinner we celebrated Jim Martin's birthday – his twenty fourth – but comings and goings between ward room and bridge made the celebrations a little disjointed. Then I joined in a foursome of Scrabble while SHACKLETON pounded away at the floes ahead. By nine o'clock it was clear that open water lay ahead: by ten only a mile or two of pack remained: but the pack was close to the last and it was not until nearly eleven that the ship was free. I went out onto the afterdeck to see the boundary of the white prison that has held us close for sixty hours receding into the distance. And there in the intervening water was SHACKLETON'S wake drawn in amazing zigzags. We were making rapid turns to port and to starboard at speed. Was this SHACKLETON being skittish at her return to open water? Or was the engineer taking his first opportunity and making a rudder test? Anyway it was clear that the rudder worked.

End of Part 1

Part 2

December 9th – January 7th

In Antarctic Waters

Deception Island and back to Deception Island

December 9th

At last we have reached base B on Deception Island, on the sixth day after raising our anchor to sail from Visca Anchorage and the fourth day after we actually got away. And this day has been as full of difficulty as any of them, for achievement of open water last night was not the end of our troubles. I went to bed to the steady rhythmic beat of the engines thinking how like a liner SHACKLETON now seemed, cleaving a swift passage through the waves. But rather before four o'clock I woke realising from the rising and falling note of the engines, the shuddering crash of the bows into a floe and the crunching and scraping of ice along the sides that we were once more in the pack. When I looked out of the port the scene was desolate enough – a pale blue-grey ceiling of cloud overhead, a pale blue-grey waste of ice floes beneath cut by harsh black lines along the narrow water leads. It was a scene without colour and without half tones or distance: a scene to dampen the spirits. The pack, moreover, seemed very fresh – there was little brash ice and the edges of the floes seemed clean and freshly broken as though till recently this had been unbroken sea ice. There can be little doubt that winter has been hard here, or spring tardy, or both. For this is surely one of the worst ice seasons that has been known in the Bransfield Strait: certainly it is the worst Jack Richardson has encountered in his ten years of voyaging here.

I lay down and must have fallen asleep again despite the crashing and pounding of the ship. When I woke again the engines were still and we were once more adrift in the pack, this time out of sight of land, with poor visibility and thin snow being driven before the wind. There was a sound of hammering astern and my suspicions were confirmed when the mess boy brought my morning cup of tea with the laconic greeting "Rudder's gone again, sir".

Breakfast in the ward room was a silent meal, but at 9.30 repairs had been effected and we were once more underway. For nearly three hours we battered our way westward through the pack. At noon Deception Island could be seen ahead, but once more the rudder collided with the ice and Jack Richardson's bolts sheared. New bolts were put in their place and we were to start again at 1.30pm. Captain Blackburn was on the bridge with officers and helmsmen ready to move when a small iceberg moved across the stern and collided with the rudder. So for the third time today it was damaged, and for the third time repaired. Nevertheless when we were able to start again we found a fair amount of good water and were able to make good progress. Visibility had deteriorated and Deception Island had disappeared so I returned to my air photographs and my stereoscope in my cabin.

After 5 o'clock visibility improved again. We were now eight or nine miles east of Deception Island and approaching it slowly through pack ice that covered 9/10ths of the sea. Between the floes, however, were several glassy pools reflecting the sun now breaking through. This was the floe in yet another new and lovely aspect and I went for my camera. I also took my stereo pairs up onto the bridge and there, as at Hope Bay, I compared the view of the aircraft flying at 14,000 feet with the sea level view through binoculars, putting together two views, each of them in only two dimensions, to make a three-dimensional mental image. For long my attention was held by the strange straight line of beach ice cliffs that forms the east coast for four miles. They are straight because the waves of easterly gales have made them so and they are black with volcanic rock, for Deception Island is the broken wreck of a great volcano and the later stages of its activity have coincided in time with the ice age. As the east coast and its ice cliffs dropped astern everybody was on deck and all eyes were on the southern coast looking for the narrow opening that leads into the great caldera, drowned 80 or 90 fathoms deep, that forms the heart of the volcano. The entrance is called Neptunes Bellows, and the caldera, Port Foster, after the Captain of HMS Chanticleer who came here in 1829. Deception Island is in fact a mere annulus of mountains, ice clad in its higher parts which rise to 1800 feet, surrounding this great natural harbour which measures some six miles by four, but whose entrance is a mere chink in the mountain ring. Even that has a rock in the middle so that the navigable channel is only 720 feet wide.

The pack ice showed no signs of thinning and SHACKLETON had to work her way slowly towards the entrance, so that Derek and I had ample time to examine the spectacular architecture of the southern slopes through binoculars. Great brown cliffs that turned out to be a massive agglomerate when we visited them, up to 400ft high were seen to be broken through by volcanic craters filled with sharply bedded black ash, while nearby slopes could be seen to be made by recent lava flows. Neil Orr asked me how old were the formations that were so colourful and interesting and he was surprised when I said that some of the lavas might well have been poured out in historic time – though I wouldn't say whether it was English or Egyptian history I had in mind.

Somehow we had found a way through the ice in the Bellows and all Port Foster opened up before us. The sun had gone again and it was a stark black and white scene – the white *néves* of the higher hills, and of the unbroken sea ice of the northern half of Port Foster, contrasting with the black snow-free slopes of the numerous small volcanic cones that form an inner rim round the caldera. And nearer at hand and in Whalers Bay (first turn right just inside the entrance) was open water which reflected the blue of a portion of sky that appeared through a rift in the clouds. Cape pigeons flew low across the mirror surface almost touching their own reflections. Ashore the ruined buildings and empty oil tanks of the whaling station of forty years ago make gaunt company for the base hut, but all six members of the base and two dogs were down on the shore to welcome the ship. Our anchor chain rattled out and so alarmed a nearby group of penguins that they set off in great agitation up a snow slope so steep that one of them could barely manage it at all: when last I noticed them they were perhaps 150 feet up! Perhaps tomorrow I shall be ascending that same slope.

December 10th

Today has truly been a wonderful day. That word is to be taken literally, for we have seen wonders and have been filled with wonder and awe at the things we have seen and we have come home silent, tired, exhilarated and grateful. A day indeed to remember – but description must wait till tomorrow.

We seem to have been very lazy about getting away. By the time we had put on field kit and the mess boy had made us some sandwiches, elevenses were being served in the ward room – so we stayed for a cup of coffee. Even then, when I found Neil Orr and Ian Hampton peeling potatoes on the after deck I stopped to peel a few with them and left only when I had persuaded the first officer to take my place. But at last we got ourselves ashore and set off up a long rock rib between two snowfields behind the beach. For long there was no bare rock showing and the rock was like a cinder heap: a black grit and gravel of volcanic fragments covered the surface. The largest fragments and blocks were of unexpectedly many kinds – dark glassy black lavas with tiny white crystals streaming in the direction in which the lava flowed: true flow banded lavas: lavas full of cavities that had once held steam bubbles and so light enough to be called pumice: blocks of yellow agglomerate that seemed very susceptible to frost shattering for often we found only a yard long patch of smaller fragments where a block had once been; red brick cindery scoriae or fine grained uniform lavas, and yet others. We began to wonder whether all these rocks cropped out on this one hillside or whether they had been assembled there by the aid of glacier transport. Certain it was that the whole tumble of waste is moving downhill fairly rapidly, for the patches of agglomerate fragments were drawn downhill a yard or two: and where a dolerite or basalt boulder had split into a collection of slices that were about the size of roofing tiles and rang under the hammer, the slices, which could be fitted together again readily enough, were strung out over more than two yards. Uphill the agglomerate fragments increased in number and size and in due course we came to the rock in outcrops: sheets of it dipped downhill to NW, W or even SW, away from a little knoll that formed the summit of our spur. But on the south the slope was covered by other rock debris and though we thought the sheets of partly cemented yellow agglomerate might lead up to a little cone of the late phase of vulcanicity – late enough for the slopes we saw to be the slopes of the cone itself relatively little modified by erosion – we could not be sure that the roundness of the spur was not due to moulding by the ice from Mt Pond sweeping over it.

Though the morning had been brilliantly sunny at breakfast time, the sky was already clouded over when we went ashore. Now it was grey with low cloud and a thirty knot breeze from the west made us rather cold. Nevertheless it would be colder on the snow slopes above so we found a fairly sheltered spot and ate our lunch looking across the whole width of Bransfield Strait. There on the far side was the continental coast of Graham Land, still bathed in sunshine. To the left Astrolabe Island formed the real limit of the view, far beyond it the cloud covered or shadowed the landscape; to the right lay the graceful mountain slopes of Trinity Island. Between stretched a long panorama of the Detroit Plateau and the plateau behind the Palmer coast, all of it sixty or seventy miles away and its white snows turned to a deep warm ivory colour, tinged with ochrous or even browner tints, by the scattering and loss of the blue end of the spectrum during its long journey through the clear air. The plateau stands 3,500-4,500 feet above the sea and the rise to it is at first gradual over a long ice apron broken by a few nunataks, and then very abrupt by rock-walled spurs that separate deep glacial troughs. All this we could clearly see, and had been led to expect by our examination of the oblique and vertical air photographs. But more than this we could see repeated again and again a feature I had only seen in one or two instances on the photographs – namely that the plateau surface undulates regularly and that the convexities correspond with the frequent divides between glacial troughs: this implies that the latter were initiated in previously existing concavities, or in a wall along the lines of preglacial valleys. I have become convinced that the form of the preglacial landscape can still be recognised in Graham Land and that in its general character it resembled the Monadhliath and portions of the Grampian

Highlands that I know so well. How grateful I must be for the good fortune that has brought me here to detect a resemblance that twenty years of fieldwork in Scotland have particularly qualified me to recognise.

Bransfield Strait itself was an impressive sight, for no part of it was free of ice, except away to the east of a line joining Astrolabe Island to the eastern end of King George Island. This was the open water we had reached after so many setbacks late on Monday evening, and it was clear that had we not achieved it we should not have reached Deception Island. Westwards of this line, although there were some extensive patches where water predominated over ice the pack was general and in large areas closed for as far as we could see from this viewpoint.

ANT 32 : Rime ice at 1600ft : 10 Dec 58

We now ascended a steep snow slope to the main ridge at eleven hundred feet. Here was a strange and beautiful panorama; an outcrop of rock had made a foundation for a fantastically intricate growth of ice. The ice mass had grown two or three feet upwards from the rock, but also for five or six feet, which were quite unsupported below, into the wind. In detail its forms were streamlined and fluted with streamlines obviously related to the wind. We had rather hoped that upon this ridge we might find some of the rime ice accumulations we had already speculated about a good time, and here we had an evident growth of rime ice, but were somewhat disappointed by it. As we went on I noticed similar streamlined and fluted forms in the wind crust over which we were walking and came to realise that that these, or the fluted forms of the rime ice we had just seen, were forms of erosion – erosion by a wind of probably more than gale force charged with ice grains at temperatures far below freezing point acting like sharp edged shot.

A long pull up the snow-clad ridge brought us to what we had imagined from more than a mile off to be the summit and here was an accumulation of rime ice like a large cairn. But as we reached it we found the summit to be further on – an even greater mound of rime ice. When we reached the top of it we sank waste-deep into a sort of froth of ice. To the north we could see many more such mounds rising from the smooth rounded snow crest. Each resembled nothing so much as a great cauliflower head ten, twenty or thirty feet across, or if you prefer an image that conveys something of the brightness and lightness of these ice structures, think of the actively growing head of a summer cumulus cloud. The resemblance to a cauliflower, however, goes a little further than the surface, for behind the flower clusters of the vegetable are a multitude of supporting stalks, and if you break open one of the rounded bosses of ice you will find it built of crystals of needle ice two or three inches long arranged perpendicularly to the surface like the little stalks in the cauliflower. If there was a rock core to any of these structures, probing with an ice axe did not reveal it. On the ground they seemed to grow quite fortuitously, but whereas the rime ice we had seen at the southern end of the ridge had accumulated with, or been eroded by, west winds, here the accumulations were quite uneroded, building forward their rounded bossy surfaces in all winds from north west to north east. This was all most exciting, for although I had already seen reason in the South Orkneys and at Hope Bay to think that accumulations of rime ace might be responsible for important differences between windward and leeward summits, this was the first time we had met rime ice in the flesh, and it came fully up to our expectations.

Our exploration of our icy cauliflowers had taken us to the end of the ridge where, at a little distance, we had noted wisps of what may have been mist, drifting snow or steam, trailing across some bare ground. Snow-free ground at 1500 or 1600 feet in this exposed situation seemed unlikely in the ordinary way so we suspected something a little extraordinary. Nor were we disappointed. When we reached the spot we found an extensive area of fumaroles where steam issued from cracks in the ground. Where the ground was bare rock it could be seen clearly that the points of issue lay, in fact, along the joint crack

and that some of these had been covered by deposition of minerals. Where the ground was covered by frost debris the steam issued from an ill-defined patch that was hot – dangerously hot – to the touch, and marked by deposition of white salts – probably sulphates – an inch or two below the surface. Never before in his life had Derek come into contact with any direct manifestations of volcanic activity and to have this demonstration to sight and touch of the inner warmth of the earth was an exciting experience. And to any thinking person it is always a matter for wonder. Not only did the subterranean warmth keep the ground snow-free but it permitted the growth to 1600 feet of carpets of mosses as luxuriant as any we have seen at lower levels on Deception Island. But though the ground surface may be warm enough for plant life, the top of a boulder resting on the ground is quite another matter. Many boulders standing on the steaming ground carry last winter's encrustation of rime ice, many times their own size, still unmelted.

From the summit of Mount Pond and all this northern line of the ridge we had a clear view of all that lay to the north and west of us, though as we reached the summit some low cloud on Mount Kirkwood on the other side of Port Foster and on Mt Pond itself made us apprehensive that we should be enveloped in driving mist. But this cloud formed only to disperse and we enjoyed a spectacle as impressive in its way as that of the Graham Land coast across Bransfield Strait. Dominating the scene were the high peaks of the eastern part of Livingston Island, which are of truly alpine aspect and rise in Mt Barnard, now called Mt Friesland, to 5000 feet. At twenty miles distance they looked impressively grand and formidably rugged. Beyond them to the northeast we could see Greenwich Island with Castle Rock and Robert Island with Robert Point both apparently just as beset with pack ice as when we struggled toward and drifted backward there last Sunday. The western half of Livingston Island is in strong contrast to the high mountains of the eastern half. A long low snow dome, ending in a considerable ice tor and of low rocky hills that even at this distance could be seen to be margined by elevated strandlines. This is one of the areas that we had marked down from the photographs as an important one [illegible]

It was now after six o'clock and we began our return by descending the long and steep snow-slope on the western side of the ridge. Below us we could see the Chilean base at Pendulum Cove, so called because Captain Foster swung his pendulums here in 1829 to determine what value the acceleration due to gravity had in high southern latitudes. We roped up and picked a course to avoid the crevasses that are a conspicuous feature of parts of the slope. I suspect that the rime ice accumulations grow forward and break away and certainly we could see a collection of fallen masses at the foot of the slope a thousand feet below. We descended without encountering any crevasses and found one of the fallen blocks that had bounded furthest to be very solid ice, but when broken open showed some evidence of the needle structure we had seen in the cauliflower-like knolls in the region of accumulation.

[illegible]

ANT23a/b : S. SHET Deception Is. Mt Kirkwood Port Foster : 11(sic) Dec 58

mounds, and each of these is found to possess a core of clear glassy ice that extends to within eight inches of the surface. Evidently the whole glacier surface was at the level of the top of the mounds in the recent past: but while the surface of the clean ice has been formed by melting, the portions overlain by a thick carpet of black volcanic gravel have been effectively insulated from the suns heat and have remained largely unmelted. They cannot remain so indefinitely, of course, for as the ridge starts to stand in relief above the ice, the mantle of ash and gravel tends to slide off and expose a scar of bare ice to melting. So the ridges of debris come into existence but also shift and spread.

This particular "Black glacier" bulges forward into a valley shut off from Port Foster by a sharp ridge: at its northern end is the shallow embayment of Pendulum Cove and at its southern end a little frozen lake. Above the lake is a small ice cliff in which we could see layers of clear ice alternating with layers of black ash and gravel: whether the latter represent periods of volcanic eruptions showering ashes onto the ice, or whether the material has arrived more prosaically, being carried by wind and water from nearby weathered outcrops or morainic accumulations I do not yet know. But there is, I think, evidence that this particular "black glacier" has pushed forward in the last 130 years. For when Captain Foster made his visit in 1829 he found (in the words of *The Antarctic Pilot)* "a considerable inlet where there is now only a small bight and a freshwater lake." It is hard to resist the inference that the "black glacier" in bulging forward has filled the whole middle part of Foster's cove, turning its head into the freshwater lake and leaving only the small bight to the north. The head of the former cove is hemmed in by a long ridge which rises to the snowfields and the main watershed. On its face two massive outcrops, presumably of lava, stand out as a line of cliffs and as this line is traced up into the snowfield it becomes marked by accumulations of rime ice. The latter has grown preferentially on the steep rock faces rather than on the ash slopes above and below. Perhaps the cauliflowers of the summit ridge have begun to grow on upstanding outcrops.

We crossed the ridge and found ourselves faced with a quite bewildering series of moraines surrounding another glacier lobe. We began to follow the moraines but abandoned them for the glacier, even though this meant roping up and probing for crevasses. Of these we found several without stumbling into any, but to cross this one glacier consumed an hour and there were two more to come. Fortunately they were not at all crevassed and gave us no trouble but by now we were getting weary. Yet our spirits were sustained by the wonder and beauty of the scene all round us. The clouds had cleared away and the wind had dropped to give an evening of still clarity in which light seemed to be a quality of the air itself. Far out across Bransfield Strait the clouds had cleared entirely from Grahamland and the plateau skyline could be seen as a gently falling and swelling line drawn in a wash of mauve against an amber sky. It might have been the skyline of the Lammermuirs or the Monadhliath, and I was thrilled both with the beauty of what I saw and with its imaginative implications. Through Neptune's window we looked into a nearer part of the strait and here the pattern of ice floes, water and small bergs made a symphony of lilac, cream and apple green that recalled some of Monet's haystacks and cathedrals. Above us and on our left the snows we had traversed earlier in the day flushed from cream to peach and from peach to salmon pink while the lavender of the shadows crept past us up the slopes till only the summits were left flaming. When the sun had gone we walked in silence to the slope above the huts, and the desolation of the old whaling station, until the spell of wonder that had been put upon us was broken as we floundered in snow, now frozen hard, now treacherously soft, and now undermined by melt water beneath frozen crust. When at last we were back on board we had been away practically twelve hours. Neil Orr, ever kindly and considerate, helped us get a meal by cooking peas and frankfurters, and the meal that Derek and I ate from the cocktail table in my cabin at midnight is one I think we shall long recall with much pleasure.

December 11th

Too tired and too excited by all we had seen I could not fall asleep readily and so slept late and woke only to the sound of coffee cups rattling for elevenses in the ward room pantry which is on the other side of the bulkhead from my bunk. After coffee I went to the Captain's cabin to amplify the report on the sea ice situation which I had given to Tom Woodfield immediately on our return the previous night. He told me that if HMS PROTECTOR could get into Boyd Strait she would fly off a helicopter to us with mail. From what Derek and I had seen of Boyd Strait, however, we were not sanguine that the PROTECTOR, which has orders from the Admiralty not to enter the ice, would be able to get close enough to get within helicopter range.

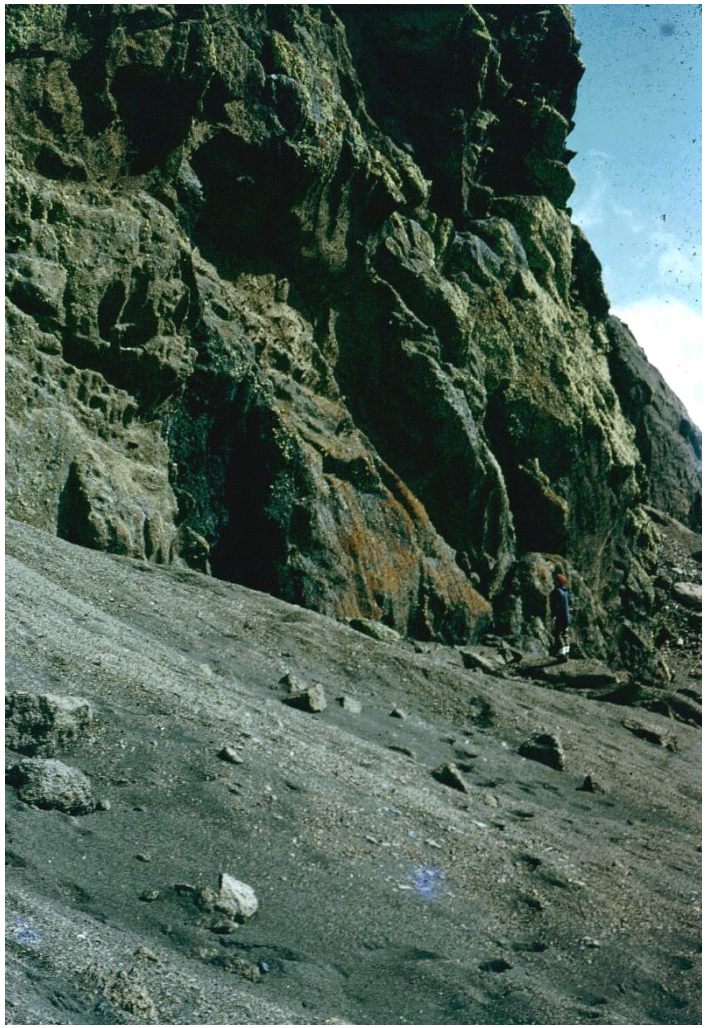
The day was magnificently bright and sunny and after lunch we examined part of the rampart of lofty volcanic cliffs that separates Whalers Bay from the open sea. This barrier is half broken through – at the first floor level – at Neptunes Window, midway along its length, and completely breached at the south western end of Neptunes Bellows. The Bellows are overlooked on the northern side by the ochre coloured cliffs of Fildes Point which rise sheer to 484ft: on the southern side, the rise, if not quite so sheer, is even more. Near Fildes Point the cliffs of the rampart drop sheer to the sea on one side and to the waters of Whalers Bay on the other and doubtless this was once true all the way along to Neptunes Window and beyond. But Whalers Bay has been extensively silted up at its head by the streams that emerge from the icefield behind and spread their waters and their gritty load all over the flat plain behind the present beach which curves round to meet the cliffs of the coastal rampart about half a mile inside Fildes Point. From the end of the beach the foot of the cliff is mantled by a great sheet of scree material which rises as one proceeds inland: at Neptune's Window it extends up to the windowsill at 125 feet and at the very head of the bay the cliffs are almost completely buried in scree up to 300 feet. Evidently the silting up of Whalers Bay, the forward growth of the beach, and the burial of the old cliffs under their own debris have all been going on progressively and simultaneously, and from all indications very rapidly.

