

UNIVERSAL
LIBRARY

OU_220347

UNIVERSAL
LIBRARY

OSMANIA UNIVERSITY LIBRARY

Call No. 919.9
H 44A
Author Heaton, P.-R.
Title Antarctica. 1959
Accession No. 17759
PG

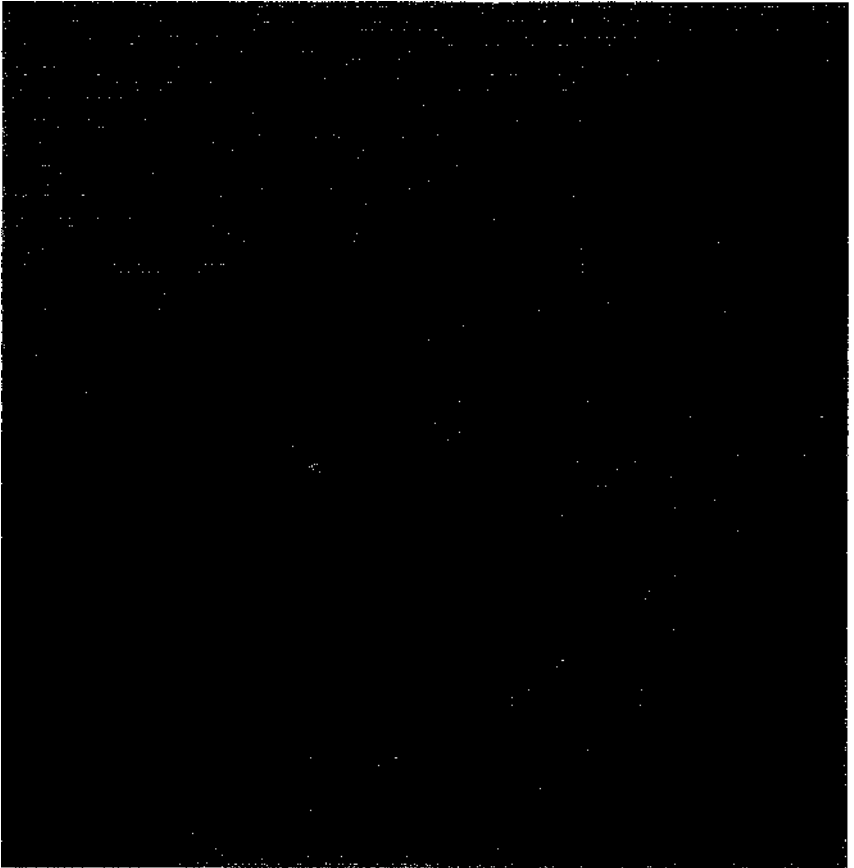
This book should be returned on or before the date last marked below.

ANTARCTICA

By the same author

CANADA

CANADA (Practical Book)



Planet News and United Press

The arrival of Dr. Fuchs at Scott Base at the end of his
Trans-Antarctic Expedition

THE ROCKLIFF NEW PROJECT
ILLUSTRATED GEOGRAPHY

ANTARCTICA

By

P. R. HEATON

B.Sc., F.R.G.S.

Author of "Canada"

Headmaster, Holmshill Secondary School, Boreham Wood

Formerly

Headmaster, Belmont County Secondary

Modern Boys' School, Harrow

Barrie and Rockliff

LONDON

FIRST PUBLISHED 1959 BY
ROCKLIFF & BARRIE (BARRIE BOOKS LTD)
2 CLEMENTS INN, W.G.2

©
P. R. HEATON 1959

Contents

CHAPTER	PAGE
How to Use this book	9
I The Discovery and Exploration of Antarctica	11
II What the Country is Like	30
III Learning How to Live in Antarctica	38
IV Antarctic Animals	45
Plankton	
Penguins	
Skuas, Albatrosses and Petrels	
Antarctic Mammals	
V The Whaling Industry	54
VI The Antarctic Islands	65
The Falkland Islands	
South Georgia	
Kerguelen Island	
Macquarie Island	
VII The International Geophysical Year, 1957-8	71
Sources consulted	73