At the southern end of the beach the cliffs make a great buttress that attracted us by its colouring. The rocks are ochre coloured and brown, and I had thought when we saw them from the SHACKLETON on the seaward side that they were of basaltic lava: but as we approached it became clear from the broken rocks that littered the scree that these were not lavas but a coarse volcanic agglomerate with chips and fragments of earlier rocks, including black and red lavas, in a yellowish ground mass. On this yellowish brown foundation nature had painted with a full brush and with a palette lavish for the Antarctic. Sheets of rock square yards in extent were covered by a lichen which ranged in colour from deep mustard yellow to rich orange red: other rocks were covered by the …… encrusting lichens of mottled sombre grey, but the upper part of the cliff was hung with a thick growth of reindeer moss of a lovely lime green colour. When Derek wished to take a photograph I clambered up to a ledge to provide an object that could give scale to the whole. As I sat there I found myself in a veritable sun trap and not alone at that. Four cape pigeons were resting at intervals of a yard or two along the same ledge.

ANT 29 : S. SHET Deception Island Beach at Whalers Bay : !! Dec 58

At the top of the cliffs we found banded sandy deposits with evident unconformity on the top of the agglomerates, and in places banked up against them, and with lenses of ice which might have been included in the beds, or frozen against them as cornices and partly buried. There was enough evidence that the latter process goes on but we still had suspicions that some of the ice was deeper seated. As we sat debating this and making notes we heard a distant drone. On field work in England, even in the remote Highlands, the sound of an aircraft is to be expected and goes unremarked. In the Antarctic it is electrifying. Soon we could see the black dot suspended above the western rim of the island behind Telefon Bay, and soon it was circling Whalers Bay and had come in to land on a flat stretch of black gravel behind the base hut. It did not stay long, and after rising circled round to look at the ice conditions in the Bellows – which amused us for we knew that the pilot would find them choked with ice though we could see a large area clear just outside – he crossed the western mountain rim and was gone. We learned later that he had left PROTECTOR at a point in Boyd Strait 56 miles away.

When we returned on board I was completely surprised to find there was mail for me – two letters and a parcel awaited me in my cabin. One letter from the editors of Nature acknowledged a manuscript that I had dispatched to them from Montevideo – a most welcome assurance that letters posted in Montevideo do in fact reach England. The second letter was from you Jane and most heart-warming it was to read your news. The parcel had been sent from Sale Hill and had evidently been passed to the JOHN BISCOE in Southampton and HMS PROTECTOR in Stanley, and contains Christmas cards and gifts from the family. I put it aside for Christmas Day and went to the radio cabin to send a radio letter to let you all know at once that I had received it. How much I look forward to opening it on Christmas Day and feeling myself for a little with you. How happy I am to be able to let you know that I shall be doing so. And how appreciative I am of this miracle that has brought mail to the ship out of the blue.



ANT 27 : S. SHET Cliffs and lichens nr Neptunes window Deception Island :

11 Dec 58

December 12th

As we prepared to go ashore this morning Derek said to me: ”I don’t think you have heard the latest news that broke last night”. My reply “No, about what?” made it clear that I had not, so he went to fetch what he called his documentary evidence. This was a signal to say that the Queen had approved the award to him of the Polar Medal for his work in the Antarctic for (it said) 1954-55 (though no doubt 1955-57 was intended.) I told Derek that it did not in anyway change or add to my own esteem for him, but it made me very happy because it meant that other people’s estimates of him would correspond more closely with my own. This, of course, is the real purpose of such awards, that a man should be given respect by all that those who know him and his work at first hand believe should be given. My own regard and esteem for Derek have both strengthened during these last weeks: in the field he is just as observant and intellectually active as myself, and a tower of strength as being most patient and considerate in the more difficult places. As a base leader at Horseshoe Island I have no doubt he was able to achieve excellent results through a leadership that owed much to personal example. His is certainly a well-merited award.

ANT 26 : S. SHET Deception Is. SE Point : 12 Dec 58

We spent all our working hours today on about a mile and a half of coastline from Neptunes Window to South East Point, and full of interest we found it. The Window itself is a fascinating place. One approaches from the landward side up a steep slope that instead of being overhung by cliffs to supply the debris, suddenly ends in midair: one comes to an abrupt edge and looks 130 feet or more down a smooth vertical black cliff-face to the ice foot and a little beach set in a tiny cove below. On either hand the cove is enclosed by cliff walls just as black and just as smooth and vertical up to the level of the window, but higher up becoming yellow, broken, and at their crusts weathering into fantastic pinnacles. The entrance to the cove lies between the buttresses which approach each other a little to give a measure of enclosure to what lies within. These like the cliffs outside are yellow right down to sea-level, and curiously enough knobs of the yellow rock, a foot or a yard in dimension, are embedded in the smooth black walls of the cylindrical cove and stand out from them in relief. Finally the scree up which one clambers to the lip is seen there in section – a ten-foot thick accumulation of boulders and blocks, resting with strong unconformity on the black rock of the cliffs. On either side of the window this unconformity sweeps up to heights of 200 feet above the sea where the breccia that overlies it passes into the coarse scree bands? that are still being augmented by the rain of rock waste from the gullies in the agglomerate cliffs of the coastal rampart. These reactions leave one in no doubt that this rampart was once continuous right over the site of the Window.

The sea has somehow breached the rampart at this point, eaten out the little black-walled cylindrical cove, and left the scree-mantled slope to end in mid-air. Evidently, too, the black rock has provided the weakness that gave the waves their destructive opportunity. We examined the black rock, though it had to be done at the end of a rope for safety’s sake, and found that it differed only in colour and in not ringing under the hammer, from the yellow agglomerate that makes the rest of the cliffs. We concluded that it had once been yellow agglomerate but had been altered by gaseous emanations rising from some lava reservoir far below sea-level, the alteration being confined to the cylindrical pipe from which the sea had so thoroughly scooped out the stressed and softened rock. Though the scooping out is very recent – and indeed is still going on – the alteration of the

rock, and the volcanic activity associated with it could be much older: certainly it is older than the erosion of the line of agglomerate cliffs that overlooks Whalers Bay and the screes that mantle their lower halves, for the scree breccias rest without sign of alteration directly on the black and altered rock.

Eastwards from Neptunes Window the ridge forms a pinnacled cockscomb of rock that we avoided by traversing on the scree, but further on broadens out into a little flat-topped and cliff-walled plateau some 400ft above the waves. We made our way on to this by way of an open funnel-shaped gully which, most uncomfortably, was choked with ice in its throat. The view from the top was splendid. The shear ochre-coloured cliffs on the other side of the window rising to our own height and more and the 150-foot stack of Petes Pillar were bordered by a dazzling white zone of small ice floes driven inshore with clear blue water astride: beyond Neptunes Bellows there were red and black lavas, grey scree slopes and green patches of vegetation below the skyline snowfields.

Immediately beneath us the sea cliffs fell sheer on one side and on the other, our little plateau was cut into a jagged fringe of rock pinnacles and separating gullies so steep that nothing but the largest chock stones lodged in their clean

ANT 25 : S. SHET Deception Is. : 12 Dec 58

swept contours. Rather to our horror we found that one of these cut the plateau in two, extending back just far enough for its lip to intersect the cliff: for about ten feet only a rounded rim a few inches wide and made of smooth but scaling rock connected the dissevered portions. With legs dangling down the gully slope and our backs to the sea we inched our way across on our seats – not very stylish mountaineering but safe and sure. The plateau remnant on the farther side interested us greatly for despite its height and its isolation we found it to be covered by level-bedded waterlaid sands and gravels. The variety of rock types represented in the gravels showed the deposit to be of fluvio-glacial origin, but what deposition of ice one must invoke to explain how these water-sorted gravels came to be perched on this lofty little platform is by no means obvious.

A little further east the sea cliffs cut a section in a small volcano, and yellow agglomerate, black ash, red scoriaceous lava, grey basalt and dark clinker combine to make a most colourful and arresting section. Its inaccessibility prevented us from unravelling the story that it can certainly tell, but we did follow one of the lava flows downhill from the site of the crater to the sea at South East Point. After being poured out the lava flow has been covered by glacial sand and gravel, but where these have been washed off again the extremely jagged and unkind hummocks and hollows of the irregularly solidified vesicular crust has been revealed once more. Derek had never seen anything of the kind before but could readily understand from seeing this small example why so many square miles of lava desert in Iceland are quite untraversable.

After dinner Tom Flack, as president of the mess invited Derek to join us in a ward room film show to allow us to drink his health and congratulate him on his award. The film was poor in the extreme, but its setting in Hong Kong and Macao set Jack Richardson reminiscing about his experiences in the Pacific War and his excellent form more than made up for the shortcomings of the film.

December 13th

When I looked out from my cabin about 5am the cliffs and screes on which we scrambled yesterday were white with freshly fallen snow with all their details of gully and buttress, joint cracks and bedding clearly revealed. By breakfast time almost all the new snow had gone and the cliffs were just a featureless wall separating the dark grey sea from a somewhat lighter cloud ceiling hung just below the cliff tops. So we made no start till after lunch, when we went with Tom Woodfield, Jim Martin, Neil Orr and a FID from Base B called O'Neill,

to the other side of Neptunes Bellows. Tom, Jim and Neil went off to photograph birds near the bellows, Vince O'Neill came with Derek and myself to be set down at a little point called Collins Point which carries a small light erected in the whaling days and now maintained by Base B. Vince in fact was setting off to visit the Argentinians at their base and we asked him to discover if we would be welcome visitors ourselves a few days later.

Collins Point is made of a recent looking lava flow which is overlaid by a dozen or more feet of bedded glacial gravel on which the light beacon stands. A few yards along the shore the base of the lava flow is seen to rest on glacial gravels of exactly the same kind. In fact it is evident that when the melt water from glaciers extended well in front of their present positions was washing the gravels into place local vulcanicity was going on so that the lava became incorporated in the outwash sequence. But despite this proof of quite recent volcanic activity we found that the low hills and enclosed crater-like basins which from the air photographs one might readily regard as of volcanic origin were all built of glacial outwash deposits. One such basin which I dubbed "The Circus" has an enclosed floor whose lowest point is 92 feet above Port Foster, but is separated from it by a grand ridge never less than a hundred foot high. Streams pour into the circus from the glaciers and snowfields on the hills on the landward side and have spread out their load and their waters to make a beautiful and intricate pattern of anastomising channels on the basin floor. There is however no ponding of the waters and no visible outlet: all the water must seep away through the extremely permeable material of the enclosing ridge. Indeed proof of this is starkly to be seen in the large number of stream furrows that begin with spring heads low down on the seaward slope.

This certainly intrigued and surprised us, but no more so than the discovery that the moraines of a glacier tongue a little further west were nothing more than mounds and ridges of ice thinly covered by a blanket of morainic gravel. A melt water stream has cut through the whole series at one point (before disappearing into a tunnel under the gravel) and revealed a cliff of 40 feet of glassy ice with a number of dirt bands. The latter followed lines of thrusting in the ice, curving upwards towards Port Foster and repeated in a sort of imbricate structure. At one point ice or dirt bands could be seen to be involved in a recumbent S-fold. What perhaps was most surprising was not that the ice and its glacier structures should be preserved beneath a cover of morainic material (for one has read of the ice of the Malaspina Glacier in Alaska having so long stagnated beneath a moraine cover that great forests of spruce have grown up on parts of it) but that the cover of debris necessary to protect the ice from melting should be only a few inches, at most a foot thick. We would willingly have spent longer here, but the weather had deteriorated to a steady snowfall and we were glad to make our way along the beach to our rendezvous with the boat

December 14th

Another day of the kind of weather that is known on the F.I.D.S. bases as 'clagg'. Whether this expressive term has been contracted from 'clammy fog' or arisen in some other way, (it is a miners' term for a sticky tunnel roof. Ed.), it conveniently describes a condition with an overcast sky and a cloud base only a hundred or so feet above sea level. Clearly we could not go far afield in these conditions and spent the day examining a 'black glacier' and its surroundings only a mile or two north west of the base hut. Sometimes we were

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wholly in cloud, sometimes we could see below the overcast to the further side of Port Foster, but except that we could have asked for better light to photograph the interesting things we saw, the weather did not impede our work.

We were much intrigued to find we could recognise three different lines of moraines associated with this glacier and its neighbour. The innermost lines comprise a series of low black ridges from a foot to a yard high, separated by a good deal of clear white ice. The middle series we called the yellow moraines because blocks of the yellow agglomerate are so common in them that the whole series is coloured by them, and the third series we called the grey moraines. On examination we found that the black series are made of small material of varied sorts, but mostly little lava fragments that are black when wet: and these moraines owe their colour to their wetness. Digging into them we found them to be made almost entirely of clear glassy ice but in the core of each is a dirt band. Some of these dirt bands are only an inch thick and the thickest was about eight or nine inches. They are inclined to the surface of the glacier at angles which increase from about 30 degrees under the discontinuous moraine strips to near verticality in the outer belt. Probably the solid matter is being pushed to the surface along inclined thrust planes and is there set free by melting and so comes to stand up as a ridge. When the ridge becomes more than two or three feet high the fine gravel slides into the hollow down slope and seems to protect a more irregular belt there.

The yellow moraines are a series of ridges and tumultuous mounds up to forty feet high that overlook the present glacier with its black moraines on the inner side, and fall steeply away to the moraines of the grey lines on the outer. Despite their height we found that even the loftiest mounds were made of ice with only a thin capping and skin of moraine material and with dirt bands a few inches thick revealed in the ice cliffs formed by slipping of the face of the mound. Only the grey series proved not to be covered by ice. They are made of the same basalt gravel that forms the bulk of the yellow moraines and the whole of the black series, but without the large boulders of the former. Having no ice cover they are permeable and freely drained and therefore very easily given rounded forms by surface washing by meltwater: and being freely drained, moreover, they dry out quickly and become dusty grey in colour. These three series of moraines – grey, yellow and black – have been formed in that order and represent three successive stages in the wasting of the glacier. Even the oldest however are quite recent and lie at the foot of a cliff of basalt that has been plucked by the ice when the glacier was more extensive and more powerful. And on top of the bluff are thirty or more feet of bedded glacial gravels that must have been in position before the bluff was trimmed by the ice, and are therefore still older. We began to see the beginnings of a chronology here that could possibly be applied to the other glaciers we had seen and we returned to the ship well satisfied.

December 15th

We learned next morning that Vince O'Neill returned from the Argentine base with a warm invitation for us to visit it. The weather was as claggy as ever but the morrow might be fine, so after lunch the motor boat took us round Penfold Point (at the northern entrance to Whalers Bay) a little way and up the east coast of Port Foster along a lead between the shore and the sea ice. Here we disembarked on to the sea ice and set off on skis, first northward to look at the black glaciers that reach the coast in strange ice cliffs, that are as often grey, black or red as they are white, and then south-westwards. The ice was in very bad condition with its covering of winter snowfall often frozen on top but melted to a layer of slush and water below. Our skis repeatedly went through the crust and at times we found ourselves with the toes of the skis under the ice and in trying to withdraw the heel would be caught under the crust as well. Before we were half way across we all had wet feet and we made for the nearest point on the western side and began to walk along the beach to the Argentine base. Soon we saw four men coming to meet us and before long we found ourselves relieved of our skis and our rucksacks and being given a most friendly Spanish welcome.

On arrival at the base hut we were introduced to the commander, Capitan di Corveta Oscar Montes and his second in command and then taken to the "cabin" or cubicle that Derek and I were to enjoy that night. The two young men whose cabin it was, and three or four others, crowded in to minister to our wants. Our wet clothes were taken from us. Glasses of orange juice were pressed into our hands and thankfully drunk. Did we want a "banio"? When we said yes bath robes of white towelling and wooden bath slippers were produced for us. Was my shirt wet? A dry one was produced. Very shortly we were bathed, dry clad and dry shod and led through the hut to the "camera" where Capitan Montes, his second and the doctor were waiting to receive us. We were bidden to comfortable arm chairs in front of a large north facing double glazed window that occupied almost the whole north end of the room. Here a runner bean was climbing two stretched strings and seedlings that might have been lettuces were sprouting from a box of soil. We could not but congratulate our hosts on providing something green and growing to delight the eye in the Antarctic. As we drank whisky a mess boy came in and laid the dinner table at the other end of the room. Evidently the "camera" is the officers' ward room – the two ends serving as anteroom and mess. The floor was carpeted and a variety of pictures hung on the wall – an excellent oil painting of Breton shepherds, a colour printed nude from Hollywood, two little flower paintings and a humorous pen drawing by someone at the base – while the dining table, chairs and bookcase might have come from a very old-fashioned and third rate

home. In fact the whole atmosphere was that of a shabby hotel and not of an Antarctic base. Before dinner, however, Captain Montes showed us his base. He went first through a small room shelved for books and holding a considerable general library, down a flight of steps to a cellar to see the seismograph, mounted on a massive concrete foundation and housed in a room within a room. At the opposite end of the building are the generators in one wing and the radio equipment and ionospheric apparatus in another. A short passage leads to refrigerated room where we were solemnly assured that 500 tons of Argentine meat are delivered each year – though we suspect that a decimal point has got misplaced there. In the centre of the building is the boiler room, the kitchen and the men's mess room, while the central corridors house the captain's office, met office, a dark room, a very well equipped hospital, the cabins – single berthed for officers and double berthed for the men – and two toilets with flush toilets and showers. Water is piped about 150 yards from a warm spring and rarely freezes. Near the spring moreover is a second hut, in large part a replica of the first and fully equipped in large part ready to be taken over should the main hut be burnt down. One can not help but be impressed by the heavy expenditure that has been incurred in setting up, equipping and maintaining this base. Everything is on a large scale. To maintain a static programme of ionospheric and meteorological observations and transmit them by radio to Buenos Aires twenty men are housed here and for these twenty men the provision is lavish. Moreover it is very evident that this is a shore station of the Argentine navy: there is a clear distinction between the upper and the lower deck and at dinner we were waited upon as on board ship. This may be natural enough but it seems to me that to be just a cook or a mess waiter is not a constructive enough job to occupy a man's thought and action during the Antarctic year. It did not surprise me to learn that everyone thinks a year is too long – and indeed Captain Montes jokingly averred that a month was more than enough. I could wish that our British bases were materially as well equipped as this one, but I am sure that our methods of personnel selection and base organisation produce much happier results.

December 16th

Another day of clagg, but though we had to abandon any hope of general views we were anxious to examine the low hills north-eastwards from the base to Telefon Bay. Derek and I slept late, having had great difficulty in getting to sleep at all since only a thin wall separated our bunks from the diesel generators which ran most of the night. Late as we were there were few signs of life in the hut. Garcia, the mess waiter brought us our breakfast of coffee and bread and fig jam in the "camera" and our "sandwiches" and the three of us – Derek, Vince and myself set off into the grey forenoon.

To go north from the Argentine base one must cross a considerable lagoon, or begin by going southward for a mile to round its end. The lagoon occupies most of the floor of a large sea-level corrie, but the innermost part of the corrie, overlooked by bold cliffs of the yellow agglomerate, holds a lake behind a striking morainic barrier. We climbed to the crest of this morainic ridge and were astonished to find that it is capped by several feet of bedded and consolidated volcanic ash. Evidently ash was ejected in quantity nearby at a time when the glacier had shrunk into the small inner part of the corrie – an event which cannot lie very far in the past. This, like the lava interbedded with the glacial outwash near Collins Point, was a reminder that, like Iceland, this is a land where glacial and volcanic activity has gone on together. The point was hammered home on the rounded hill of bedded outwash gravel that encloses the cove and its lagoon on the north, for up on the ridge we found a line of fumaroles which reddened the ground and gave off steam when disturbed over a distance of about a hundred yards. A little to the north of this again between tide marks are some strong fumaroles which were steaming and emitting hydrogen sulphide: on our return, when the tide was high they were bubbling vigorously underwater.

For the next mile or two we walked along the beach with Port Foster on our right hand and the hills on our left rising into the cloud. In this stretch the inner and outer shorelines of Deception Island are less than two miles apart and the mountain ring appears to be of a simplicity not found anywhere else. Facing Port Foster is a great scarp built of yellow agglomerates below and grey lavas above: the aerial photographs show the outer slope to be gentler and scored by innumerable snow-filled gullies. The crestline rises to 1,300 feet but is snow clad above 800 feet and even that was hidden in the cloud. This inward facing scarp and gentler outer slope reflect the structure of the original volcano which must have been as majestic in size and proportions as Etna until explosions and subsidences destroyed all the upper part of the mountain and created the caldera that is now Port Foster. Here we were looking at a portion of the rim of that caldera uncomplicated by any of the accretions which later volcanic activity and glacial deposition have added almost everywhere else.

Only a mile further on low hills of later ashes and glacial deposits intervene between the caldera wall and the shore of Port Foster and here we were able to ascend the screes leading up to the long level line of cliffs that is a conspicuous feature of the inward facing scarp. These we found to be built by former extensive flows of basaltic lava – red and scoriaceous below, light blue grey in

the middle, with a transition zone of purplish red lumps embedded and partly ingested in the blue-grey rock. The upper part of the cliff was red and cindery marking the top of the lava, and yet another cliff above was presumably of the same character. We tramped along the cliff in uncomfortably deep soft snow, admiring the spectacular icicles and ice-stalactites and stalagmites, but cursing the clag that surrounded us and robbed us of a view. So we descended the spur at the end of the ridge and Vince returned to base to keep a radio "sched" with base B. Derek and I then examined in turn three large amphitheatres which bite into the main ridge. The middle one is particularly impressive: for convenience we called it "Pennyconite" since two thirds of its perimeter is almost circular and on our air photographs it is exactly covered by a penny! Its steep sides give rise to many gravel flows which cover the floor and have almost filled a tiny lake. The lake outlet is by way of a little gorge and in the gravels of fans that descend from the two sides of the valley: evidently the supply of waste from the valley sides has been so much greater than that from the walls of Pennyconite (perhaps because the latter slope harboured glacier fragments) that a barrier was raised across the path of the outlet of the corrie. The third amphitheatre is puzzling in that its outlet crosses two ridges that on the air photographs look like the rim of a volcanic crater – though how that should come to be is very puzzling. The ridges however are made of glacial gravels and like all the lower ridges hereabouts are probably best regarded as lateral moraines: these two no doubt enclosed a fairly large mass of stagnant ice in the "crater" when they were laid down.

Near here is an Argentine refuge hut which we inspected and were able to report later to Captain Montes that it was in good order and free of drifted snow inside. It was already after 6pm and we must return. So we sat down by a stream not far from the hut and ate the rest of our "sandwiches". Each "sandwich" consisted of a cold grilled steak which was delicious in half a loaf of dry bread which was not. My bread became a raft to float down the stream. Most welcome of all was a large tin of orange juice – though I must confess that after drinking it we were both thirsty long before we got back to base.

The first part of the return lay along the top of rather spectacular cliffs cut entirely in unconsolidated bedded glacial deposits. It was reassuring to learn that thick masses of the kind we had felt bound to assume do actually occur – at one point more than 200ft are exposed in these cliffs. After this we had to put our best feet forward to get back to base at a not too disgracefully late hour. It was in fact 9pm when we arrived and would have been later had we not taken a short cut across the sea ice of the lagoon.

December 17th

We have certainly not been fortunate in our weather during our visit to the western side of the island. Yesterday was another day of clag that began with the clouds little above sea level and ended with more snow. In the morning Derek and I made our way on skis across the sea ice of the lagoon beside the Argentine base and up the little valley that heads in a col overlooking the west coast. When we got there Derek, who was some yards ahead, peered into the mist and said "It might be anywhere". I suggested that if we descended the slope to the cliff top we might be able to see under the cloud layer, but before we had done a dozen yards the clouds lifted somewhat and suddenly we could see below us the sea – a sea full, or nearly full, of pack ice. As we watched New Rock – or rather the base of it – appeared above the ice two miles away. We turned our attention to the cliffs near at hand, and found them to be of the yellow agglomerate in their lower parts overmounted by some scores of feet of bedded glacial deposits. By the time I had taken a photograph and put the camera away, the whole of New Rock was revealed up to its many pinnacled top, and ten miles out we could see the remarkable sea mark called Sail Rock. Pack ice covered 8 or 9 tenths of all the sea we could see and beyond New Rock to the south west there seemed to be a large expanse of quite unbroken ice. This information would be of much interest to Captain Montes, since the Argentine relief ship BAHIA AGUIRRE was on its way from Hope Bay and hoping to land stores on this coast to be taken by sledge over the route we had traversed to the base. It would also be of much interest to Captain Blackburn. Satisfied to have learned so much in such adverse conditions Derek and I returned to lunch at the Argentine Base, followed by a leisurely coffee in the "camera" and farewells to captain Montes and all his men.

The sea ice proved to be in rather better condition than on the outward journey and we followed it a short distance from the south western coast of Port Foster as far as Collins Point. Visibility was poorer than ever and much of the journey was made in cloud. At Collins Point we made rendezvous with the ship,s motor launch and half an hour later we were on board.

At dinner I was greeted with a warm "welcome home" – and indeed that is just how it felt – and told how the repairs to the ship had gone in my absence. All that could be done to the rudder until the next refit in Southampton has been done and attention has been turned to the bows. Accordingly the forepeak has been pumped dry and the ship's bow has been run up on the beam and held there by cables – one attached to a winch of the old whaling station and one passed round one of the great derelict oil tanks. Inspection shows several frames in the bow have been buckled and broken and there are leaks that can be stopped with cement. It seems the SHACKLETON has been more seriously scarred than we realised.

December 18th

A morning for making and mending – and I had a good deal to do – an evening for writing notes and sketching the great standing – wave cloud that formed over Mt. Kirkwood, and in the afternoon a visit to Base B.

This is what is known as a "static" base – that is it has no programme of geological or topographical survey and consequently no need for sledge journeys and all the equipment – sledges, dogs, harnesses, tents, rations and the rest – that such journeys entail. An excellent map at a scale of 1/50,000 has been made from the surveys of N.Leppard and R.R.Kenny made in an incredibly energetic four months, November 1953 to February 1954, and was published by the Directorate of Overseas Surveys in January 1955. And a specialist geological survey was carried out last season and is being worked up in Birmingham now. So the duties of the base are confined to those of a meteorological observatory, requiring a meteorologist, radio operator and diesel mechanic. But some dogs are kept here – partly to provide experience in dog handling for FIDS who may spend their second year at a "field" base, and partly to give an additional interest. Certainly the dogs are liked, but they tend to be pets rather than working dogs. And though some enjoy the outings required to provide seal meat or penguins for their food, provisioning the dogs with fresh meat can become a chore and a problem. For my own part I feel that this arrangement is not wholly satisfactory: the men should certainly have reason to make expeditions away from base but they should arise from the scientific programme and not be artificially engineered.

The base hut is the roomiest of the British bases that I have seen, and on the whole well maintained, though at present not very tidy since some FIDS who came with the ship are only camping out there. Meals appear to be taken in the kitchen: the sitting room has a small bar with a firkin of beer, a collection of the tail ends of club ties (including the tail of Commander Parker's shirt cut off by the Duke of Edinburgh himself), and other decorations appropriate to a saloon bar: the atmosphere is very appropriate to a social occasion but for nothing else. Separate from both is the large bunk room where, as at Hope Bay, the personal predilections of each man are much in evidence, but because it is not also the living room untidiness is more readily excused. There is, in fact, no room here in which I could live as happily as at Hope Bay, and nowhere that one can enjoy the privacy of the bunk cubicles of Admiralty Bay. Not only is

the hut ample in floor space, it has a great deal of loft space above which provides admirable storage and even room for a ping pong table.

Base B has something of a bad reputation among FIDS. One can see some physical reasons for this – the hut faces south and away from the sun: it looks out on the chaos of storm-whitened timber and rusty iron that is a legacy of the whaling industry: and in late summer only the higher hilltops are snow clad and the rest of the island is monotonously black and monstrously dusty. In winter of course the ruins are masked by snow, and the snow clad hills and sea ice are very beautiful: beside the hut, moreover is perhaps the best ski slope in Antarctica, and the island is plenty big enough to provide expeditions on foot or on skis. In this it contrasts with those FIDS bases which are on small islands and where exploration of the mainland requires a double crossing of water or sea ice before one can begin. The base leader's view was that the low reputation of Deception Island among FIDS has been put about by people who had made only short summer visits – he has been here two years, as has the diesel mechanic Clements who was laying with care and pride new concrete beds for his motors – and both of them would happily spend a third year here. I hope I may make some contribution to the life of this base during the coming year by suggesting a programme of outside work for Ian Jackson, the meteorologist/glaciologist, in which he can enlist the interest and support of his colleagues.

December 19th

Dhobi day – which is the seaman's term for wash day – and for me not before time. This dusty island makes socks, shirts and all else black. There are two washing machines and power wringers in a laundry that is so well supplied with hot dry air that one must strip to the shirt before washing there. Dhobiing over I inspected the damage and repairs to the fore part of the ship. From the foc'sle one climbs down to the upper port hold in the level of the upper deck and then to the *blank space* which is just above the double bottom. Here one is inside the flaring bows at a level below the water line, and here the ship had sustained some seven buffets from the submerged portions of the ice floes she had rammed. Not only had plating been pushed inward, and rivets sprung, but the frames that keep the plating in position had been buckled and fractured. These are substantial I section girders, and nothing could be done about straightening them. The fractured members were being welded and the leaks dealt with by making a cement box on the inside. I came back on deck with the feeling that SHACKLETON is by no means a strong enough vessel to deal with the kind and quantity of ice we have encountered this season, and if she was weak before she is weaker still now.

After lunch Derek and I set off to accept the invitation urged by Commandant Fornet when he visited the ship two days ago, to pay him a return visit at the Chilean base at Pendulum Cove. Although it is only four miles away and some bright sparks among the crew have been there and back twice in one day, it took us over four hours to get there. We are like dogs or children straying first to this side to scrutinise Lake Kroner and then to the sea shore to look at the sections in glacial gravel, then inland to look at moraines and back again to the sea shore. Then we zig-zagged across the moraine belts of the black glaciers to examine features that on the air photographs might possibly be small craters or ash cones. None proved to be so – indeed almost all of the features I had thought of from my examination of the photographs to be "younger volcanic forms" turn out to be made of glacial debris. These pits in the black glacial moraines are almost certainly formed by the collapse of the surface following subsurface removal of buried ice by melt waters. Next we worked out to the top of the coastal ice cliffs, overhung with immense icicles and drenched with thaw water. Their edges are precarious places with loose morainic debris resting on the ice which in places overhangs the beach some scores of feet below. We managed to see something of the dirt bands in the ice face, one four or five feet thick being the most massive we have seen. To get away from this spot, however, was far from easy. Meltwater channels had turned the moraine covered ice behind the cliffs into real bad land topography, with a complex of steep-sided valleys separated by knife-edged crusts. To move along the crusts was precarious for the thin covering of moraine was apt to slip off the icy core: on the steep slopes it was even more apt to slip, while the valleys were in many cases most dangerous of all, for under a debris-covered bridge of half-melted snow crevasses opened up to a depth of a score of feet or more. We were quite glad to extricate ourselves from this bit of the glacier and get onto "terra firma" which in this case was the hills carved from the older glacial deposits.

It was interesting to see how new snow drifting had completely obliterated our tracks of a week earlier, and we were impressed to observe the scar, tracks and debris of a considerable avalanche from one of the accumulations of rime ice that had occurred since our previous visit. Just before we reached the Chilean Base we looked back at the moraines of the black glacier we had crossed on that occasion and were quite surprised to see, overlying a moraine ridge, what appeared to be a recent lava flow. Where it originated we could not see: there was no trace of it on the track we had followed in crossing the glacier.

At the Chilean base Commandant Fornet was as warm in his welcome as Captain Martes had been on the other side of the Foster. We were offered felt boots and dry socks and were glad to accept, and then regaled with hot coffee. This is a small base operated by the Chilean Air Force and manned by two

officers and six enlisted men. The atmosphere is homely and at the same time purposeful. The men seem to have real jobs to do and to get on with them. There is no room here for the separation of officers and men, all eating together at one table in the living room, which has also a small bar and a record player. Officers sleep in single-berthed and the men in double-berthed cabins as in the Argentine base. As there the radio antennae and equipment was impressive, but met office, dark room and base office were much as in a British base. Two things, however, were quite distinctive. The diesel motors and generators are housed in a separate small hut connected to the main hut but only by a covered passage which is shelved to make a supplementary store: when the door to this passage is closed the noise and vibration of the generators is excluded from the hut – a real boon to comfortable living and an important benefit in radio operating.. The second distinctive feature is that the base goes in for rural economy. At the northern end of the building Captain Fornet opened a door marked BODEGA and we found ourselves in a rather untidy barn with baled hay at one end and a ping pong table in the middle, and smelling as a hay barn should! We laughed delightedly as we scented the air for the only smells in the Antarctic are those of the beaches fouled by elephant seals and of the penguin rookeries. Each year the Chilean supply ship MAIPO brings twenty sheep. These are allowed to run loose on the hill but as there is nothing there for them to eat they always come to the station each day at the hour at which they are given their ration of hay. One by one they are slaughtered to supply fresh meat, and at the moment only one is left. Apparently it is aware that it is a Christmas dinner on foot and has become very nervous and wary. Opening from the BODEGA is a door marked CORRAL, and the livestock housed beyond it was chickens. The last of these went into the pot to celebrate a recent visit by members of Base B! Captain Fornet was obviously proud of his station, as well he may be. It has not the size or material resources of the Argentine base but compares more than favourably with Base B and has a pleasingly workmanlike but friendly atmosphere. Dinner was certainly very friendly and pleasant and afterwards we sat talking till about 10.30 when Commander Fornet walked the first footsteps of the way with us as we started for Whalers Bay. This time we made no excursions to right or to left and were back on board about 12.30am.

December 20th

A day of relaxation - a long sleep and a shower bath in the morning were followed by reading, note writing and ironing in the afternoon and a film in the ward room in the evening. The weather was much improved and I was tempted to go ashore after lunch and scramble once more on the cliffs west of Neptunes Window and look down on the billows, but stayed to do my chores instead. The ship was now ready to depart and Captain Blackburn intimated that everyone must be ashore by 4pm. At that time, however, two large floes had been driven close against us leaving no room to manoeuvre the Shackleton off the beach. Later in the evening however the falling tide or wind drove the floes off and at 11.30pm we weighed anchor and the ship was rather cleverly turned and brought into deeper water. So at last the long enforced stay at Whalers Bay has come to an end, there is no doubt that everyone on board was glad of it. Apart from the engineers pre-occupied with the repairs to bow and rudder, Derek and I had more to occupy and interest us there than anyone else, and though we leave Deception Island with interesting places still unvisited and many questions very, very open, even we were glad to go. For the time that now remains to us is only four weeks and in that time we cannot hope to see and do all that we had hoped at the outset. So we shipped out through the Bellows and past Petes Pillar at 12.20am, still fascinated by the forms and colours of the rocks dimly seen in the twilight and especially by the wonderfully symmetrical section through a volcano just south of the entrance point, but even more exhilarated to be heading southward through the scattered bergs and open pack towards new and different scenes.

December 21st

My first view from my cabin port after my alarm clock roused me this morning was of a series of steep-sided islets rising darkly from the sea in an almost continuous wall to summits sugared with a thick layer of icing. Above them the sun shone through a broken layer of fairly high cloud: below them a mirror smooth sea reflected the dark shapes of their icy crust and the sun's brilliance. This, as I confirmed by comparing it with the print lay down, was Intercurrence Island and marked our entry into the Gerlache Strait. This name is one that has been on many lips lately, for the Gerlache Strait is the highway between the northern and southern FIDS bases: when HMS PROTECTOR tried to enter it a fortnight ago it was closed by ice and there has been much speculation since whether we would find it passable. Its name recalls Lieutenant Adrien de Gerlache who commanded the BELGICA expedition which spent three weeks exploring this strait in January-February 1898 on the way southward into the Bellingshausen Sea when their ship became frozen into the pack at 71 degrees south and the party became the first ever to endure the rigours of the Antarctic winter. The strait separates the Danco Coast, called after Lieutenant Danco who died during the wintering and a series of islands whose names – Liege, Brabant and Anvers – honour the country from which the expedition sailed. All

three islands are extremely mountainous, as is the Danco Coast, but cloud obscured everything above 2,500ft. Nevertheless the views were impressive. Liege Island offered a steep mountain wall of rock spurs and glacier-filled embayments on our starboard hand, while to port was the strongly contrasted "Two Hummock Island" almost completely swaddled in snow, but with two great triangular rock-faces leading up to the two hummocks that, despite their name, were high enough to pierce the cloud layer. Perhaps these rock faces once overlooked two lowland corries that lay back to back but whose common wall has been overrun to give the depression that separates the northern snow dome from the rest of the island. At the southern end of Liege Island something of the same kind has gone on. That its mountains were once (i.e. pre-glacially) continuous with the lofty Solvay Mountains of Brabant Island is clear from the form of two steep-sided little peaks that rise in the intervening space and were evidently once parts of the divide between the great corries. But today these little peaks are islanded by the waters that also insulate Liege Island itself.

All that could be seen of Brabant Island was its northern end – a series of mighty mountain spurs enclosing great glacial amphitheatres beneath the level of the sea – and the off lying Kaiser Island[5] which presents to the Gerlache Strait an almost unbroken rock wall some five or six miles long. Everything beyond was blocked out by a snow shower driving up the Strait, but we stood over toward the mainland shore where fitful gleams of sunshine still lingered and gave a strange green light that played below the cloud ceiling upon the larger glaciers. At the head of one of these, descending to Charlotte Bay, I could see a great half-moon of rock cliffs, fluted by immense gullies, where the glacial trough is growing backwards into the high plateau, and a little further south a portion of the smoothly undulating plateau skyline was momentarily visible above the lower clouds. We were heading for Cape Reclus[6] – I wonder if this was named by de Gerlache for Elisee Reclus, the great French geographer of the late nineteenth century – which is the bold black terminus of a rugged mountain ridge separating Charlotte and Wilhelmina Bays. At the foot of the rocky ridge some low spurs mantled in neve project into Charlotte Bay and on one of those is a tiny black refuge hut. From this refuge a party of FIDS from Base O in 1956-7 manhandled their sledges up onto the 4000ft plateau to make a successful rendezvous with a dog sledge party that had travelled more than a hundred miles from Hope Bay, both parties returning to Cape Reclus[6] to be taken off. But as a survey base Cape Reclus[6] has only limited possibilities and it is the ship's task to load all the sledging and other equipment from the hut leaving only the food and other necessities appropriate to a refuge.

While this was going on under Tom Flack's direction the motor launch took Derek and myself to Gaston Islet[7], a small snow dome about half a mile across and 200ft high that had attracted my attention from the ship. It had interested me because the southern side had broken away in an ice cliff which appeared to show stratified neve above and structureless blue ice below resting on ice moulded hummocks of rock. When we reached it we found the rock surfaces too steep to land upon, we were able to land on a little rocky footing between two ice caves. One of the caves could be entered and was a place of great beauty. All the ice was blue, and in the gaping fissures that led upwards from the roof (and of course had been enlarged and smoothed by the melt waters they conducted down into the cave) the blue was of an intensity hardly to be believed.

If one could magically transport such a cave to Cheddar it would outdo all the limestone caverns there. Yet when I broke off a large mass of very blue ice with an axe what fell to the floor was as colourless as a glass of water: the colour comes only with bulk sufficient for the light coming through it to have suffered selective absorption. Yet how little that bulk can sometimes be is seen from the fact that quite often ones footprints in snow are quite strongly blue.

Our ice cave revealed clearly that the ice was regularly stratified right to the bottom, where the layering was one of quite clear layers alternating with others clouded by minute air bubbles. We estimated that the cliff showed some 200-300 layers, and if these are, as is usually supposed, seasonal accumulations of winter snow alternating with summer thaw (and in some cases dust) the whole could have accumulated since Shakespeare died. About half way down the cliff is a layer reddened by penguin excrement which by the same reckoning might be contemporary with the French Revolution! I am not quite sure where the logic of this chronology leads. Does it mean that in, say, the sixteenth century this islet was clear of snow and the accumulation we see has grown up since? Such a conclusion would seem surprising, though I can see the possible ways of explaining it. But what seems important to me is that we should explore more of the snow domes. It may be that the blue but stratified ice of the basal layers is actually being squeezed out under the pressure of the neve above, in which case accumulation of snow year by year may be balanced by outward creep of the basal layers into the sea when they are melted. If so this is not a snow dome but a miniature glacier cap.

On a second islet nearby the snow cover is less composite and less dome-like, so that bare rock protrudes in places. It does so in the form of whalebacks of hardened sediments, and, on some of these, glacial striations are abundant and conspicuous. They indicate a movement of ice, as one might expect, away from the mainland above Cape Reclus and northwards across the islet into the Gerlache Strait. Whaleback forms were also seen in the pink granite on which

the refuge hut stands but the surface is already too pitted by weathering for any striations to be noticeable.

In the late afternoon we weighed anchor and proceeded on down Gerlache Strait. The cloud ceiling was now thick and getting lower, although an hour or two earlier it had cleared after noonday snow showers enough to reveal the lofty summits of the Solvay Mountains on Brabant Island. As we crossed the broad Wilhelmina Bay the ceiling hid the summits of the mountains of Nansen Island, but the lower and shapely peaks of Delaite and Emma Islands were still quite clear and revealed themselves as the streamlined remnants of former dividing ridges between glacier troughs. But the deterioration now became more serious. By the time Wilhelmina Bay had been crossed the towering cliffs of Cape Anna loomed up darkly to be lost in the gloom. Yet below the clouds we could still see some miles or so had the unexpected excitement of seeing a ship emerging from the Schollaert Channel between Brabant and Anvers Islands and pass to starboard of us. Jim Martin signalled it with the Aldis lamp: it proved to be the BAHIA AGUIRRE on the way from the Melchior Islands where she had been relieving the Argentine Base, to relieve Captain Mantes and his men at Deception Island. Jim wished him a Happy Christmas and she replied with a “Buen viaje”.

In gathering gloom and worsening visibility we turned to port into the deep and narrow Ronge (Errera) Channel. Ice cliffs could be discerned dimly on either hand punctuated at intervals by towering rock faces that rise up like giant black teeth. We passed a bold island that was nothing more than a great ice-moulded whaleback of rock, and then ahead we could see the snow-covered Danco Island which offered the only lodgement in this spectacular but hostile area and on which was sited base O. As we manoeuvred among the stranded and floating icebergs to find a suitable anchorage it began to snow again. It was in fact what we at home would call a wild night!

December 22nd

If the solstice is rightly called midsummer day this one opened unpropitiously. From the ship in the early morning we could see only the bases of the great black cliffs that hung over the Ronge (Errera) Channel, so low were the clouds. So Derek and I worked in my cabin while some base O personnel aboard and a party of four including Vince O’Neill left to dismantle the base. It has proved to be of too limited usefulness to be worth maintaining: the country round is too difficult of access to make any but limited survey operations possible. I am rather sorry that I did not go ashore here and see the hut – which is of the most recent type used by FIDS – before it was closed. From all I hear it was the most attractively maintained of all the bases we have visited.

By three in the afternoon we were on our way again and for a brief space the clouds broke and revealed the sun. We had some fine views of the over steepened cliffs on both sides of the channel and of the incredibly steep glaciers and glacierets that descend from some of them. As we cleared the exit from the channel a fine view opened up across Andvord Bay of a lofty or apparently detached portion of the high plateau of Graham Land. It towered above the mountains of the peninsula across the bay and the serrated knife-edged ridge of Lemaire Island just as Mount Taylor towered above the Blade Ridge at Hope Bay, and with the same contrast of form between the smoothly undulating, and possibly non-glacial, plateau surface and the mountain ridges lowered and wasted and sharpened by the erosion of glaciers. For this glimpse I was grateful; a few minutes later clouds were wreathing the high plateau and a trailing scarf of grey stratus had mysteriously appeared at a much lower level and was wreathing itself about the lower peaks.

Our course lay due westward across the Gerlache Strait towards Anvers Island, but in this direction the cloud was already a solid sheet, perhaps 1500 feet above the sea. Abruptly the high peaks of Anvers Island – which rise to 9000ft in Mt Francais, called after Dr Charcot’s first ship in 1904 – ranged high above the cloud layers into sunshine and blue sky, but all we could see were their bases. These were for the most part black, well-like and precipitous with level bedded ledges of dark rocks outlined by lines of snow. This tabular style of mountain architecture built of bedded rocks offered a marked contrast to that found on the same island a little further south as we entered the Neumayer channel, where massive rocks and strong intersecting joints give a mountainside of deep gullies alternating with lofty spines and tapering buttresses, but on the eastern side of the channel the mountains of Wiencke Island presented to us a scarp face with great mural precipices of bedded rocks dipping quietly away from us.