Illustrations

Frontispiece The arrival of Dr. Fuchs at Scott Base at the end of his Trans-Antarctic Expedition

Planet News and United Press

	<i>Facing page</i>
2 Antarctica as known about 1930	14
3 Captain Roald Amundsen at the South Pole, December 1911	16
<i>Paul Popper</i>	
4 Captain Scott and party at the South Pole, January 1912	17
<i>Paul Popper</i>	
5 Captain Scott taking a photograph of a pressure ridge on sea ice	17
<i>Paul Popper</i>	
6 Exploration of Antarctica from 1930 onwards .	20
7 Hurley and Shackleton at Patience Camp .	24
<i>Reprinted by courtesy from "Shackleton" by Margery and James Fisher</i>	
8 Pony transport as used by Scott's Antarctic Expedition, 1911	
<i>Paul Proper</i>	
9 Manhauling sledges by members of Scott's Southern Party	
<i>Paul Popper</i>	
10 Motor tractor used by Scott's Expedition .	
<i>Paul Popper</i>	
11 Ferguson farm tractor used by Hillary in his dash t o the Pole	
<i>Planet News</i>	

12	Admiral Byrd in his hut near Little America 1933	25
	<i>U.S.A. Information Bureau</i>	
13	Dr. Fuchs, Sir Edmund Hillary and Admiral Dufek, U.S.N., at the South Pole, January 1958	25
	<i>Trans-Antarctic Expedition</i>	
14	Antarctica 1957-8 and the wanderings of the Spin Pole	27
	<i>Daily Telegraph, National Geographic Magazine Trans-Antarctic Expedition, News Chronicle and others</i>	
15	Crevasse detection during "Operation Deep- freeze"	32
	<i>New York Times and U.S.A. Information Bureau</i>	
16	Filling in crevasses during "Operation Deep- freeze"	32
	<i>New York Times and U.S.A. Information Bureau</i>	
17	Present day antarctic transport	33
	<i>U.S.A. Information Bureau</i>	
18	The South Pole from the air	33
	<i>U.S.A. Information Bureau</i>	
19	A cross section of Antarctica	
20	Changes in length of day and night during the year	34
21	Emperor penguin	48
	<i>Paul Popper</i>	
22	Royal albatross and day-old chick	48
	<i>Paul Popper</i>	

23	Sno-cat trapped in a crevasse on the way to South Ice	49
	<i>Trans-Antarctic Expedition</i>	
24	Economic animals of the Antarctic	56
25	Whale catcher about to harpoon a whale	64
	<i>Paul Popper</i>	
26	A large fin whale drawn up on the slipway of a factory ship	
	<i>Paul Popper</i>	
27	Flensing a whale	
	<i>Paul Popper</i>	
28	Sea leopard	
	<i>F. G. Bird and F.I.D.S. Bureau</i>	
29	A shepherd's house on the campos, Falkland Islands	65
30	A gang of sheep gatherers with their dogs	65
31	The Falkland Islands Dependencies	67

How to Use this Book

IN such a small book as this, one cannot tell the whole story of even one small expedition to the Antarctic. A whole library of books has been written about it by the men who have been there and it is to the first-hand accounts that you should go to get the real feel and atmosphere of this most fascinating land. While you are reading this book you must try to remember that many of the explorers like Taylor, Mawson, Debenham, Wordie, Priestley and others are still alive and are now revered and respected University Professors whom you would not suspect of having encountered the full terrors of the antarctic winter.

Make a collection of drawings or photographs of the animals of the Antarctic. A visit to South Kensington Museums, if you live near London, will be very rewarding, but many other museums have whale bones and other exhibits dealing with the Antarctic and there are gateways made of whale jaws like the one at Barnet. If you live near Newcastle or some other whaling port you may get the chance to go over a factory ship. Or you may visit a margarine factory and see the whale oil being made into very wholesome food. Almost every zoo has a few penguins which provide a lot of entertainment at feeding time.

Everyone should read the whaling story from *Moby Dick* to get a first-hand account of what whale hunting was like in those days and if you visit, or live near, Martha's Vineyard in U.S.A. you will find many relics of the old whaling days.