The Neumayer Channel is one of the show places of Antarctica. Narrow and sheltered its waters are often still and reflect the lofty mountains that hang over it on both sides. Even today, when the cloud ceiling robbed the mountains of half their height and the scene of most of its colour, the scene was majestic. Hanging glaciers lived up to their name, appearing to descend from the clouds themselves and hang blue, crevassed and precarious on the precipitous rock faces down which they must thunder some year or other in great ice avalanches to become what the glaciologist calls reconstituted glaciers at the foot of the

slope. When the tops of the cliffs could be seen ice – some of it to all appearances rime ice – accumulated on ridge, peak and pinnacle. And nowhere that I can recall along the whole length of the channel do the rock cliffs descend to the water: always the glaciers Nordenskjold called "ice-foot glaciers" and Lancelot Fleming called "fringing glaciers" intervene. Their ice cliffs are seamed by crevasses and provided in their blue depths the only note of colour save the great malachite green stain that extends for hundreds of feet down the rock wall of Copper Peak. To me those same ice cliffs by their stratification right to the water line posed the same question that we had left unanswered at Gaston but yesterday.

The climax of the Neumayer Channel is that it is to all appearances a cul-de-sac. Ahead lies only a glacier, descending between parallel mountains. One knows that the channel is dog-legged and makes a sharp right turn through the north-western of the two ranges (which is a continuation of that of Copper Peak on Anvers Island): but because all the mountains descend to fringing glaciers, and because it is almost impossible to separate one ice cliff from another at a greater distance until you are fairly close to one of them, the exit remains concealed even when you know it must be. At last it opens up and in a minute or two more the ship is turning and making beautiful curving wave patterns on the still water. Then comes a noise like a heavy swell breaking upon a shingle beach as she moves through a zone of brash ice and her bow wave sets the floating masses crashing against each other. A moment more and she is turning to port and a new scene is revealed. Perhaps there are days when one may look across Borgen Bay to the great William Glacier and see Mt Francais rising beyond in its immense south-facing rock walls. This was not one of them, and we thought ourselves lucky to find the clouds high enough to let us see, mistily, the 5000ft peak of Mt William to the west on Anvers Island, and the fantastically craggy skyline of the 4000ft Sierra du Fief[8] on Wiencke. And so round a snowy point into the harbour of Port Lockroy, much favoured by the whalers of the nineteenth century and the site of the first FIDS base - Base A – set up in 1944 . The base is situated on a small islet in the middle of the anchorage. After some little search for a satisfactory place to anchor – the usual place being still covered by fast ice – we were finally at anchor a little before 7pm. Almost immediately it began to snow. Two hours later a second anchor was dropped, for the wind had risen mightily. At eleven o'clock snow was no longer falling but much was being lifted from all the nearby slopes and streaming like smoke out to sea. The barometer had fallen 13 millimetres in six hours, and the wind was streaming off the glacier at the head of the bay at 35-40 knots with gusts of 48knots, and raising a nasty short sea. Now, at midnight it shows signs of abating and by morning this sudden gale may well have given way to some other kind of Antarctic meteorological surprise packet.

December 23rd

Perforce an indoor day. Though the easterly gale blew itself out during the night we have been storm-bound on the ship all day. At breakfast time we looked out upon a calm sea and the barograph trace was steady at a little below 962 millibars after its precipitous drop from 980. Clearly it could not remain for long at this abnormally low level, and about 10 o'clock it began to climb –

ANT 76 : Peltier Ch. & Dayne Peak : 24 Dec 58

and the wind speed with it. An hour later a gale was blowing from the west raising a considerable top on the sea and, what was worse, bringing in a great quantity of pack ice from the direction of the Bismarck Strait. It packed in front of the fast ice at the head of the bay; it surrounded the island which carries the base hut. Our scow, which had been taken to the shore loaded, became surrounded and had to be abandoned till conditions improved. By the afternoon the barograph trace was back at 980 millibars and began to flatten out: hopefully we interpreted this as the beginning of an improvement, but our hopes were vain. All evening the pressure rose and the wind continued at 30 to

35 knots .Ice continued to stream in and, the bay becoming ever fuller began to pack around the ship. Floes bumped and scraped along our sides. At midnight the barograph trace had risen to 983 millibars – a rise of 22 millibars in 15 hours.

December 24th

An encouraging morning. The clouds still surrounded the mountain tops, but the sun was breaking through and the wind had lulled. The scow was still beset by the ice but we set off in the motor boat with Tom Woodfield and Jim Martin so that Derek and I could examine ice cliffs in the Peltier Channel – which is lined with them almost continuously – and Tom could search for a "one-fathom-patch" reported to exist at the further end of the channel. We decided to proceed there first and work back along the ice cliffs, but when we rounded the sharp elbow in the channel it was clear we could do no such thing. The channel was full of pack ice, brought in no doubt by the same westerly gale that had filled Port Lockroy. But Curie Point, which forms the north-eastern angle of Do
umer Island round which the Peltier Channel makes its sharp dog-leg bend presented a big ice-moulded hump of whale-backed rock and snow and snow passing into an unbroken snow dome in a short distance. It invited a landing: so we landed. From its humped back we had excellent views though the summits were shrouded in cloud. On one side the regularity of the whaleback was broken by a steep-sided indentation with a large overhanging cornice of soft snow at its head. Rock appeared at a few places on its sides and the sea had gained entry on the foot: indeed it was clear that the waves must be regarded as the active agents, opening up a fissure along some line of weakness in the

ANT 66 : Mt William swept by snow broom : 24 Dec 58

massive diorite rock, and maintaining and enlarging the gully above despite all the attempts of the wind to fill it with snow.

Returning to the boat we examined briefly an ice cliff on the north side of the Peltier Channel and found its foot mantled in what I can only call an ice breccia – a tumbled mass of lumps of ice from the size of your fist to the size of a double bed frozen together in a very solid mass. Where the sea level lapped the base it evidently melted the cementing matrix more rapidly than the included lumps, so that the weathered surface came to look like a cast in ice of a gigantic bunch of grapes. This type of deposit we found to be rather abundant on these cliffs. Sometimes it formed a screen to a vertical face and had clearly filled a former crevasse of which only one still remained; sometimes it formed a talus in front of a cliff of long standing.

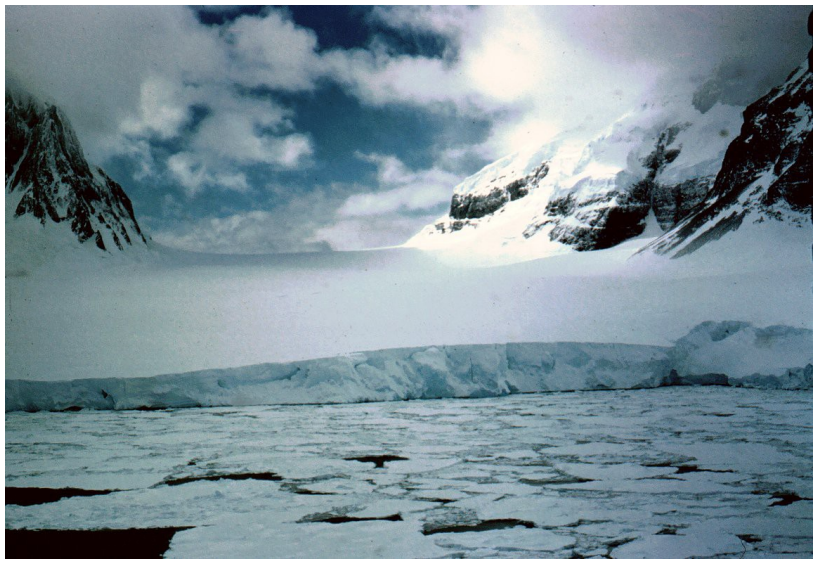
As we neared the ship the clouds on Mt Francis began to break and we enjoyed

ANT 72 : Ice cliff in Peltier Channel : 24 Dec 58

seeing Shackleton backed by this great mountain. The clearing of the sky went on all afternoon, and since motor boat and lifeboat were now both in use ferrying stores to the back of the island on which the base hut stands – the scow being still beset and with a leak to boot – I spent a happy and leisurely couple of hours on the empty bridge drawing Mt William. This graceful mountain rises straight from the sea to 5250 feet. Except for a few rock outcrops powdered with fresh snow it is an ice-covered mountain. And so the afternoon wore on and the clouds dispersed to reveal the summit and flood the mountain with sunlight. I found myself attempting the almost impossible. Brilliant highlights gleamed from the ridges and spurs of the mountain: by contrast the corrie recesses were dark, yet within their darkness was a translucent lightness in the midst of which the bare rock outcrops were dark indeed. To add to these difficulties the wind, which had abated very little, was sweeping the ridges with a gigantic snow broom. Every ridge smoked snow smoke, and the smoke poured downward into the lee hollows in great torrents. By the time I had finished, the mountain stood serene and untroubled against a blue sky, dramatically painted with shadowy blue depths and vivid gold highlights – a very different mountain to the delicately tinted, silver-grey, cloud-shaded mountain it had been when I began.

After dinner a game of whisky poker began in the ward room and somehow, before very long, all nine of us were playing. Losers paid for rounds of drinks and interest ran high, and jubilation and commiseration were enthusiastic. Before long a real party spirit was manifest and a suggestion that we should broadcast a Christmas carol to all the FIDS bases on the R.T. was welcomed. We decided for some reason that was never clear that it should be “Hark the Herald Angels Sing” and after two rehearsals felt ourselves equal to the occasion. Alas! The occasion never materialised: when Sparks spoke over the R.T. to the FIDS only one appeared to be listening!

While the poker game was interrupted the clouds that had covered the Sierra du Fief[8] ever since our arrival, rifted and broke and revealed the summit of their highest peak Luigi di Savoia[9] 4640 feet high. The whole Sierra is wall-like towards Port Lockroy with great mural precipices built of lava-bedded sediments. Snow lies on the ledges and terraces and reveals them, and avalanches sweep down through the gullies and leave them also revealed by the snow: but by and large these are rock mountains and it was with a gasp of delighted surprise that I now saw that the Luigi summit was thickly crusted with rime ice that sprouted upwards and outwards from the rock ridge, and now in the sunset light gleamed all down one side with a rosy radiance. I asked Jim Martin to measure the angle of elevation with his sextant and we found that the great icy crust appeared to be some 320 feet from top to bottom and a fully 150 thick above the highest visible rock outcrop. These are mountains of great grandeur and even the icing on the cake is majestically in proportion.



ANT 69 : Thunder Glacier from Curie Point : 24 Dec 58

Our game of whisky poker was never renewed, for an invitation from the crew to join them in their mess for a drink was immediately accepted. There spirits certainly were high. Jim Martin and Tom Flack dancing an eightsome reel *a deux*, Sparks singing a comic song, Tom Woodfield and some FIDS singing a new and appropriate version of "Good King Wenceslas", and the seamen going round the room and holding a match under the balloons to enjoy the enormously simple pleasure of watching them burst – these were some of the highlights of a very successful party. When we returned to the wardroom and brewed ourselves hot drinks it was 2am. A dawn was already upon us. It came first to Mount Francais as a rich salmon pink glow when everything at lower levels was cold blue and lilac or grey. Eventually the glow spread along the ridge and downwards and at the same time became brighter and more orange tinted. For a long time it remained so, confined to Mount Francais and its immediate spurs, so far as they tower above all else. Not until the flushed zone on Mount Francais had gained a depth of some 3000feet did it begin to tip other peaks and ridges. When it had reached Mount William and spread along the whole intervening ridge, the spectacle was for me complete and I went to bed.

Christmas Day

A wonderful serene morning of still air, mirror smooth water, sunlight and snow – just what one would wish Christmas morning in the Antarctic to be. My first thoughts on waking were of course of my dear ones at home and the little parcel that had been prepared by your hands for this moment. First I opened the four cards: Oliver's addressed to "Daddy: South Pole" with a child writing at a

candle at his desk: holly, ivy and Christmas roses from the boys: Santa Claus at home in Megallanic antipodes from Rita – wherever did she find something so tellingly appropriate? - and your own sweet bunch of English spring flowers. They all delighted me and now they decorate the wall above my bunk: but when I first saw them I lay still thinking of you all and wondering about each of you. Has Oliver gone with Helen to Munich? How has Matthew found his University entrance and scholarship examinations? Is Rita finding at Sale Hill some of the family happiness she has looked for and ceased to look for at

Hampstead? And are you, my love, finding that you have friends enough to support you in my absence? After a time I opened the little packets that you had each prepared to give me pleasure, and I was delighted with each in turn. At breakfast there were radio telegrams awaiting me – your own from Sale Hill which particularly delighted me because it included mother's name: one from the Governor and Mrs Arrowsmith, one from Winifred D and one from Winifred B. I was certainly not allowed to feel alone and forgotten.

After breakfast I found myself on deck and went to the foc'sle head. I seemed to be alone on an empty ship. Around me on all sides were scenes of profound loveliness because I was seeing them in a moment of unwonted calm and under radiant sunshine. The mountains lay mirrored before me in the water. Mount William, full face now to the sun, chaste white and dazzling: Mt Francais remote, immense and awe-inspiring: Wall Mountain[18] grey and difficult, its rock obliquely splintered along its acutely intersecting joints: Luigi di Savoia[9] Peak and the Sierra du Fief[8], black as night against the sun save where snow lodged in gullies or on ledges revealed the magnificent quality of their architecture. Truly the world in solemn stillness lay and one might well have heard the angels singing. I began by taking photographs: I became content then to sit and gaze: at last I went to my cabin and sat down and closed my eyes. So much beauty was too much to bear.

While I was thus occupied, Tom Flack knocked at my door. Would I come to the Captain's cabin to take a drink with him? Of course I would, and likewise a dozen others, officers and FIDS. And after this drinks in the FIDDERY until the Captain's steward came to announce that luncheon (or did he say dinner?) was served. Officers and FIDS old and new sat for the first time thoroughly intermingled and enjoyed a repast that had taken long in the planning and preparation. Here it is:

R.R.S. SHACKLETON
DECEMBER 25th 1958

LUNCHEON

Fruit juices *Grapefruit/Pineapple*

Mock Turtle
Cream of Tomato, Golden Croutons

Fried Fillet of Lemon Sole, Maitre d'Hotel

Cheese Aigrettes

Roast Stuffed Argentine Tom Turkey
Minted Green Peas
Asparagus Beurre Noisette
Pommes: Chateau, Persillees, Straw

Christmas Pudding, Brandy Sauce

Scotch Woodcock

Apples and Oranges

Coffee

ANT 68 : Wall Rang from Peltier Ch. : 26 Dec 58

ANT 70 : Wall Range & glacier from Peltier Ch. : 26 Dec 58

With the coffee the Loyal Toast, and some pleasant speeches in few words by Neil Orr for the FIDS, Captain Blackburn, by J M Smith, the base leader at A who became ill with appendicitis six months ago and has been confined to his bed practically ever since, and Tom Woodfield. After which the officers and FIDS set about washing up and serving the mess stewards who had served us.

In the evening the ward room were at home to the FIDS and though an enjoyable time was had by all the spontaneous party spirit that had infected us twenty four hours earlier had left us. We went to bed looking forward to a working day.

December 26th

After descending to less than 962 millibars in Tuesday's depression the barometer had risen to 1000 mb by 6pm on Christmas Eve and had remained above that figure on Christmas day. Then after weakening a little it recovered and actually reached 1004 mb late on Friday evening. This fine calm spell of three days is something to be grateful for: certainly it gave us a wonderful day yesterday in the Peltier Channel.

ANT 73 : NoblePeak. Shags on nest : 26 Dec 58

Tom Woodfield, Jim Martin, Derek, myself and the lamp-trimmer Peter Munn set off in the morning to examine glacier cliffs, and returning after lunch, continued the work in the afternoon. Things that pleased and excited us in the morning became eclipsed by what we saw in the afternoon. We began by examining dirt bands and we finished by finding a place where we could actually crawl under the sole of a glacier. We landed on a tiny footing of rock

below a beetling blue ice cliff because I had noticed a pretty coloured layer 18 or 20 inches thick at the base. This was, as I had anticipated, a true bottom moraine. Beside this exposure was an ice cave and here Derek found that the roof of the cave was in fact the sole of the glacier. It was full of rock flour, grit and stones of various sizes and was corrugated exactly as a piece of galvanised roofing is corrugated. Looking along the corrugations one could see that each could be traced back to some hump or hollow in the smooth rock surface with the ice resting directly upon it. Beyond this we could, of course, not see for, no doubt, the ice inland of this is plastic enough to be continuously in contact with the rock surface, reshaping itself to conform with the shape of the rock bed, and slowly abrading the latter with the sharp-edged tools that we could see and feel embedded in the basal ice layer. This is, to me, the great paradox about glacial erosion. How does ice which is plastic enough to keep in contact with the underlying rock surface, no matter how irregular that might be, also provide a rigid chuck to grip the tools which mould the rock bed and leave it smoothed and rounded and scored of grooves? In fact, the ice we were looking at had lost this propensity of being able to mould itself plastically to the form of its bed. The flutings and corrugations of the glacier sole above our heads showed quite

ANT 74 : Shags on nest : 26 Dec 58

ANT 75 : Dayne Peak Lemaire Channel : 26 Dec 58

clearly that as it approaches the cliff face the ice becomes, at a certain point, quite rigid: it moves *en bloc.* In this case, since the rock bed sloped downward, the massive forward motion of the ice caused it to part company with the rock and leave the little cave we were exploring. Thereby to look at the fluted roof of this cave was to gain a powerful sense of the forward drive of the glacier. One was reminded of the engineering practice of producing rods or bars of irregular cross-section by extrusion through an opening of the appropriate shape. Whether or not the hypothesis of extrusion flow offers a valid explanation of glacier flow, the “extrusion” of the mass of rigid ice above our heads, with the basal surface perpetuating the contour of the rock floor was most impressive. Presumably the forward thrusting of the visible overhang could only be the work of one or two years: if it had taken any longer one would have expected the grit and stones to have melted out of the basal ice and for the latter to have taken on the forms – like cups and cusps – that result from melting. Clearly it would here be a simple matter to obtain a quantitative measure of the forward motion and I hope that in the future someone from Base A will attempt it.

During the afternoon we landed on an ice-moulded whale-backed rocky islet in the Peltier Channel. Here shags nest every year, their nests of stones perched on exposed ledges above the one cliff-like slope on the island. We found them with chicks in the nest, and very ready to express their disapproval of our intrusion by deep-throated squawks or by expectorating a piece of half-digested fish or a squirt of fishy juice: but in no way ready to move from the nest. Here two pairs of skuas were also nesting but allowed themselves to be driven away from their nests with two olive green and spotted eggs merely by our close approach. We observed a skua flying with a shag's egg in its bill and provoking much hostile exclamation from all the other birds. And we noticed a skua landing, standing and taking off using only one leg: it seemed very likely that the other one had been damaged by the beak of a penguin or shag whose nest had been attacked.

During all the time we were on shag island there was a recurrent thundering of avalanches down the sun-drenched precipices of the Sierra du Fief[8]. When one looked towards the source of the noise it was often hard to find anything moving at all. At other times a stream of rocks and snow could be seen descending over some cliff edge and breaking into what looked like powdery spray, though the noise left one in no doubt as to the real size of the falling material. Doubtless much of this was snow and ice, especially in certain cases where descent of material along the same track was almost continual: one avalanche track, indeed, seemed almost to terminate in a lofty hanging waterfall, breaking into a curtain of spray before reaching the slope below. That slope was a neve field on which an increasingly large brown stain told its own story.When we got back to the SHACKLETON and thanked Tom and Jim and the lamp-trimmer for their kindness and patience in taking the boat over rocks, through ice and under ice cliffs for us, Jim unexpectedly, but most gratifyingly replied "Not at all. It's been one of the best days of my life".

December 27th

I had asked Captain Blackburn if when we left Port Lockroy we might go round the south end of Wiencke Island so that I might see the other side of the Sierra du Fief[8]. He consented readily and fixed our departure for 6.10am. I set my alarm clock accordingly and as I dressed I observed gloomily that all the upper part of the Sierra was in cloud. As we weighed anchor and prepared to depart the cloud base came lower and lower, and when we were truly under way in the southern part of the Neumayer Channel visibility was so poor that we lost contact with both shores. we rounded the southern end of Doumerumer Island, crossed the outlet of the Peltier Channel and rounded Cape Errera into the

ANT 77 *: Dayne Mt. Lemaire Channel : 26 Dec 58*

southern end of the Gerlache Strait seeing these features only on the radar screen. It was now snowing steadily and the barometer though still above 1000 mb was definitely falling; without doubt a depression was passing somewhere to the south of us and we were experiencing the warm air (35 degrees) and precipitation at the warm front. It was pointless to stay longer on the bridge and I went below to get warm and to have breakfast.

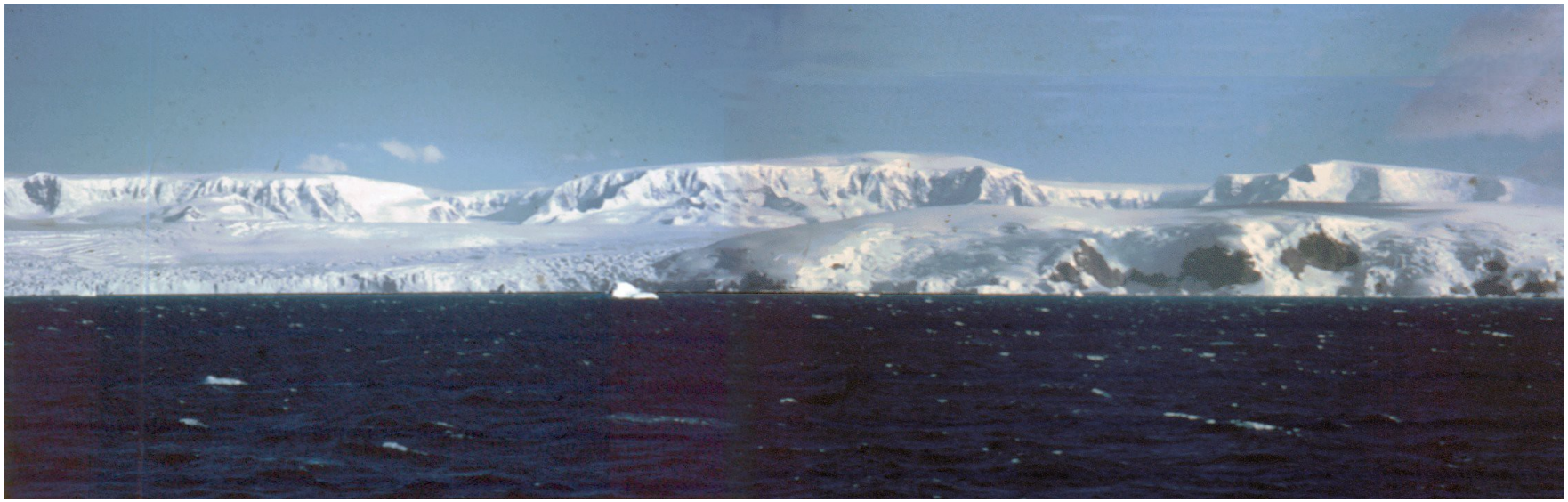
When I returned to the bridge some time later visibility had improved sufficiently to allow us to see the lower slopes of Bryde Island which we were passing on our way to the Argentine base in Paradise Harbour on the eastern side of the Gerlache Strait. The sea was quite calm and covered by a scum of fallen snow and ice crystals. As the ship moved forward this scum behaved like a very thin sheet of ice and fractured into pieces about the size of a table top or carpet. There two sets of fractures: those that ran perpendicularly to the ships course opened to a width of a few inches to reveal the almost black water beneath: those that ran parallel to the course were revealed as narrow white bands when the edges of two sheets of frazil ice overlapped each other. The first set were evidently tension cracks, the second set comprised overthrusts. One may see the same thing on a smaller scale when the congealed surface of gravy is disturbed.

Elsewhere there was no frazil ice but an abundance of floe ice, small bergy bits and brash, all in the last stage of disintegration. As SHACKLETON moved through the still water she created a beautiful train of waves from her bow and it was fascinating to watch these overtake each ice mass in turn. Old growlers

already furrowed and fluted by wave erosion rocked as the waves broke on them with a noisy splashing, but survived the passing of the waves unchanged. Moderate flows, virginal with their covering of new snow, were often unable to stand the strain of being suddenly lifted at one end by an advancing wave and cracked into several pieces, which, as the wave passed beneath them, broke further. By this process a floe about the size of a tennis court might be converted into brash ice at one fell swoop. Larger floes merely suffered some erosion of soft snow at the edges or the collapse of a marginal slice: smaller floes took a ducking which washed off their new snow but left them intact. This was a very different pack to that which had beset us in the Bransfield Strait three weeks earlier.

At the Argentine Base we had merely to deliver some items of equipment left at Base A by the party that brought their doctor, an Argentine of Japanese extraction, to attend to Jim Smith during his illness, and to recover some items that had been lent. Soon we were on our way again past Lemaire Island and out into the Gerlache Strait where landmarks made familiar by the outward journey began to appear: Lion Island and Anvers Island to port – but with a new view of a stupendous amphitheatre in the Osterrieth Mountains[10] of Anvers Island – the shapely Emma and Delaite Islands with Nansen Island in Wilhelmina Bay to starboard. This time we could see the plateau summit of Nansen Island and I had to speculate whether this would be part of the same surface as the plateau of Grahamland. Then as Brabant Island came abeam the weather improved and minute by minute the clouds cleared to reveal the topography by instalments as it were. First the coastal hills, then the great glacier trough running inland with a line of cliffs separating the northern trough from a plateau surface. Then it became clear that both troughs were cliff-walled and that the cliffs led up to ice-covered plateau surfaces. Finally these surfaces were revealed as broad interplanes sloping upwards toward the west from some 2000feet to the summit of Mount Parry at 6260 feet. Here, perhaps, is a continuation of the plateau surface of Nansen Island – the latter occupying the central portion and Brabant Island the western limb of a major downwarp

As the afternoon advanced the sun broke through the clouds and the wind freshened. The waves of the Gerlache Strait were whipped up into a steep sea with white tops, which, when lifted against the sun, revealed their strong green

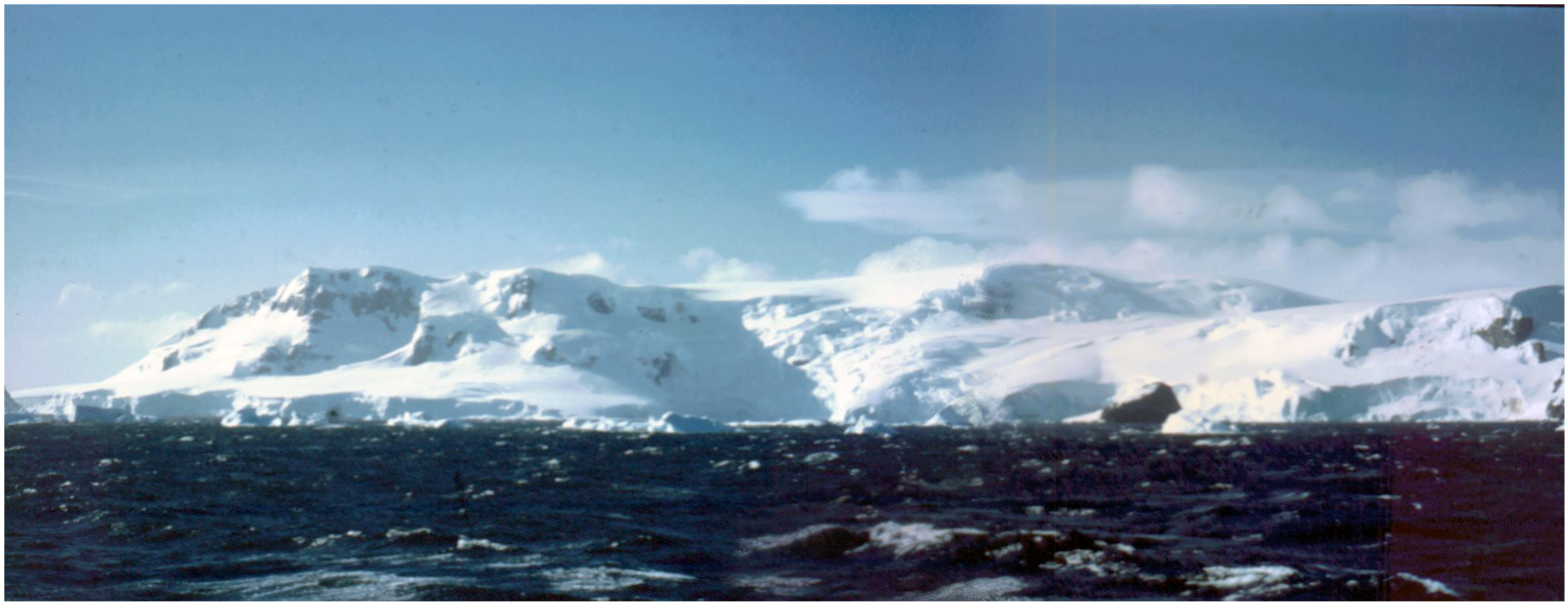


ANT58ab : Detroit Plateau : 27 Dec 58

colour, varying from a yellowish green, through olive, to a dark bottle green colour. These waters receive much very fine rock flour from the glacial melt waters of all the neighbouring lands and this remains suspended for long periods and makes them almost as green as those of the estuary of the River Plate. Yet in still bays blocks and boulders of light coloured rock may be seen through twenty feet of clear, transparent Prussian blue water.

For my benefit we were taking a course through the Orleans Strait, which has the Palmer coast of Graham Land on the starboard and Trinity Island on the port hand. Trinity Island proved to be one of the most heavily glaciated areas we have yet seen. Apart from the great tabular rock island called Farewell Rock and some smaller rocky inlets and a few remnant areas between corries at the south west corner, the whole island seems to be covered by snow and ice. From and extensive ice plateau wall-sided glaciers descend the plateau margins like vast icy ramps, and as we advanced these merged to become a great sweeping ice slope that connected the plateau rives with the coastal ice apron. The south eastern spurs and all the east coast are completely swathed in ice and Captain Blackburn wondered if I was disappointed that so little actual land could be seen!

As we turned northwards to follow the eastern coast of the island the continental Palmer Coast on the opposite side of the Orleans Channel[11] began to emerge from a shroud of grey cloud into evening sunshine and to claim our attention. What an original and striking topography was there revealed. Two-storied architecture on the grandest scale. Above is the High Plateau itself – here it is called the Detroit Plateau – with a gently swelling and sinking surface



ANT59ab : Trinity Island SW : 27 Dec 58

between 3000 and 4000feet above the sea, and breaking away in what looks like a great rock wall leading down to the 2000 feet level. Actually the wall-like appearance is rather deceptive: as the ship moved on we could appreciate that very considerable ridges and spurs ran out from the plateau but are foreshortened in the full face view. Here too, as so often in these Antarctic views, the clear air robs the landscape of its third dimension – depth along the line of sight – and reduces it to a spectacular but two-dimensional backcloth. Yet even when these allowances are made the High Plateau is very abruptly terminated by lofty cliffs and the sharpened divides and arêtes that run out from it are short in comparison with the extent of plateau margin in the field of view.

If the High Plateau and its wall-like cliff form the upper storey, the lower is even more striking in its upper simplicity. It is a vast piedmont ice apron, level topped at 1500-2000 feet and descending towards the sea in a sweeping convex slope to end in ice cliffs. Yet here too impressions are a little deceptive. In one stretch at least the ice apron could be seen to bury a bold topography of sharp rock ridges rising 1000-1500feet above sea level. Possibly the ice-scrubbed and subdued continuations of some of those spurs whose shortened distal portions buttress the plateau edge lie buried here. As we stood away from the coast more and more of the plateau came into view but now the third dimension was quite lost. Great indentations of the coast like Charcot Bay were lost, and the long promontory that ends in Cape Kater could not be identified with any certainty.

Now we draw near to the northeast corner of Trinity Island with a few rock ribs breaking through the snow to mark the positions of former arêtes between corries. The wind was now at gale force and lifting sheets of spindrift from the waves which the sun on our port quarter emblazoned with all the colours of the rainbow. It was also lifting clouds of snow from the island slopes and cliffs and whirling them out to sea. As we passed Cape Wollaston the north coast came into view and at once a major fact of Antarctic geomorphology was revealed. Unlike the heavily glacierized condition of the other coasts of Trinity Island the north coast is rock bound. The waves here gnaw at the bases of great rocky cliffs which are kept so steep that in general snow accumulation is not cumulative from year to year. So in contrast to its other white coasts, the north coast is black. It was black for us in another sense. Once past Cape Wollaston we lost the substantial shelter afforded by Trinity Island and SHACKLETON at once began to roll and pitch on the big waves from the west that had been travelling unimpeded for hours along Bransfield Strait. And within minutes it became clear to me that sea sickness is not a matter of stuffy saloons, the smell of hot oil, fear of being sick, coldness or exposure. I was warm, comfortable, absorbed in what I was doing, looking forward to a late supper and without a thought of sea sickness, but as I descended the stairs from the bridge I realised all at once that I could not hope to get anything or do anything other than lie down. I took an avomine tablet and lay on my bunk under a rug, and though comfortable enough there my equilibrium was rather precarious. Before long I had to get up to stow the rock specimens that began to tumble from the top of the cocktail cupboard, and the photographs cascaded from my desk all over the floor. By now the ship was pandemonium. In the wardroom pantry next door I could here the crockery slamming about inside its racks and the noise of crockery and glass sliding to the floor and being shattered came from time to time from one part of the ship or another. Doors that could not be secured slammed, my wardrobe door that had been locked worked free and suddenly flung itself against the head of my bunk to give me the worst of frights. Woodwork creaked and groaned and water gurgled in the wash basin outlet. Suddenly four of my drawers flew

ANT 60 : Trinity Island complete glacierization : 27 Dec 58

open and began to disgorge their contents: my chair fell over, and the books I had stored on the settee shot across the floor. Grudgingly I got up and stowed everything again and was so exhausted by the effort that I lay down again before getting up once more to get undressed. Once in bed I fell asleep: I almost believe that if there is enough noise you don't notice it and it cannot keep you awake.

December 28th

In the early morning we should have landed a party of three FIDS at the eastern end of Livingston Island at a conspicuous promontory called Edinburgh Hill, but when the ship arrived there, the swell was such that a boat could not be put overside. Consequently when I went to breakfast I learnt that we were recrossing the Bransfield Strait en route for Hope Bay in order to collect a survey party and put them, their sledges, equipment and dogs ashore on Joinville Island. The gale was still blowing itself out at thirty knots or so, but visibility was good and when I went on deck a fine panorama of the continental coast was on display. As on the Palmer Coast so here in the Trinity Peninsula the architecture was storied, but unfortunately the whole lower story was obscured by grey cloud. Very probably it was a cloud of blizzard snow lifted from the lower slopes into the clear air and driven along before the wind. Only an occasional lower peak like Mt Jaquinot projected through this shroud, but above it the upper storey of the landscape – the Louis Philippe Plateau and its supporting ridges stood up clearly. Two passes – Windy Gap and Misty Pass- could be seen at the north eastern end of the Louis Philippe Plateau separating it from an unnamed section of the high plateau between 58 degrees and 57 degrees 40' west. East of the latter mountain the ridge comes to an end in a long nunatak ridge which could be seen in its full length, completely covered with snow, white outlined against the blue sky.

We arrived at Hope Bay at 2.30pm and Derek and I went ashore with Graham Hobbs, the geologist in charge of the party that should have been landed on Livingston Island. We landed at the jetty of the Argentine Base and first looked respectfully at the little enclosure, about a dozen feet square, of massive dry stone walling where the three Swedes of Nordenskjold's expedition, Gunner Anderssen, Duse and Toralf Grunden, who had been landed here with provisions for two months, had involuntarily spent the winter when the ANTARCTIC was crushed in the ice and lost. Their stone-walled enclosure was roofed by a tarpaulin and this broke the force of the winter winds. Inside it they pitched their tent and floored it with the skins of the penguins and seals that had to be their staple food. This is one of the epic stories of the heroic age of Antarctic exploration and this little enclosure, half full of the litter of the Argentine camp is a historic spot.

We walked with Graham over ground that we had travelled before as far as the Scar Hills lake and the striking soil polygons that occur beside it. It was interesting to see it again, to reconsider our earlier observations and to have a professional geologist view the rocks. On our way back we found above the Argentine Base, on ground that had previously been snow covered, that the slope was littered with rounded beach pebbles. With this clue we soon made out an upper and a lower raised beach, respectively about fifty and about thirty feet above the sea. Not the least interesting thing about these beaches was that even on the lower and younger of them the beach pebbles showed marked weathering since they had been rounded by the waves. Some had developed a thin hard rind which had peeled off over part of the stone; some had been polished and patinated by the wind: some showed both effects. Truly, we are continually being impressed by the rapidity of the destructive processes at work in these climates.

At the landing place we found Lee Rice and others of our acquaintance of Base D busy loading their sledges, equipment and dogs on to the scow and before the evening was over there were 18 dogs chained on the deck of the SHACKLETON. As I was undressing I heard a dog bark, and again, and yet again. And each bark was accompanied by a crash somewhere in the ship. This struck me as an impossible coincidence, and it gradually dawned on me that each crash was made by the impact of 80 or 100lbs of dog landing on the deck at the end of his chain about two feet above my head, and that the simultaneous bark in fact came from the same dog!

December 29th

We sailed from Hope Bay at 6am in the expectation of landing the survey party on Joinville Island an hour later. But the calm of the previous evening gave way to a rapidly freshening wind which raised a sea that made landing stores from the motor boat on to rocks out of the question. So SHACKLETON headed south down Antarctic Sound for Rosamel Island where Lee Rice wanted to land to build a cairn to act as a survey beacon and I wanted to land to find out why an island rising to 1409 feet carried practically no snow. In fact neither of us did land and I wonder if any landing on the island has ever been made. As we approached it became obvious that for almost half of its height the island rises in beetling ochreous brown cliffs of level-banded volcanic material – probably lavas. Sheer buttresses alternate with chimneys and inaccessible

gullies. Above the 600ft level the slopes are much gentler and here in one or two places subsidiary cones occur. Sometimes they are revealed in a cliff section when the sea has brought about the opening up of a funnel shaped embayment by gnawing away at the base, and then the lavas of the minor cones are seen to rest discordantly on the slope eroded by rain and run-off across the bedding of the older volcanics. Only near the summit of the island are there any patches of snow and these appear to be thin and wasted and much discoloured by dust from the nearby rocks. Here was the first hint that we were entering a region that is deficient on snowfall.

ANT 54 : Rosamel Island from N : 29 Dec 58

Disappointed that we could not land on Rosamel the SHACKLETON turned WSW across Erebus and Terror Gulf so that I could learn something of Vega Island and the other islands of the Crown Prince Gustav Channel[1]. To starboard lay Andersson Island with the remarkable looking Cape Scrymgeour (a good Dundee name that recalls the voyage of the Dundee whalers BALAENA and ACTIVE in these waters in 1892-3) at its eastern end. On its northern sunny side this is a rock cape of dark red volcanic rocks, dipping gently south-westwards: The southern side is hardly less steep but made of ice and snow, the upper part being a thin sheet of ice and the lower part an accumulation of neve leading down to an ice cliff of the usual kind. The ice of the upper part exhibits an irregular banding like the graining of wood sawn with the grain: evidently layers of old ice are being exposed by progressive melting of the surface. This is surely a mass of relict ice sticking to the steep rock wall on the shady side of the cape and being gradually eroded away. From this one must infer that the snow line is now above the cape (which rises to 700-800 feet) but was lower in the recent past.

As we steamed towards Cape Gordon at the western end of Vega Island two things appeared to dominate the physiography of the area we were approaching

ANT 55 : Rosamel Island from E : 29 Dec 58

– the general snow starvation of the region which results in a snow line approaching a thousand feet above the sea and a superabundance of bare rock slopes below this level, and the tabular character imparted to the relief by the presence of the widespread sheets of basaltic lava of the James Ross Island Volcanic Series. Cape Gordon itself rose boldly ahead in steep red pinnacled slopes to a massive layer of columnar jointed rock that appeared to dip away from us. Beyond it an alternation of level outcrops of black rock and horizontal bands of white snow marked the successive lava terraces of the southern part of the island. Beyond this again, rising from a similar foundation of plateau basalts we could see the wide-spreading ice dome that rises gently to the culmination known as Mt Haddington 6561 feet above the sea. Probably this is not so much a true ice dome as a thin covering of ice masking a large lava

dome or “shield volcano” of the type seen in Skjaldbreidur in Iceland and Mauna Loa in the Hawaiian Islands. The geologists regard it as the main source of the James Ross Island Volcanics.

ANT 52 HOPE BAY : Cr. Pr. Gustav Channel Corry Island : 29 Dec 58

It was now a brilliantly fine afternoon. The sea gleamed and sparkled under the breeze. Nunataks with the sun behind them stood out sharply from the ice surfaces of the Tabarin Peninsula to the north of us. Westward and ahead the ice covering of the Detroit Plateau and its glacier streams descending between bold nunatak ridges and peaks gleamed with the cream and ivory tints that distance lends to sunlit ice. This was the opposite side of the same plateau that we had viewed from the Orleans Channe[11]1 less than 48 hours earlier. In front of it were the nearer islands of the Crown Prince Gustav Channel[1] – most of them like Corry Island, Red Island and Beak Island almost free from snow and ice, and displaying the red and black colours of volcanic rock, but with Eagle Island having a low ice dome at altitudes at which the other islands are ice-free. Possibly this ice, like that on Cape Scrymgeour is essentially a relict mass, a diminished remainder of a larger ice body accumulated under conditions of more adequate snowfall.

Southward of us lay the long coastline of Vega Island. Near at hand in a bay Devil Island rears two pinnacled peaks of bare brown volcanic rock above scree slopes, and at the eastern horn of this bay lies Cape Well-met. The name commemorates the dramatic reunion in October 1903 of Otto Nordenskjold with the three members of his party – Anderssen, Duse and Grunden – who had been left at Hope Bay by the ANTARCTIC and had walked thus far overland after a winter of great privation and fortitude. The cape is an impressive promontory of spectacularly simple build. Cliffs of tawny brown sandstone (they have yielded Upper Cretaceous fossils) rise some 600 feet sheer from the sea and are capped by massive horizontal beds of dark basalt making a sharp tabular feature. On top of the table a gentle snow slope begins a little back from the edge and rises to a neve dome that forms the culminating area of Vega Island a little above 2000 feet. Two things interested us greatly here. The first was of professional interest. The Cretaceous sandstones below their level lava capping could be observed to have a dip to the east or southeast of 30-40 degrees at the cape: further west along the line of cliffs they appeared to dip westward at similar angles. Here, clearly, is a spectacular unconformity implying folding, uplift and denudation of the sandstones before the outpouring of the first lavas. And the regularity of the surface on which those lavas rest reveals it to be a base-levelled plane of either sub-aerial or marine erosion.

The second point of interest fascinated everyone. Just west of Cape Well-met we could see a large waterfall plunging over the cliffs. Melt water from the ice above leaps over the cliffs edge in a ribbon of white that hangs and wavers and dissolves into spray in the wind before meeting the lower rocks hundreds of feet below and running off in a fresh cascade into the sea. A waterfall in the Antarctic is a rare enough sight: a waterfall of this magnitude of beauty must be rare indeed. Nor was it alone. As the afternoon advanced melting on the snowfield ashore went on apace, so that between 5 and 6 o’clock a score or more of lesser waterfalls poured over the cliff edge east of Cape Well-met to dash themselves upon the screes two or three hundred feet below.

ANT 53 HOPE BAY : 700' Waterfall : 29 Dec 58

When we had penetrated the Crown Prince Gustav Channel as far as the meridian of 57 degrees 30 west between Corry Island and Vega Island, close pack of large and heavy floes barred our way, and I had to agree, regretfully it is true, that here we should turn back. So SHACKLETON steamed north-eastwards towards Duse Bay, in search of seals to provide meat for the dogs of the Joinville survey party. We steamed in among the floes and bergs till our way was closed by a large tabular berg. The motor boat was put out and Tom Flack went off to shoot seals. Five in fact were shot but only four were recovered and brought on board: the fifth lay on a floe beyond a passage between two tabular bergs that looked as though it might close before the boat could go and return through it. Content enough we turned southward again, and found ourselves threading a passage through a concourse of great tabular bergs. Always it seems there are many of these huge bergs sojourning here for a season or more on their journey from the Weddell Sea where they are calved from the Filchner or Larsen Ice Shelves to their final dissolution in the warmer waters of the southern ocean. W.S.Bruce observed many such when he came here in the BALAENA in December 1892, and Ross, fifty years earlier found here "the largest aggregation of icebergs" he had ever found together. We saw nothing approaching this but we must have seen three or four dozen. The smaller ones were perhaps the size of a forty acre field: the largest was rectangular with a short side of about two thirds of a mile and a long side of two miles. Their cliffs were vertical and very rectilinear. Narrow vertical cracks and fissures traversed them at intervals, sometimes from top to bottom in lines of intense blue: sometimes the cracks in the superficial snow and light neve layers died out five or six feet from the surface to be replaced by a set of larger and more thinly separated features in the deeper(?) layers. From one of these a stream of melt water gushed out some thirty feet above the sea with such force that it sprang a yard or two clear of the cliff. The Chief Engineer later remarked that we could have quickly replenished our fresh water supply at this source! The corners of these bergs were often truly rectangular, and the larger ones always had their upper surfaces, and the stratification exposed in their cliffs, horizontal. Several of the smaller bergs, however, had upper surfaces that were markedly convex and their bedding followed the form of the surface. Convexity is thus an original and characteristic feature of such bergs and they clearly have not originated like their neighbours in the great ice shelves of the Weddell Sea. It is probable that they have more local origin and have carved from the convex ice apron that borders the landward side of the Crown Prince Gustav Channel[1] itself.

The last of the bergs were not cleared until we had actually entered the Fridtjof Sound between Andersson Island and the Tabarin Peninsula – indeed they appeared for a time to leave no passage into the sound. That would, however, have been a little unlikely for strong tidal currents pour through it. Only modest swirls in the water were visible as we made the passage but, for good measure, the waters were alive with penguins porpoising about in schools of a dozen or a score at a time, while the rolling black backs and dorsal fins of a few killer whales were also in evidence.

The thinness of the snow cover on Andersson Island was again noticeable. At this western end the scarp made by a horizontal lava bed could be picked out by eye over long distances, and a former volcanic cone with its seaward half removed by the waves to reveal its internal structure, was completely bare of snow. An even more impressive view of the middle of a former volcano was seen when we entered Fridtjof Sound and could see the north face of Jonassen Island. Here in a great cliff undermined by the waves one sees at the base a foundation of level-bedded lavas, followed upwards by a cone of yellow agglomerates and ashes: this in its turn was buried by a rain of grey-black ashes, while on top of all are the most recent lavas which still form the actual surface of this part of the island.

Our day was already full but for some on board it was just beginning. About 8pm we came abreast of Cape Kinnes, the westernmost point of Joinville

Island and Lee Rice and I examined together the air photographs of the view through binoculars of the rocky point on the north side of the little bay beyond Cape Kinnes to find the most suitable point to set his party ashore. Landing was clearly possible there but it would involve back packing up a long stiff slope before the sledges and dogs could be used, so we looked again for an alternative and found one a mile or so along the coast where a rocky outcrop backed by a crescentic moraine (looking together like an eye and a raised eyebrow!) made a break in the usual coast of snow slope and ice cliff. Lee went off in the motor boat to prospect this spot, but finding it exposed to the swell returned to the first choice and reconnoitred there. We found landing conditions more favourable but the penguins were unusually hostile and pecked savagely. He was proposing to land in one of the biggest rookeries in this part of Antarctica, estimated by zoologists to contain some 330,000 birds. The whole rocky hill, right up to its 500 or 600 foot summit could be seen from the ship to be covered with penguins, and the snow slope nearby was as busy with

ANT 50 HOPE BAY : Beak Island & Seven Butresses : 29 Dec 58

their little black figures scurrying up and down as the surroundings of a disturbed ant hill. Here in fact the party landed, but by the time the equipment was ashore the tide had fallen enough to prevent the dogs being landed from the scow. The third officer consequently spent an unpremeditated night in a tent ashore and the dogs had to remain on board until landing became possible about six next morning.

December 30th

Once or twice during the night I had woken and, feeling the ship under way, believed her on course across the Bransfield Strait to Penguin Island, a little volcanic islet southeast of King George Island, which I wished to visit. It was, therefore, a great surprise when I got up to look out of my port and see the familiar landmarks of Antarctic Sound – Mt Taylor, Sheppard Nunatak and Mount Bransfield. Not until breakfast did I learn about the difficulties of landing the dogs and realise that we had been lying off Joinville Island with engines running all night. However, at 7.30am we had in fact got away, but shortly after passing intoBransfield Strait we ran into deteriorating weather and ice. Course was therefore altered about 11am for Admiralty Bay. By noon a gale was blowing and SHACKLETON was rearing and plunging as her bow took the seas, and the wind would pick up the water she threw up on her port bow and dash it against the bridge. My cabin ports were closed and screwed home but somehow the water, driven by the wind on the weather side of the vessel, found its way in past the seal and onto my writing table and my bed clothes. In the afternoon most of us were well content to take a siesta. At 5pm with Martins Head only a few miles away we ran once more into pack ice. At its edge a sharp line separated the ice, shepherded by the wind, from the open water, but the heavy seas respected no such boundary and ploughed on through the mass of broken floes and brash ice. To see the pack heaving and subsiding as the rollers pass beneath it is a grand and somewhat awful sight. Soon, however, we came well into the pack where the motion was almost damped out. Progress was slow for the pack became heavy. After an hour Martins Head seemed but little nearer. In fact we were making slower progress through the pack at times than some of the big bergs that were moving steadily westwards, driven by a strong current, into the teeth of the westerly wind. Behind them lanes of open water showed clearly their masterful course. A thinning of the pack then enabled Captain Blackburn to make better speed and pass round the remaining bergs into the entrance of Admiralty Bay. A little later we were clear of the pack, steaming past familiar landmarks, Ezcurra Inlet with Dufayel Island, Point Thomas and Point Hennequin (where I noted raised beaches of an interesting looking moraine) to cast our anchor for the night off Base G.

December 31st

A day of misfortunes yet, in spite of all, a satisfying and curiously happy day. Misfortune met me at the start. When gathering my gear together to be put ashore in the boat I found that my Weston exposure meter would not function. No doubt during yesterday's gale it received a knock when the little bag it was in made a sudden excursion across the shelf of the wardrobe. The shelf is only about twelve inches wide and it cannot have moved far – but evidently I should have kept it in a drawer with soft clothing. Jim Martin took Derek and myself across Mackellar Inlet in the motor lifeboat, a rather wet journey as the southerly wind was still fresh and raising a fair sea. Visibility was poor but we had no difficulty in finding the place where our photographs showed elevated beach ridges coming in contact with moraines. The highest of the shingle ridges was double and some 20-22 feet above the sea: at its northern edge its two low swells of packed and rounded stones appeared to pass in an obvious way underneath the loose and tumultuous accumulation of the outermost moraine. We dug with the hammer at the point of contact and as far as we could excavate, which of course was very little, the angular moraine material overlay the well-rounded shingle of the beach. This moraine was the outermost and thus the oldest of four. The innermost is in the condition of emerging from the ice by the ablation of a group of dark bands, the next is low and recent and made only of small material and has obviously originated in the same way quite recently. The remaining moraine is the principal one and forms a ridge 30-40 feet high with much coarse material that runs a considerable way up the hillside. We were somewhat surprised to find that this moraine incorporates a great deal of beach material. Wave-rounded and smoothed stones are conspicuously different from the normal constituents of a moraine and we found an abundance of medium and large pebbles and some cobbles up to 8 inches in dimension. as we followed the moraine inland these pebbles suddenly became less common and in a score of yards more ceased altogether. They were confined to the portion of the moraine roughly below 100 feet and within 200 yards of the shore: within these limits the glacier had evidently overrun the old beach ridges and incorporated the contents in its moraines.

In the afternoon we made another excursion with a similar purpose. Again Jim handled the boat and Neil Orr came to give him a hand. The sun was now shining on the water and glinting off the myriad –faceted waves running briskly before the keen wind. The lifeboat rose easily to the waves and the long reach across Admiralty Bay to Point Hennequin was like a holiday jaunt. We landed on a fine shingle beach and found a magnificent flight of abandoned beaches rising in front of us. We estimated the various rises to be 6, 10, 22, 30, 45 and 55 feet above the sea – the last with a broad flat (area) behind that may once have held a small lagoon. All of them were built of well-rounded cobbles but at the upper levels much shattering by frost had a greatly reduced number of such stones remaining. Returning to the 22 foot ridge and following it southward we found it abutting against a crag of earth. Wave action had smoothed the foot of the crag and hollowed out a small cave with rounded boulders still lying on its floor: yet frost action had played havoc with some of the lava outcrops since the sea had washed this cliff.

Beyond Point Hennequin is the extensive deVieville Glacier and I had observed from SHACKLETON a fine lateral moraine on its northern flank. We found on close inspection that though the conspicuous inner moraine rose some 12 feet across the general surface of the glacier, only the top three feet were made of morainic material: the remainder was an ice core with included dirt bands. These were very well seen in the ice cliff, for fortunately a rock stack nearby afforded an excellent view point from which the cliff could be examined. The dirt bands below the moraine rose in beautiful curves; concave upwards to meet the glacier surface at about 40 degrees, but others a little nearer the centre of the glacier had an inclination of fully 70 degrees.

By this time Jim and Neil had brought the boat to the rocky point and we joined them there. The wind had now dropped, the sun was shining brilliantly and the bay looked at its best. Admiralty Bay is shaped like a very broad-bottomed flask with a neck almost three miles wide which leads southwards between Point Thomas and Point Hennequin to Brandsfield Strait. The body of the flask is really a great oval depression 12-15 miles broad (from west to east) and half a dozen miles from the neck to the base. On all sides including the south this depression is rimmed by a high ice plateau at 1500 or so feet and from this plateau a dozen or more glaciers descend by relatively short steep courses to the bay. Some of them are still separated by well-marked ridges that jut out from the rim like the Keller Peninsula that carries Base G: some have been reduced to vestigial divides that now appear only as nunataks, so that the glaciers they once divided now reach the sea in a common ice cliff. I sat on the boat and counted the glaciers round from Point Hennequin to Ezcurra Inlet and Point Thomas and wondered about the origin of this great depression into which they bring the upland ice. If the ice age should return and all these glaciers extend until they coalesced the outlet of Admiralty Bay as the neck of our flask might just be adequate to carry away the combined discharge. Probably it did so in the past for the centre of the channel has been ice-scoured throughout a distance of 1500 feet. But even if one outlet channel did carry away the discharge of more than a dozen glaciers, such an arrangement is not characteristic of ice streams which tend to proceed by short, direct and independent routes to the areas where melting takes place. The existence of this

arrangement here surely argues that the ice streams took over a valley system already eroded by rain and rivers before the Ice Age. For arrangements of this kind whereby many rivers join and find a single outlet are common. They may arise directly during the uplift of the land which sets the erosive process working, where we have a tectonic depression which may have had more than one possible outlet but for which the lowest has proved the most efficient. Or such problems may arise by the slow adjustment of streams to weak structures in the way in which the upper Thames carries the drainage of parts of half a dozen counties through Goring Gap to Reading. Of the two possibilities the first seems the more probable in the South Shetland Islands which are built mostly of later Tertiary volcanic rocks, which are not likely to have afforded much scope for stream adjustment, but are very likely to have been dislocated by unequal tectonic movements.

My speculations came to an abrupt end as we ran into ice that had been moving up the bay all afternoon and now surrounded SHACKLETON on all sides. We had been warned of this when Jim called the ship on the RT and had been advised to approach by going close to La Plaza Point[3]. This we did and as I had moved up to the bow of the boat I now stood up to get a better view of our way through the ice and to signal to Jim at the helm. All went well till we were perhaps 200 yards from the ship, when I saw that Jim was going to hit a sizable piece of ice. I was holding on to a rope all the time and as this was taut I enjoyed a false sense of security, and did not, as I should have done, drop onto my knees and take a firm hold of something solid. In a split second the bow had rammed the ice, the bow was brought up short and I was catapulted into the water. I think I expected to be frozen to the marrow at once by the icy water and was quite surprised to find I was not. But I was quite desperate to get out as quickly as possible and pulled instinctively on the rope which I was apparently still holding. The immediate result was that I battered my head against something. My immediate reaction was the panic thought "I am underneath the boat: how shall I get out"? But I also have a recollection of opening my eyes momentarily in a world of green water and transparent white ice and thinking – "Good heavens: I forgot about the ice. I must get through the brash layer." Whether I hit my head on the keel of the boat – as Neil Orr believes – or on a heavy bit of ice I shall never know. In a moment I had broken surface and with Neil now hauling in the other end of the rope – though at the time I imagined it was all my own effort – I got my hand on the gunwale and tried to raise my right foot and hook it into the loop of the lifeline that runs round the boat. Then I discovered how heavy a big rubber boot full of water can be: the effort was too much. And I felt the cold of the water getting to me through my clothing.

Three pairs of willing and rather anxious hands now seized me by the arms and body and dragged me in board and sat me down on a thwart. Neil at once became the doctor and took charge of me. Blood was running down my right temple and putting a (scarlet!) handkerchief into my hand, he bade me hold it against my head. Then from his pocket he drew a flask of whisky and poured me a most welcome tot. Meanwhile Jim had got the boat away and was making for the nearest side of the ship and shouting for a ladder. He need not have done. Practically everyone it seems had been on deck watching the boat making its way through the ice and my involuntary (and unnecessary) election to the Antarctic Swimmers (fully clad) had been staged before a full audience. As the lifeboat came alongside the crane jib swung over side and in a moment the lifeboat was hoisted bodily up to the ship's gunwale. Willing shoulders supported me as I jumped down to the deck and blankets were wrapped round me whether I would or no. It seemed to me such a pity to wet good blankets, but in fact I was glad of one for my teeth were chattering indeed.

There is a shower bath immediately opposite my cabin and I turned straight in there and Neil helped me to undress. Parts of my clothing around my middle still showed dry patches – the water had quickly penetrated by neck, arms and legs but had not completely enclosed me. As I stepped under the shower I was prepared for the reddish stain that came from my head: and then I stood gratefully for many minutes till warmth really came back to my spine and limbs. What luxury. Then wrapping one towel around my head and another round my middle I was quickly across the alleyway, into my own cabin, my pyjamas and my bed. There I found two hot water bottles, extra blankets and a cup of hot cocoa awaiting me. Neil gave me codeine tablets and went away to get a bite to eat. Before long he was back and set to work first to bathe and clean the wounds on my head and then to stitch them up. This was not altogether pleasant but when it was accomplished I must say that I was thoroughly warm again, very comfortable and had a most heartening sense of having been very well cared for and most kindly treated. And I was still very pleased at what had been, for a geomorphologist, a most enjoyable day.

Then I lay thinking idle thoughts I remembered my damaged exposure meter and was seized by the thought that if you were here, Vera, you would be worried by your superstition that misfortunes go in threes. Was there a third to come? About that time I reached for my watch and found to my horror that the hands stood at seven o'clock – evidently the moment when I fell into the water. Now I knew where the third misfortune was and I thought with regret that perhaps this was the end of the useful life of the watch you had bought me when Judith was born 22 years ago. I lay back sadly on my pillow thinking

what a good friend the watch had been to me. After half an hour I got up, found my penknife and some clean blotting paper and got back into bed. I opened the watch, wiped out the moisture from the case, laid the movement on the blotting paper and hopefully took up a book. After thirty or forty minutes I picked up the watch again and shook it. To my delight the balance moved and the watch began to tick. Twenty minutes later it was still ticking – and it has ticked ever since.

By this time the evening had worn away till it was past eleven: by this time also sounds of jollification could be heard from the wardroom through the open door, coming up the staircase from the Fiddery and from the crew's quarters below me. Neil returned about 11.30 and put a dressing over the gash in my temple to hide it and donning a paper hat and a dressing gown I made my way to the Ward Room where I was received with delighted cheers. A rigorous sing song was in progress. A few minutes before twelve Tom Flack headed a conga procession that wound its way round the ship collecting all and sundry on its way and finished in the FIDDERY

with Auld Lang Syne and general hand shaking and good wishes to everyone from everyone else. Crew, Fids and officers now joined in a genuine sing song and in due course all the old bawdy songs were sung with, in some cases, new and witty verses provided by members of the company whose talents might not have been suspected. And towards one o'clock I slipped away to bed – but I believe some of the crew kept it up till day break.

New Year's Day 1959

When I went I decided to make a lazy morning of it, but after 10am so many people came to see me that I got up and dressed. Peter Reynolds brought me your radio message of New Year greetings and pointed out to me that it had been handed in at 12.25am in Sheffield. So I pictured you, Babs, bringing in the new year with Rita and the boys and then telephoning a cable of greeting from all of you, It was most heartening to be brought suddenly so close to you and to find that we were all sharing the same New Year's day.

Neil Orr thought it best that I should not do anything active that day and when Tom Flack came to say that the wind was rising and it seemed unlikely that we should weigh anchor I luxuriated mentally in the prospect of being lazy without any nagging afterthoughts of opportunities missed. But at lunchtime the expected gale had not materialised and both Toms were a little restive that we were still at anchor. So when Captain Blackburn asked if it would suit me to proceed to Penguin Island I readily assented and went to Neil to make my apologies for flouting his medical authority and to assure him that I felt very well. So at 4.30 we weighed anchor and two hours later lay off Penguin Island.

When the boat went ashore it was full of FIDS. Never perhaps since it was discovered has the island submitted to such a numerous invasion or has its ashy acres been seamed in so many directions by dusty footprints. Everyone had heard that the island was volcanic, but more than that, it had also become known through Derek that I was intrigued by an appearance on one of the photographs that looked solid enough, but could not be matched on its stereopair and so just possibly might be a cloud of smoke. So no one was going to miss the chance of finding evidence not noticed by earlier visitors to the island, that some measure of volcanic activity is still manifested there. Alas they found much to intrigue and interest them on this fascinating island in its coloured rocks, fantastic caves and rich bird life – but the island is less volcanically active even than Deception. No belching steam as at Whalers Bay, no fumaroles bubble through the water as at Port Foster, nor send their plumes of steam drifting across the skies as beyond Mt Pond. The appearance I had seen within the crater of the young ash cone that is the island's principal feature turned out to be as solid as it looked on the first photograph, and it must have been an accident of photographic tone and the hiding by the object itself of its own cast shadow that made it invisible on the second. The object met our gaze as soon as we climbed to the top of the long slope of loose red and black gravel of ash and lava fragments, and stood on the crater rim. Rising from the near slope, midway between the crater rim and the floor a mass of solid brown rock rose with vertical walls sheer almost to our own level. No volcanic fires burned here: this was rock long cold and solid: indeed it has possibly been disengaged from the crater wall by erosion of the softer rock from around a pipe filled by solidified lava and aggregate. If so it may well be older than the little red ash cone that occupies part of the crater floor and preserves its constructional form untouched by surface erosion. The main crater on the other hand has certainly suffered in this way: two fans of eroded gravel diversify its flow and almost fill in a small seasonal lake. We could infer the existence of this lake from a well-marked strand line, but already this summer it has emptied and percolated through the loose materials of which most of the cone is built.

On all sides but the western side the cone rises from a platform of older lavas that has itself been attacked by the waves of the sea to give a series of bold cliffs a few score feet in height. But on the western side the cliff sinks below sea level, as if it was deformed by the weight of the cone, and in consequence have there been able to attack the cone itself. They have undermined all this side to produce, a long, steep and unstable slope that runs up from the boulders of the beach to Deacon Peak 534 ft, the culminating point on the crater rim. In

the middle of the great red scar which is hardly steep enough to be called a cliff, stands an unusual wall-like mass of rock. In origin it is a dyke of basalt or fine grained dolerite squeezed into a vertical fissure while still in the liquid state. Enough fluid rock was squeezed in to push the bounding walls of the crack six or eight feet apart, but the material in which the crack occurred has itself been eroded away leaving the vertical sheet of dyke rock and rising several score feet above the beach projecting nearly as much from the red ash face. But interestingly, the material that has been eroded away has left trace of itself on the two flat surfaces of the dyke that face up and down the beach. Here may be seen almost parallel lines that dip moderately towards the sea. There is no reason to think they mark any change within the dyke rock itself, but rather that they are the impression made on the dyke rock itself by the bedding in the now vanished rock into which it was originally intruded. Here we have a simple local chronology. First the building of the ash cone: second the intrusion of the dyke, and third the exhumation of the dyke by the waves after all had become cold and solidified. Possibly the great stack inside the crater is coeval with the dyke and has been laid bare while the seaward slope has been driven inward to the crater rim.

On the southern side the cliffed platform of older lavas that forms a basis for the main core is narrow and has been extensively colonised by penguins, and no doubt it is the conspicuousness of this rookery that has earned the island its name, for it is not really large as Antarctic rookeries go. Here we found the Adelies with chicks gathered together in “crèches” surrounded by rings of older birds! And here too we found nearly a hundred feet above the sea a fair abundance of rounded beach pebbles many of which were if ice-transported stones like granite that do not occur on Penguin Island. But no actual beach deposit remains, nor would one say with any certainty that the beach on which the pebbles rest is a wave cut feature since it is also the surface of the lavas and falls lower and rises higher than the particular level at which the pebbles were found. Much more striking are the remnants of a shingle beach with large well-rounded beach boulders up to a foot in diameter found about 22 feet above sea level in the two or three little embayments in the cliffs of the western coast in which a beach would have accumulated at this level.

Most of the northern part of the island is a gravel plain out of which project, here and there heaps of stones that look at some distance like badly buried buildings. Actually they are always masses of lava – very slaggy and vesicular above but often massive and blue –hearted in the interior. Yet these masses do not appear to constitute anything that can be called a lava flow. Rather do they appear to have been blisters of lava that have been broken open and largely destroyed by the shattering action of frost, for the fragments that remain normally show dips outward in all directions. I recalled the Demabjorgur of Iceland where giant bubbles in a lava flow, once occupied by steam, now form caves over-arched by massive lava with a slaggy outside crust. We found no caves but many fallen blocks that I tried to interpret as bits of cave roof, resting on the a…..y gravel into which everything is being rapidly broken down. When we came to the cliff edge however there were the caves – not sea caves though wave erosion had laid them open to our inspection – but lens like cavities in the rock a yard or so in height and many yards in horizontal section. In many the walls and roof were encrusted with secondary minerals?, often beautifully coloured, and in some cases we found little stalactites of basalt that told how when steam under pressure had raised part of the lava bed to form a cave roof there had been cracks in the roof through which still fluid lava had trickled and emerged to solidify as it dripped upon the floor.

The caves in the cliffs and the crannies in the slaggy lava blocks rising from the gravel grounds inland provide an abundance of nesting sites for the shy Wilson’s petrels and in one or two cases we not only heard their subterranean chirping and whistling but discovered or uncovered the sitting bird. On the cliff tops and on the slaggy lava blocks giant petrels were nesting with a large blue-white elliptical egg apiece. In lower latitudes the giant petrels are sooty brown or black: in higher latitudes a pale (white) form is common. Most of these birds were of intermediate light coloured but mottled plumage. Two seemed pure white but close inspection revealed some tiny dark flecks on the wings: since these two were paired their progeny may be an (extracted) pure white bird.

January 2nd

During the night SHACKLETON sailed westwards past the coasts of King George and Nelson Islands in the hope of landing a team of three surveyors with their sledges, dogs and equipment on Nelson Island in the morning. When she reached the proposed landing place at Harmony Point, however, close pack driven hard against the shore made a landing out of the question. We, therefore, steamed on westward through waters where we had made more leeway than progress a month before, to Edwards Point on Robert Island. This was both a suitable starting point for part of the survey operations and a spot which Derek and I had marked down from the air photographs as of great interest, for

ANT 34ab S. SHET : RB Half Moon Island Mt Barnard on Livingston Island : 2 Jan 59

between the ice-covered landward slope and the rocky reef parallel to the

shore, which constitutes Edwards Point itself, the photographs reveal a series of elevated shingle ridges. Nor were we disappointed when we landed. Here in fact we found convincing evidence of a whole series of former strandlines – at least twelve of them – ranging up to 110 feet above present sea level. At the highest lines which represent the earlier positions of the strandlines one could forgive the casual observer not recognising that he was standing on an elevated marine beach – in fact the features between 60 and 110 feet are better described as degraded shingle beaches. Relatively few of the pebbles and cobbles of which they were originally composed have survived shattering by frost and at the 110 line particularly they have to be patiently sought. The original form

moreover has been changed by the channels cut across the former ridges by

meltwater from the ice and snow inland and by snow creep and shearing downhill. Yet the linear nature of the features, of their arrangement in plan and the increasing proportion of wave worn material as one descends leave me in no doubt that these are indeed raised beaches.

Below 50 feet no one could have any doubt of the matter: the lower ridges have been little modified as to form, they sweep unbroken across the head of the bay enclosed by Edwards Point just as the present shoreline does, and they are obviously built of rounded cobbles. Behind each ridge is a hollow still holding ponded water or floored by ground so saturated that patterning of the stones is the rule. This was the first locality at which we found that satisfying marine features could be traced at all levels from modern sea level to 110 feet: moreover the distinction in their state of preservation between the beaches above and below 50 feet is something we have sensed but not been able to prove elsewhere. On the face of it suggests that the higher beaches are more than proportionately older than the lower ones.

While Derek and I completed our examination of these features with a despatch which reflects the relative certainty with which the evidence could be interpreted the landing went more slowly. We found as we descended that the towing boat was flying a pair of trousers lashed to an oar in the hope of attracting attention on the SHACKLETON: the boat in fact had come ashore on the falling tide and the radio telephone was being temperamental. Ultimately attention was attracted and the motor lifeboat came out and brought with it the dogs. When these had been landed and after some time had been vainly spent trying to get the towing boat off, we bade the shore party farewell and returned to the SHACKLETON> The ship immediately raised her anchor and proceeded six miles or so up English Strait to Discovery Bay which makes a wide indentation in the eastern side of Greenwich Island. Rounding Ash Point, the south-eastern entrance to the bay, we came in sight of the Chilean Base with the supply ship MAIPO, a converted tanker of six or seven thousand tons lying off with the tug P.LIENTOR alongside. With our signal flags we exchanged courtesies and New Year greetings and dropped anchor ourselves. Our lifeboat was put overside and Derek and I immediately set off to make the best of the remaining daylight by examining the beaches of Ash Point. Scores of Chilenos appeared on the beach near their base hut, but probably most of them were the complement of the MAIPO. As our boat made its way past the base a Chilean launch set off for the MAIPO, and from the flight deck on the after end of MAIPO an army helicopter mounted on large cylindrical floats, took off and purred over our heads.

We landed on some rocks at the further end of the beach and asked to be picked up two hours later at the nearer end but before setting off in that direction we decided to examine the moraine of the glacier that reached the sea in a long line of ice cliffs immediately beyond. Climbing up a steep snow bank we reached the glacier about 150feet up and our attention could not but be taken first by the lovely prospect spread out spread out in front of us in the calm evening light. Across the bay Mount Plymouth stood, blue against the evening sky, a mountain completely swathed in ice and snow. Below it and to the right the northern end of English Strait, so wide and open in the stretch up which we had recently come, became lost in a scatter of islands and peninsulas of strange sudden up-jutting shapes that resembled nothing we had seen on the southern coasts of the South Shetlands, but recalled the wave-worn cliffs of the Inaccessible Islands and Larsen Islands of our first Antarctic landfall.

We turned from the distant islands to the moraines at our feet and noted at once how, like so many we had examined already, there were two ridges of debris with cores of ice: a few strokes of the ice axe revealed one or more dirt bands following the length of the moraine and steeply inclined down into the glacier through the clear glassy ice of the core. From these newest moraines we descended to those lying beyond the present margin of the ice and some fifty feet lower. At the same moment Derek and I exclaimed suddenly that we were walking on wave-worn boulders. The moraine was copiously supplied with well-rounded beach material both large and small. So extensively in fact that we could not do other than conclude that very close at hand the ice had advanced over the shingle ridges of a former beach and incorporated the material in its moraine. Back we went up the hill and though rounded stones were fewer they were never lacking: back at the innermost and latest moraine rising from the ice at 155 feet above the sea, beach pebbles were locally rather common, but as we traced the moraine uphill they vanished. Even at lower levels the inland portions of the moraine were built only of angular and subangular gneiss debris. A little lower still a snow slope, broken by rock stacks and pinnacles looked down on a series of raised shingle ridges showing black against the snow and conspicuous as a series of midway embankments running round the point. Two series occurred at about the same level – some 30-35 feet above the sea – but it was clear that the outer and rather higher ridges were younger than the slightly lower and more degraded ridges behind for they cut across them. The older beaches had fronted onto both English Strait and Discovery Bay and had curved round at the angle to become almost back to back and terminate against what was at that time a rocky island. By the time the newer beach was constructed this island had been broken into two rocky reefs and the shingle ridge, though deflected towards them cut across the

lines of the earlier double t… b.? On the air photographs this pattern of branching ridges had appeared intriguing but puzzling: now we perceived the relation of the rocky reefs (that had once been the real Ash Point though they now lie inland of the modern beach) the pattern on the air photographs appeared to our vanity as elegantly self evident. Elated, and perhaps a bit inflated, by our little discoveries we followed the line of the principal ridge and were disquieted to see the lifeboat just arriving at the rendezvous a little ahead of us. We clamboured onboard SHACKLETON intent on brewing ourselves hot drinks and getting to bed. As we passed the Third Mate's cabin we found him putting on sweater and oilskins and commiserated with him: he was about to start on the six mile journey back to Edwards Point in the lifeboat to bring back the towing boat that by now would have floated off her rock with the rising tide and be riding at moorings. Poor Alan - he had an unpleasant trip from which he did not get back till 3am.

January 3rd

Having landed Danny and his companions, their dogs, sledges and equipment on Robert Island Captain Blackburn still had on board the field party of three, led by Graham Hobbs that he had attempted to land on Livingston Island on December 28th. Accordingly he was now concerned to return there with them and land them, as Hobbs wished, on Edinburgh Rock[15], and since Edinburgh Rock[15] is the promontory that encloses Moon Bay on its northern rim, and Moon Bay contains Half Moon Island which I wished to examine, these two places now became SHACKLETON's immediate objectives.

At last, weather conditions were in our favour. As we steamed into McFarlane Strait, into which Moon Bay opens, the prospect was grand indeed. To starboard the mountains of the southern part of Greenwich Island which formed such a rugged front to the Bransfield Strait were seen to be much more deeply mantled in ice and snow on this side, and as we advanced up the strait became

ANT 33ab S. Shet : Pin Point Livingstone Island 1020 m : from RB on Half Moon Island : 3 Jan 59

reduced to a few nunataks marking the remnants of divides between ice streams that have so far coalesced as to form a continuous ice apron. To port the mountains of Livingston Island appeared in their full height and grandeur. Beginning, or if you prefer it ending, in the peninsula that terminates in Pin Point[13] they build up stage by stage to the forbidding mass of Mt Barnard[12]. Pin Point[13] itself is black, rocky and rugged with two small ice masses that barely deserve to be called glaciers. The spine of the peninsula is made of a serrate ridge whose sharp horn peaks rise only to about the 2000 foot level between a series of low lying corries. After a gap comes a mass of bolder structure and a 3000 foot summit with corries at about perhaps 2000 feet discharging by ice falls. Then comes the Mt Bernard massif rising to near 6000 feet, with glaciers with lofty corrie heads that descend not by one but several successive ice falls to the low level ice apron whose ice cliffs front most of Moon Bay. In front of this splendid background lay the two rocky hills of Half Moon Island connected by the shingle accumulation we wished to examine. To the north McFarlane Strait could be seen to be closed, like English Strait by a succession of rocky promontories and islets. In the foreground a barrier of pack ice stretched across the bay and the strait and for a time it appeared that, just when the weather had become kind, the ice would oppose any landing. It proved penetrable however and SHACKLETON anchored at noon off Half Moon Island in open water.

There is an Argentine Base on Half Moon Island and we were not surprised to see figures moving to the beach as our boat drew in. We were welcomed by the commanding officer and taken to the base hut to enjoy a drink together. The living quarters here were laid out to exactly the same plan as that we had become familiar with on Deception Island, the same mess-room for the men, the double and single bunked cabins for men and officers opening off both sides of a spacious centre corridor and the combined ante-room and dining room for officers at the end. The atmosphere again was that of a hotel rather than that of an Antarctic base, and indeed it is Argentinian policy to make their bases as much like home as possible. With the help of the doctor, who spoke English, we stayed in conversation a full hour and then left amid protestations of great friendship, making us free not only of the island "but also of my house".

Our task was in essence a simple one – to examine the flight of beaches that we had seen on the air photographs. In practice it was made difficult by the fact that here as elsewhere much of what we wanted to see was still buried beneath the winter's snow. This not only filled and obscured all the hollows between the beach ridges – and the top one has a sizeable lagoon under the snow – but being soft drifted snow it is not firm enough to walk upon so that one sinks thigh deep at every other step. Being rather lighter than Derek I might go a few steps further without being let down, but no sooner would I begin to congratulate myself in treading more delicately than he than one or other foot would find no support within two feet of the surface and I would begin floundering again.

The first shingle ridges (there were two facing in opposite directions) to connect the two rocky islets that make the present Half Moon Island are now some 77-80 feet above present sea level. Between these two levels beaches occur at some six other altitudes witnessing to eight successive strand lines. All the features are manifestly wave built and are made of wave-worn pebbles. But the successive ridges differ in containing varying proportions of the different rock types, in the general size of pebbles and cobbles involved, and in the degree of frost pitting and frost shattering that the stones of the several beaches have undergone. Those at the highest levels contain the greatest proportion of weathered and shattered stones, implying, as one would expect, that they were the oldest of the sequence.

By four o'clock our task was completed, so we trudged uphill over a snow bed that proved much more extensive than it looked to the rocky summit of the island. From there we had a magnificent prospect in all directions and could clearly see that SHACKLETON was still lying at anchor off Edinburgh Rock[15]. We had time on our hands, so, observing that the rocks around us were covered by a more than usually luxuriant growth of *cladonia* I invited Derek to sit on the grass and enjoy the sunshine. In fact he wandered off to investigate skuas' nests while I sketched. We were some 350 feet above the waters of Moon Bay with a steep-gullied cliff and extensive screes and another set of elevated shingle ridges. The sun shone on the blue water, the dazzling white snows, the brown red and black rocks, and the nearby pale green of the reindeer moss carpet. We relaxed and enjoyed the peace of it all for some time before descending and being invited by some of the Argentinians to have a cup of coffee with them. The hut we entered was the hangar for the helicopter with living quarters for the helicopter crew. These quarters were being temporarily occupied by a summer party that included a geologist. As he had only arrived the previous evening he had no local knowledge to put at our disposal, but he and another did play a song for us on two guitars. By the time we had drunk the Nescafe and eaten a couple of "Antarctic candies" – "penguins' eggs" made of sugar and real penguins' eggs (chinstraps) with a walnut in the middle and a little too sickly sweet for our liking – the SHACKLETON was rounding the point and soon the boat was seen approaching – a tiny black dot at the head of

an immense train of diverging waves and looking for all the world like some very purposeful form of water boatman. Our friends escorted us to the beach, writing down their addresses and extracting promises from us to visit them in Buenos Aires. International relations are very human and cordial at this level.

January 4th

SHACKLETON now had no further stores to land or personnel to move and for the first time would be able to give primary consideration to the requirements of our geomorphological project. I was very conscious when she weighed anchor after breakfast what a privilege and an opportunity this represented. For perhaps ten days Captain Blackburn would take the ship to those places that we regarded as most important to our work, subject only to the need to make rendezvous with BISCOE about the 9th at Deception Island to transfer some cargo which SHACKLETON had brought from England but which BISCOE would carry to one of the more southerly bases. So we decided that the days before the rendezvous should be spent visiting the Danco Coast, Flandres Bay, the Wauwermans Islands and the outer coast of Anvers Island at Cape Monaco, while the days that remained after the rendezvous could best be used to fill some of the gaps in our knowledge of the South Shetland Islands, finishing with a visit to Clarence and Elephant Islands before we set course again for Stanley. How much we should actually accomplish would, of course, depend on the weather, but with good weather the opportunity was large and exciting.

ANT 36 S. SHET : Gentoo Chicks Yankee Hbr. : 4 Jan 59

Unfortunately the magnificence of the previous afternoon had already been replaced by an overcast sky, and to the north of us the clouds hung so low that the abrupt and strangely shaped islands at the end of McFarlane Strait were already obscured. We steamed across the strait and anchored off the entrance to Yankee Harbour. The towing boat was put overside carrying the winching machine and portable radio. Yankee Harbour is a roomy anchorage overlooked on its northeast and southeast sides by ice cliffs and rising neve slopes and closed in by a shingle spit most of a mile long. It was our intention to examine this spit while Tom Woodfield sounded the entrance, which has been reported by Captain Johnston of the John Biscoe to be subject to change.

Such change is certainly to be expected since the spit itself has changed much and is still changing. Although we found the main ridge to be only about 11 feet above the sea level and so well within the sphere of activity of present day storm waves, the ridge cuts across several shingle banks that are manifestly older. Direct comparison of the shingle reveals this: in the older banks which are rather lower flattened and compacted, there is a good deal of fine debris, an abundance of frost chips and flakes, many frost shattered cobbles, and many stones shivered with frost flakes that still stand together like a partly disarranged pack of cards. The shingle of the newer ridge is both well-rounded and graded: Fine-grained material is rare, and fresh frost flakes and fractures equally so, though there are many frost flakes that have been partly abraded by the waves. The evidence of form, moreover, reinforces that of physical

composition. The newer shingle can not only be seen to overlie the older, but the new ridge cuts obliquely across a whole series of the lower and older ridges. The latter, though apparently formed while sea-level has been at its present level, none-the-less belong to an older order of things and are the recurved ends of a spit whose stem and attachment to the cliffs have quite vanished. They must have lain seaward of the present spit which has, in part, been formed as the older beaches were torn down, sorted and re-eroded. Only at the eastern end of the spit, where it springs from the land, did we find any of the older ridges to be higher than the modern storm beach. Here, however, a series of ten recurves exhibit a rising sequence, and, beyond a snow slope, there is a strong ridge of well-rounded pebbles and cobbles which is almost thirty feet above sea-level and can only belong to an old lagoon flat and beyond that again a series of morainic ridges descending seaward towards the echelon. The seaward ends of all these ridges are rich in wave-worn pebbles and cobbles, but as the moraine is followed inland and uphill these disappear at about the hundred foot level. Here was evidence of exactly the same kind that we had found at Admiralty Bay and at Ash Point: that the ice must recently have advanced over the raised beach ridges and incorporated the wave worn stones with its own angular and subangular debris in its moraines.

After lunch SHACKLETON sailed with deteriorating visibility and a rising wind. All the part of Livingston Island lying immediately north of Moon Bay was now hidden in low cloud: Mt. Plymouth had quite disappeared. To the south also, out in the Bransfield Strait the clouds appeared to come right down "on the deck", but just west of the towering Mt Barnard[12] massif was still largely clear of cloud. This was no doubt a "lee effect' analogous to the warm dry air found in the Swiss Fohn, and Canadian Chinook winds.

As we came out of MacFarlane Strait we lost the shelter of Pin Point[13] and were directly exposed to sea swell and rising wind, and as we sailed along the coast the clouds crept lower and lower. At first cloud base must have been as high as 4000 feet for, though we could not see the main ridge and its peaks, I was much intrigued by the glacial sculptures of the lateral ridges that spring from it. In my notebook I sketched the forms as I saw them and then tried to reduce them to simple geometric forms. Alas in one or two cases I found, as the ship sailed on, that some of the spurs divided and opened up to reveal a very sizeable glacier tucked away behind them. As we sailed northwards, also, the clouds hung ever lower and lower over the mountains till at last we could see only the curious reflected glare of the glaciers and the black rocky cliffs on the spur ends between them.

Hereabouts we set course for Deception Island, which we saw little of as it wore its familiar mantle of "clagg", and so south-westwards to the Austin Rocks. These were on our starboard beam and about three miles off at midnight. How many there are I could not count. The most conspicuous is a pyramid of rock about 150feet high. All are clearly just minor remnants of a once continuous island of some size – perhaps as big as Smith Island, although less lofty; one cannot help but speculate about its original size and form and to ask how long it has taken to reduce the original land mass to its present form.

January 5th

As I dressed this morning I looked out of my cabin port and saw a black shape rising into low cloud and intuitively said "Cape Anna": and so it proved to be. During breakfast we passed through the Ronge [*Errera*] Channel and when I went on deck we were steaming for the entrance of Paradise Harbour. It was a still morning and the grey stratus lay like a cold and clammy pall upon everything. Often it seemed to be little above our masthead. All was still, stifled and sad, the vibration of the engines and the brushing of the ship through the water and the brash ice the only noise: our spreading wake the only visible movement.

Shortly after 10.0 we came almost to the Chilean base at Gloria [*Presidente Gonzales Videla on Caleta Gloria*], and noted that it had obviously been recently revictualled for a score or more of sheep were pottering about among the glacially moulded rock forms that we call roches moutonnees. We blew our siren in salutation and received an answering wave. In a few minutes the base had disappeared into the fog behind us as though it had never been. Ahead the visibility was no better. Captain Blackburn asked "Is this any good to you, Prof?" and I replied "No good at all". At which he gave the order hard a port and SHACKLETON turned like a London taxi cab. She heeled over and drew in the clear water a tight circle of radius no greater than her own length, on which a tumult of crossing seas soon gathered at the centre. Back we went, to the consternation no doubt of the Chilenos, as we passed their base for the second time in half an hour, and anchored off Base O. We could at least provide a break for the men there by bringing them on board for lunch and an afternoon film show.

At four o'clock visibility had greatly improved and Captain Blackburn weighed anchor. On our port hand as we sailed down the Ronge [*Errera*] Channel we had an impressive view of the great wall of rock and ice, with its little glacierets "cascading" down at perilous angles between vestigial ribs of rock

that had so excited my attention before. On that occasion cloud down to 200ft had concentrated my attention on the over-steepened lower slopes that constitute the fiord wall. This time the clouds were higher and more broken and I observed that above 200 feet the glaciers occupy troughs bitten in to the rounded and mature forms of some earlier landscape. These forms survive only in one or two major ridges where they are beautifully moulded under a layer of neve a hundred and more feet thick. It is a matter for thoughtfulness that they have survived at all in a region of such active glacial sculpture. And though I was quite surprised to see them and studied them through the binoculars for as long as they were in sight, the forms revealed are quite consistent with such evidence as we had already gleaned elsewhere about the nature of the pre-glacial landscape in Graham Land.

Again we passed the Chileno base, but though we could see we were observed, we forbore to hoot. And so into Paradise Harbour and out between Lemaire and Bryde Islands into the Gerlache Strait. But the clagg had descended again and nothing could be seen of the glacial erosion on Bryde Island that I had wished to see. We found Useful Island and set course south-westward in thickening snowfall. Wiencke Island was invisible but we rounded its southern extremity, Cape Errera and the Pi Point and Cape Kemp into the Neumayer Channel relying entirely upon the radar for navigation. At 7.0pm we dropped anchor once more in Port Lockroy.

January 6th

Clagg, clagg, clagg. Our hopes of making an examination of the mountains that rim Flandres Bay were clearly vain and must be abandoned. So, rather regretfully, we weighed anchor at 9.30 and proceeded down the Neumayer Channel to Cape Lancaster and turned westward into the Bismarck Strait. Our objective was the Wanvermans Islands, one of several groups, each of a score or more of islands to be found in these waters. The Wauwermans Islands, however are “better behaved” than most. The islands are fairly sizeable and the group has fairly sharply defined more or less linear boundaries. This feature of linearity is even more pronounced in the islands themselves. Most of them have simple geometrical shapes with linear features following two or three directions. Were these directions determined by structural features in the rocks or did they represent the direction of ice motion? Only landing could settle the matter.

By noon SHACKLETON had found an anchorage among the islands and after a hasty lunch we set off for an island which showed some bare rock. This was an important point. All these islands have thick snow cover amounting in some cases almost to a snow dome. Even the smallest islet has snow resting on neve and the larger ones show neve resting on blue ice in the ice cliffs. Although there will be some more melting as the summer advances these ice masses will be substantially unchanged when winter comes and will endure from year to year. We must, therefore, conclude that here the neve line or firn line lies at or below sea-level.

Our rock outcrops proved to be ice-moulded whalebacks of what might be taken fairly enough for a grey granite, but which extensive ice-smoothed surfaces quickly revealed an injection complex in which rocks already solid have been caught up and partly digested by rock of rather different composition still in the molten state. We turned our attention to the cracks and joints that seamed the various outcrops and determined their compass bearings and soon and found that among the frequently recurring values were some of the directions I had noted on the air photographs.

We were no less interested in the direction of ice motion and of this we found abundant evidence. First there were the scratchings and striations on the rock surface. Certainly we found some of these but the granitic type of rock, as its name implies, is grainy and the grains all too hard and too coarse for anything but rather crude structures to be found. But if fine striations of the kind sometimes found on limestones and quartzites were absent, their lack was more than made up by some of the finest flutings I have ever seen. Between two long narrow islets lay a sort of narrow corridor occupied by the sea and walled by vertical rock faces following major joints: it had the form and size roughly of a railway cutting. Through this cutting some of the bottom layers of ice had moved over the rock smoothing and striating it and moulding it to whaleback form: in the cutting it probably moved with increased speed as it passed into the narrows of the cutting and there it gouged and fluted the walls as it passed. Some of the flutings are feet wide, yards long and six to ten inches deep. Most interesting of all were the curious series of crescentic fractures that we found on the smooth surfaces that we examined in vain for striations. They occurred in groups, thus:

(Diagram)

The large fractures measured two feet or more from top to tip, the small ones almost six or eight inches. Each one showed a fracture face sloping down gently on the concave side and steeply on the convex side, and the groups each had an apparent community of direction, being normal to an axis which I have

marked with an arrow. Neither of us had ever seen features of this kind on such a scale before. They are presumably some kind of chatter marks made by the rock-laden sole of the ice. They appear to be present instead of striations and I wonder whether this is some consequence of the texture of the rock (yet coarse gabbros carries well-marked if bold striations at Loch Coruisk in Skye), or whether it implies some kind of discontinuous motion in the ice. One or two sets were convex towards the east: most, including the biggest, were convex towards the west. There can be no doubt that the general motion of the ice here was from the east to the west – from the Graham Coast towards the open waters of the Bellingshausen Sea and the South Pacific. And it would appear that between different islets, or different whalebacks on the same islet the actual direction of ice motion could vary ten or twenty degrees, but always corresponded with a joint direction prominent in the outcrop. In other words the ice moved generally from east to west but its sculpturing action in detail took advantage of existing planes or lines of weakness and accommodated itself to them. To round off our visit we examined a considerable ice cliff cut into the slightly irregular snow dome of one of the islands and found it very similar to the ice cliffs in the Peltier Channel, though obviously no glaciers are involved here. We took the boat close under a large overhanging mass in order to see clearly into a cave and kept our fingers crossed lest the whole should come toppling down. Our boats crew were both willing and greatly interested. So we made our way back, navigating from island to island using our air photograph as a chart till at last we could see SHACKLETON looming up out of the mist.

As soon as we, and the sounding party under Tom Woodfield in the other boat, were aboard SHACKLETON weighed anchor again and set off in the hope of being able to land Derek and myself at the site of the now abandoned Base N, and at Cape Monaco, both on Anvers Island. At first we steamed through fairly open water with visibility of a mile or so. Then we encountered close pack with vast unbroken floes and bergs of fantastic architecture frozen into its edges. We took what appeared to be an inshore lead and came within sight of Cape Bonaparte[19]and its beacon and the abundant off lying islets and skerries. But these had held up another zone of pack ice inshore and it was no surprise when, about 5.30, Captain Blackburn said that he could not get to Base N but he would still try Cape Monaco.

So back we went to extricate ourselves and to round the end of the giant floe that now lay between us and the open sea. By 6pm we were on course again on the seaward side of the floe, and for thirty or forty minutes we skirted it. Visibility now became poor and with one shoal of rocky islets on our port bow and another but smaller one to starboard and with icebergs and islets both giving images on the radar screen we had to realise that it would be dangerous folly to go on. Captain Blackburn gave the order to return, and soon we found ourselves again following the edge of our giant floe. At 7.45 we passed a distinctive berg frozen into its margin that we had passed on the outward journey at 6.15. By 9pm we were leaving the Wauwermans Islands on our starboard quarter and steering for Cape Lancaster: by 10.20 we were rounding Cape Errera and shortly afterwards the weather began to change for the better. The layers of cloud began to part and we began to see, between the cloud layers, something of the eastern side of the Sierra du Fief[8]. At first the glimpses were only fragmentary, but gradually the openings became more frequent and extensive and, though the range was never wholly revealed, we saw enough to appreciate how much this side contrasts with frowning rock precipices with their narrow rock ledges and avalanche gullies that overlook Port Lockroy. These slopes are for the most part deeply covered with snow and ice and descend in two giant steps each marked by a compound cliff with 700-1000 feet of rock below surmounted by a layer of icing 100-150 feet thick. Toward the northern end of the island these beaches are wanting and heavily crevassed glaciers descend steeply to the coastal ice apron while the neve extends over practically all the divides except the steep spur ends. In a word the south-eastern slope of Wiencke Island is more heavily glaciarized than the precipitous north-western range. I am glad to have seen and appreciated this contrast: explanation must await the detailed examination of the photographs.

As we steamed up the Gerlache Strait I found myself much intrigued by the islands and peninsulas with their snow domes. As on the Wauwermans Islands these accumulations point to a snowline at or below sea-level, so that quite small rock foundations serve to carry quite large edifices of snow and ice. If the sea were frozen all year those snow domes would presumably slope down, as they still do when the toe of the slope is protected from the sea by resting on a rocky reef, with a convex-concave curve. But the sea is not frozen all year nowadays, though it may have been when these domes were accumulating, and the ice is eaten away by both the dissolving and the grinding power of the waves, and stands in considerable ice cliffs. In these cliffs the early stages of ice cave formation could readily be studied.

It was almost midnight and I went to the pantry to get myself some biscuits and cheese and a hot drink. When I returned, we were about to turn from the Gerlache Strait into the Schollaert Channel. On our port hand we were passing the northern end of Anvers Island which here presents one of the most remarkable rock walls I have seen anywhere. The crest is about 3600-4000 feet

above the sea and from it bare rock slopes and snow-lined ledges lead down to an immense rock cliff that is truly vertical, incredibly smooth and withal chocolate red. It must be 800-1000 feet high without any visible horizontal partings; its smooth face is doubtless determined by a series of master joints of unusual perfection and is broken or offset occasionally when the main face is crossed perpendicularly by joints of another system. Below this dark red wall one can see in a few places a foundation of putty-coloured rock, but for the most part this is covered by a continuous snow apron that slopes steeply down (30-40 degrees) to the line of ice cliffs along the Gerlache Strait. Actually the north easternmost point of the island is of different construction, being lower and built of a massive dark rock with oblique jointing and is sculptured by two or three low level corries.

This north-eastern point (Cape Ryswyck[20]) is continued below sea level by a ridge which emerges at one or two points to form the rocky islets known as the " Waifs". To enter Schollaert Channel one must therefore avoid the foul ground over this ridge and sail north-westward well past the Waifs beacon before turning sharply back on to a north-easterly course. As we were doing so the view to starboard of the mainland coast was most impressive. Although the sky was still quite thickly overcast the cloud base in this direction was not lower than 3000-4000feet and in places the plateau surface itself was visible. For the first time I saw Cape Anna, not as steep rock cliff receding upwards into cloud, but as the terminal portion of a major glacial divide that bristles throughout its length with spires and buttresses. Emma Island and Delaite Island I did not at first recognise but took for parts of ridges running out from the plateau, heavily gnawed away by glaciers. To be sure this is technically what they are, but the ridges of which they are the culminations are now largely submerged beneath the sea. Most interesting of all was the impression given by this view that the flat neve covered plateau at 2000-2500 feet that forms the summit of Nansen Island could rise south-eastward to articulate with the plateau surface itself.

The high cloud base that permitted a brief sketch of the islands of Wilhelmina Bay and the Graham Coast and plateau beyond, certainly did not stretch to the Schollaert Channel. Against the mountains of Brabant island the cloud base could be seen to fall sharply and rapidly northwards, and as we made our way past the low snow dome of Gand Island we could see little more of the mountains of Brabant Island than the black cliffs at the end of the glacially-sculptured divides, alternating with long lines of ice cliffs marking the glacial troughs. Even this, however, was most instructive, for as we steamed across the glacier fronts the echo sounder would record depths of 250 or even 300 fathoms, but as we crossed the continuations of certain of the divides the depth would suddenly lessen by scores or even a hundred or more fathoms. On the record drawn by the instrument the scale is such that each one of these rises in the sea floor appears as a sharp crested ridge with slopes on each side of incredible steepness. This exaggeration must be allowed for, but I think it may well be true that these drowned glacial divides are among the most abrupt (and to mariners some of the most alarming) features of submarine topography.

As Gand Island was left astern we began to draw abeam of the Melchior Islands, which, after having landed only twelve hours earlier, I was anxious to see. They have very conveniently been named, by whom I know not, after letters of the Greek alphabet. Not all were visible to us, but we could see Omicron, Omega, , Eta Islands, the Pi Islets[14] and Tau Islands. All possess snow domes except the last, and in most of them the rock foundation is visible here and there. In one or two places, as on Omega, the rock footing has protected the neve dome from erosion by the waves, and the dome displays what I take to be its "proper" profile – an upper convex portion passing downward into a uniform and fairly strong slope – right down to sea-level. Elsewhere the waves have made inroads into the domes, creating coves, each surrounded by a half moon of ice cliffs and often a rocky reef at each horn. These coves are very conspicuous in the vertical air photographs and give the islands a startlingly crenellate outline. The two Pi islets[14] showed ice cliffs of particular interest. The ice domes on these islets are perhaps 200 and 100 feet high, the higher elevation being on the larger and more southerly islet. Wave erosion on the side facing our course has eaten into the centres of these small domes and exposed their rock foundations extensively. In so doing it has revealed an unexpected fact. The rock in the smaller northern islet rises some 70 feet above the sea and the thickness of the ice above the rock is only about half this figure. In the larger southern islet the rock never rises so high as 70 feet and appears to reach its greatest altitude of about 50 feet at the northern end. The highest elevation of the snow dome is thus not related to the highest elevation of the underlying rock, but is centrally placed on the island and the actual height is probably related to the area upon which neve accumulation can occur. In this case some 150 feet of neve have built up when the rock rises less than 50 feet from the sea. The Tau Islands, the most northerly we saw and the most exposed to wave attack from the open sea, have quite lost their neve domes and are simply low and irregular rocky masses, sometimes no more than skerries awash, and at best upstanding rocks that may reach 100 feet.

About half past three we were approaching one of the north-western capes of Brabant Island – Cape Claude[16]. It appeared to be of plateau-like form and built of massive horizontal strata giving rise to strong cliffs some 560 feet high. Dark rocks at the top and in the lower 300 feet appeared to be lavas or basic sills, while between some 100 feet of pinkish rock may be red lavas or

sandstones. At this point the Admiralty chart marks “Astrolabe Needle (340) conspic.” Jim Martin and I looked through the glasses for this “conspicuous” object but could see nothing but the dark cliffs of rock to the north and the ice cliffs of the most northerly of the big glaciers descending from Mt Parry to the right. We looked and again we looked and five minutes later we looked again and we decided that this needle was not as conspicuous as someone had reported it. Suddenly as I watched through the glasses a slender point of rock detached itself from the right hand margin of the black cliff, and as the ship moved on, appeared to elongate downwards till its whole length was separate from the cliff and sharply silhouetted against the glacier behind. I exclaimed in wonder and called to Jim. Veritably this was a needle! 340 feet high it was incredibly slender – not more than 30 feet thick – and with a beautifully tapered point. The resemblance to Cleopatra’s Needle was striking. Seen from this viewpoint it must be one of the most striking and shapely sea stacks in the world. As we steamed on it moved relatively away from the cliff and we came to realise that it stands fully a mile from it. Moreover we came also to see its side elevation and this, though striking enough, is by no means as breathtaking as the view we first had of it. It seems probable that the needle has been shaped by wave attack out of a mass of rock which had already been isolated by glacial erosion as a nunatak. Less probably it was once part of Cape Claude[16] and has been isolated from it solely by wave erosion. Even if we reject this possibility as unduly extravagant and allow that the ice may have provided, rough hewn as it were, the isolated nunatak out of which the Needle has been shaped, we still have impressive testimony of the rapidity with which wave attack can destroy glacial landforms.

Beyond Cape Claude[16] the coast recedes into a ten mile bay with Cape Roux as its furthest extremity. Cape Roux is a plateau-like promontory covered by a great thickness of ice which rises into a dome whose summit was shrouded in the low cloud. No great glaciers descend to the sea here and so the echo sounder no longer recorded a succession of deep troughs and sharp divides such as recurred further south, but with a level bottom at 80 to 90 fathoms, quite possibly a surface of glacial sedimentation.

It was now nearly 4.30am. Tom Woodfield had come on watch some time since. Our course was almost due north and then dead ahead and sixty sea miles ahead the peaks of Smith Island stood up, clear of all cloud, sharp clear pale blue-grey silhouettes against the pink-flushed sky. It would be five hours before we would approach them and I went below to get some sleep.

January 7th

When next I saw Smith Island all but its lower slopes were hidden in cloud. Tom Woodfield reported that an hour or so after I had left the bridge cloud had gathered around the island, though the peaks remained clear, and that at a quarter to eight even these had been lost to sight – doubtless as we had passed under a stretch of low cloud. Now clagg enveloped everything. Even the rocks of Cape James had their tops cut off.

As we steamed up the west coast of the island a progressive change in glacierization and glacial erosion could be noted even though only the lowest coastal slopes were visible. At first there were steep rocky slopes broken only by gullies with avalanche cones of snow at their feet. Then came one or two avalanche glaciers with reconstituted glaciers with small ice cliffs at the shore. (sic) A little further north a steep small glacier descended to the sea and, beyond this, true glaciers occupying ever broader troughs gave a coastline of almost continuous ice cliffs. All this time the bottom was very regular at 110 to 120 fathoms 3 miles offshore. Not till we had reached the seventh glacier of the series, a composite one, did the bottom at three miles descend into two troughs. But after two more glaciers had reached the sea the soundings deepened to more than 300 fathoms – possibly because here we were crossing the major trough of the area, but at least equally possibly because we had passed the line of the continental shelf. At the northern end of the island, where glacial tongues are as rare as at the southern end, though a sea-level corrie was noted, the soundings reveal a very level bottom at 80-85 fathoms with occasional very sharp ridges

--------^---------^--------. It seems plausible to interpret this as depicting a bottom smoothed by sedimentation that may still be in progress but has not yet completely buried some of the sharp glacial divides.

From Smith Island we sailed north-westward and about noon had the mortification, after we had gone ten or a dozen miles from it, of seeing the clouds partly lift from it while sunshine momentarily bathed the ship. But only momentarily. In the afternoon we were feeling our way into Barclay Bay at the western end of Livingston Island under a thick grey overcast and with poor visibility. Hurriedly I made a stereoscopic examination of the vertical photographs and marked on them the visible rocks and islets, and some that, though not themselves visible, could be inferred from the diffraction patterns of waves they set up. Captain Blackburn was very appreciative of this aid on a coast both uncharted and notoriously foul and thus reassured stood well inside some of the rocks before casting anchor.

This was the first landing at what I call an "outer coast" – one exposed to the waters of the open ocean – and very impressive it was. The whole coastline seemed littered with mute witnesses to the power and extent of marine erosion. The modern wave-cut platform is represented by the extensive zone of submerged reefs and rocky platforms, while here and there masses of more resistant rock surge up to heights of a hundred or two hundred feet. By 4.30 the motor lifeboat was bearing us across the reefs and round one great stack made of columnar basalt toward another which appeared from the ship's deck to be a nunatak half embedded in the ice cliff. When we reached it quite a different interpretation seemed necessary.

The rock mass was no nunatak but a true sea-stack of massive proportions, and as far as we could ascertain had been cliffed by the waves on all sides. But the island side was now in contact with the ice, and since that cannot have been the case when the island side was cliffed by the sea, a recent advance of the ice must be postulated. All the indications afforded by the ice itself fully supported this view. Where the ice cliff was impinged upon the rock stack it shows every sign of being under great compressive stress. A conspicuous and unusually regular and continuous dirt band that can be traced right across the ice front becomes violently compressed on each side of the zone of contact. Against the rock stack the ice has bulged and broken, while above this point the glacier surface rises in a much crevassed convex blister.

Much intrigued by this evidence of glacial advance over ground previously occupied by the sea we landed on the moraines on the western side of the glacier. We had not climbed far upon them before we found them full of wave-worn pebbles and cobbles. So full indeed that parts of the moraine could fairly be said to be incorporated rafts of beach shingle. Here, as at Ash Point on Greenwich Island, we found marine pebbles both in the innermost moraine in contact with the ice, and in the outer and therefore rather older moraines. Moreover they could still be found, though they were increasingly pitted or recognisable only as elliptical frost flashes, several hundred yards inland and at heights up to 200 feet, here was striking confirmation of the conclusion we had just drawn from the contact of ice cliff and sea stack. The ice has recently advanced over ground previously occupied by the sea and has incorporated much beach material in its moraine.

From the moraine crest we could see (beneath the clagg!) most of the western end of Livingston Island and across to the bay on its southern side which appeared to be filled with ice. It was a harshly black and white landscape – black lava outcrops, black beds of shingle or rock debris and white snow beds filling all the hollows. Yet this stately soot and whitewash treatment of the landscape helped to reveal its essential lineaments. Horizontal lines that marked the edges of remnants of wave cast beaches, or at lower levels shingle ridges, were everywhere. Except for the rocky hills rising to perhaps 400 feet the whole western end of Livingston Island has emerged, not so much from beneath the ice as from beneath the sea and as it rose it has been trimmed by the waves at a whole succession of levels. The uppermost bevels the island at about ……(left blank) and where this was sea level the two rocky hills that rise higher were islands in the ……(left blank) foot sea. Down to 100 feet the successive strandlines are represented by rocky flats covered by frost debris: at lower levels shingle ridges are well developed. Time did not permit us to ascertain the altitude of several flats - indeed we felt there was work enough for several days here – but we were certainly convinced of their existence up to heights we had not previously thought possible.

At 7.30 we returned on board SHACKLETON, weighed anchor and set course to circumnavigate Snow Island so that Derek and I might be landed next morning from Hell Gates onto Snow Island, and if possible, on the southern shore of Livingston Island so that we might learn more about the sequence of elevated strandlines. Visibility diminished almost to nothing and navigation was wholly by radar. After an hour of this visibility improved a little and we could see beneath the lifting and lowering curtain of the cloud the nevé dome that is Snow Island, and the rocky masses that fringe it – Castle Rock 580 feet, Rugged Island (about 600 feet) and the nearby peninsula of Livingston Island which rises to 690 feet. The question naturally springs to mind –why should these hill masses be ice free while other hills that are presumably little or not at all higher have provided the nucleus for the island snow dome? Partly the answer might be that the hills beneath the nevé were both higher and more extensive, and to discover how much higher they could be I attempted to estimate visually the height of the snow dome. When the summit and Castle Rock seemed equally distant the former appeared one and a half times as high i.e. 1.5 x 600 = 900 feet. And when later the summit and Castle Rock were in conjunction (in the astronomical sense) and Castle Rock was shown by the radar screen to be 3 and a half miles distant and the chart showed the summit to be 5 miles further, the skyline of the snow dome cut Castle Rock at three quarters of its height. This gives a height of 1100 feet for the snow dome, so possibly there is room here for hills larger than those that are now ice free.

In any case the contrast between this area with its extensive snow free areas and relatively high snow free hills and the Melchior Islands less than a hundred miles away is very great. In the latter the climatic snowline is at or near sea-level: in the western South Shetlands it must be at least 500 feet above the sea.

While I was thus speculating about snow domes and ice free areas a signal was received informing the Captain that the JOHN BISCOE would reach Deception Island at 11.30 next day and expected to make rendezvous with us there. Accordingly our plan to go to Hell Gates was dropped and when I went to bed we were on course for Deception Island. At 4am we were once more at anchor in Whalers Bay.

This is the end of the second volume of the Journal. Whether there was ever a third volume is unknown.

Postscript

Professor Linton's last entry was on the 7th January 59. The following has been put together from Derek Searle's diary and report, Neil Orr's diary and FIDS Periodical Report for January 1959. Some of the entries are conflicting.

January 8th. Derek Searle and David Linton used the ship's launch to re-examine the shores of Port Foster. HMS Protector arrived at Deception.

January 9th. A rendezvous was made with the John Biscoe.

January 10th Professor Linton transferred to HMS Protector and the rest of the day was spent waiting for the two ships, Shackleton and Protector to sail for their different destinations. Derek visited the wreck in Neptunes Bellows. The Officers from Protector came across for a drink in the evening and the whole thing developed into a monumental party with Captain Adrian Butler leading the singing of ribald songs with ensuing high jinks.

January 11th David Linton sailed on HMS Protector and probably to made additional landings using the ships helicopters. The Shackleton sailed to Discovery Bay off Greenwich Island. Derek Searle wrote that 'in the evening after a gale had subsided I went alone to Fort William on Greenwich Island. Neil Orr wrote 'I went ashore with Derek looking at raised beaches'. *(Fort William is on Robert Island.. Derek may have landed at Fort Point on Greenwich Island. It is unlikely that he would have been alone and may have been referring to not being with Linton.)*

January 12th The ship reports landing Derek and Graham Davey at Fort William on Robert Island. Derek wrote that he visited the glacier near the Chilean Base on Greenwich Island. Neil Orr wrote that Graham Davey climbed 800 feet to do another triangulation while Derek and I looked glacial scratchings and moraines. *(This is almost certainly Chilean Point triangulation point at 254m, which I revisited with Graham Davey on the 29th January)*

January 13th The Shackleton left Discovery Bay at 6am and arrived at Harmony Cove on Nelson Island at 10am. Graham Davey was put ashore with his companions and dog team at the Argentinean Base on Harmony Point. Derek only had fifteen minutes ashore before the ship sailed at 11am for Hope Bay.

January 14th Shackleton left Hope Bay and sailed back to Admiralty Bay anchoring at 8.15am. A helicopter from Protector brought Professor Linton back to Base G (Admiralty Bay) to embark on Shackleton. The ship sailed at 5pm and tried for an hour without success to put David Linton ashore at Cape Melville (south-east point of King George Island), but he was unable to land because of the heavy swell.

January 15th A rather miserable day with low cloud and very dull. Clarence and Elephant Islands were examined from a distance but again a heavy swell prevented a landing. Headed for Stanley in the afternoon.

January 18th Shackleton arrived Port Stanley early in the morning where it was raining. Petra Searle joined the ship.

January 19th Derek and Petra Searle were taken on a flight across the Falkland Islands. In the evening Government House held a farewell party for the Professor.

January 21st Professor Linton and Mr and Mrs Searle left Port Stanley for Montevideo on the Darwin.

CHANGES TO PLACE NAMES SINCE 1958

The names used in the Journal are those that were in use during the 1958–59 Antarctic summer, printed either on BAS maps, or on Admiralty charts or in the Antarctic Pilot. All were available to David Linton on RRS Shackleton. International agreements and standardization of generic terms have led to some changes. Listed below are the significant changes. These are noted in the text with a superscript number.

No.	Old name	New name
1	Crown Prince Gustav Channel	Prince Gustav Channel
2	Keller Range	Keller Peninsula
3	La Plaza Point	Plaza Point
4	Palmer Coast	Davis Coast
5	Kaiser Island	Lecointe Island
6	Cape Reclus	Reclus Peninsula
7	Gaston Islet	Gaston Islands
8	Sierra du Fief	Fief Mountains
9	Luigi di Savoia	Luigi Peak
10	Osterrieth Mountains	Osterrieth Range
11	Orleans Channel	Orleans Strait
12	Mount Barnard	Mount Friesland
13	Pin Point	Renier Point
14	Pi Islets	Sampaio-Ferraz Ile
15	Edinburgh Rock	Edinburgh Hill
16	Cape Claude	Claude Point
17	Hansen Point	Cape Hansen
18	Wall Mountain	Wall Range
19	Cape Bonaparte	Bonaparte Point
20	Cape Ryswyck	Ryswyck Point

Results

The journal was transcribed by Oliver and Deidre Linton. The geomorphological terms and place names were checked by Petra Searle and Chris Brading. The results of Professor Linton's research were subsequently written up and published in Chapter 7 of the following volume:

Antarctic Research

A review of British scientific achievement in Antactica

Edited by Sir Raymond Priestly, Raymond J Adie and G de Q Robin

London

Butterworths 1964

C G Brading April 2008

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