The small creatures which make up plankton can be studied in many text-books and making models of them will keep you both interested and very busy. There is a lot to learn about the husky dogs which are used for polar transport and some of these can very often be seen in zoos and especially at Whipnade. If you are lucky enough to be in Canada, of course, you may even have the chance to drive a dog team yourself.

If you are in London then arrange a visit to Scott's vessel, H.M.S. *Discovery*, which lies in King's Reach on the Thames. It is best to tell the Ship-keeper that you are coming and the size of the party so that a special guide will be ready to show you round (Telephone number Temple Bar 5138). The wardroom and cabins are in their original state and a collection of personal relics of Captain Scott has been set out in his cabin.

The Discovery and Exploration of Antarctica

WHEN Dr. Vivian Fuchs¹ was due to arrive at the South Pole in January, 1958, newspaper reporters from many countries flew out there to meet him. He had travelled with his party by sno-cat and dog team across Antarctica from Shackleton Base on the Weddell Sea via their supply base at South Ice. Also waiting for him at the South Pole were Sir Edmund Hillary and Admiral Dufek. Hillary had earlier travelled from Scott's old base on McMurdo Sound to establish a series of depots along the route Dr. Fuchs was to follow and had then made a dash for the Pole on his Ferguson farm tractors. Dufek was in charge of the American Amundsen-Scott Base which had been established at the South Pole by the U.S. Army Air Force. This base had more materials landed from aircraft than had been landed on the entire continent of Antarctica by all previous expeditions.

The dog teams which had led the way for Dr. Fuchs from South Ice were flown out to Scott Base and Dr. Fuchs then continued by sno-cat via Depot 700 to McMurdo Sound and so completed the first land crossing of the Antarctic continent, a

¹ Now Sir Vivian Fuchs, Polar Medal and Gold Medal of the Royal Geographical Society.

distance of 2,150 miles in ninety days. Later the single-engined Otter aircraft which had been one of their main supports flew right across the continent and so established another record as well as demonstrating a remarkable standard of air navigation by Squadron Leader Lewis, R.A.F. and his crew.

There are now hundreds of men and a few women who have lived on the continent of Antarctica; some men, indeed, have lived there for several years, but it is only the combined forces of many nations, using all modern techniques and equipment, which have at last enabled the scientists to unlock some of the secrets which have been guarded for so long by the cruel seas, bitter blizzards and frightful travelling conditions which still make a trip to continental Antarctica a gamble with death.

Ptolemy, the second-century Egyptian astronomer, produced a map showing a round earth with a large continent covering the southern hemisphere with the Indian Ocean as an inland sea. The Greeks had the idea that the earth was round with a vast ocean in the southern hemisphere. But after the time of Marco Polo a wrong idea got around that there was a land to the south of Japan called Locach or Beach which had gold in incredible quantities, elephants, fine timber and porcelain shells. These riches were enough to attract many adventurers and explorers.

The ice-covered sea around Antarctica may have been seen first by the Polynesians in their long ocean voyages to New Zealand and other places in the

Pacific. But the first European to set a limit to Antarctica was Captain James Cook. Sailing from Cape Town in January, 1773, he made a zigzag course during which he got further south than any previous navigator and from his observations disproved any idea of a rich tropical paradise in the southern ocean. Instead he indicated a land of snow and ice and blizzards. Cook was also probably the first man to eat dog during south polar exploration for when he was taken ill he was given Mr. Foster's dog to eat as it was the only fresh meat on board. Since then, dog flesh has kept many an explorer alive when all other foods have gone. On his third voyage Cook was killed, but his ships went on to discover fur seals and sea otters off British Columbia and as a result of this the sealers and whalers flocked to the North Pacific and rapidly destroyed the animals they hunted. Turning their attention southwards to the seas reported on so favourably by Cook, the sealers and whalers again set about killing off their prey, using the small islands like Kerguelen and South Georgia as their bases.

Following Cook, many ships went far south, and the first map gives some idea of the number of recorded approaches made to Antarctica, especially during the nineteenth century. In addition many sealers and whalers prowled around looking for their prey. First they came in sailing vessels and then in steam-driven and more powerful ships able to push aside the ice and try to get nearer the land. Many names such as Weddell, Enderby, Biscoe, Palmer,

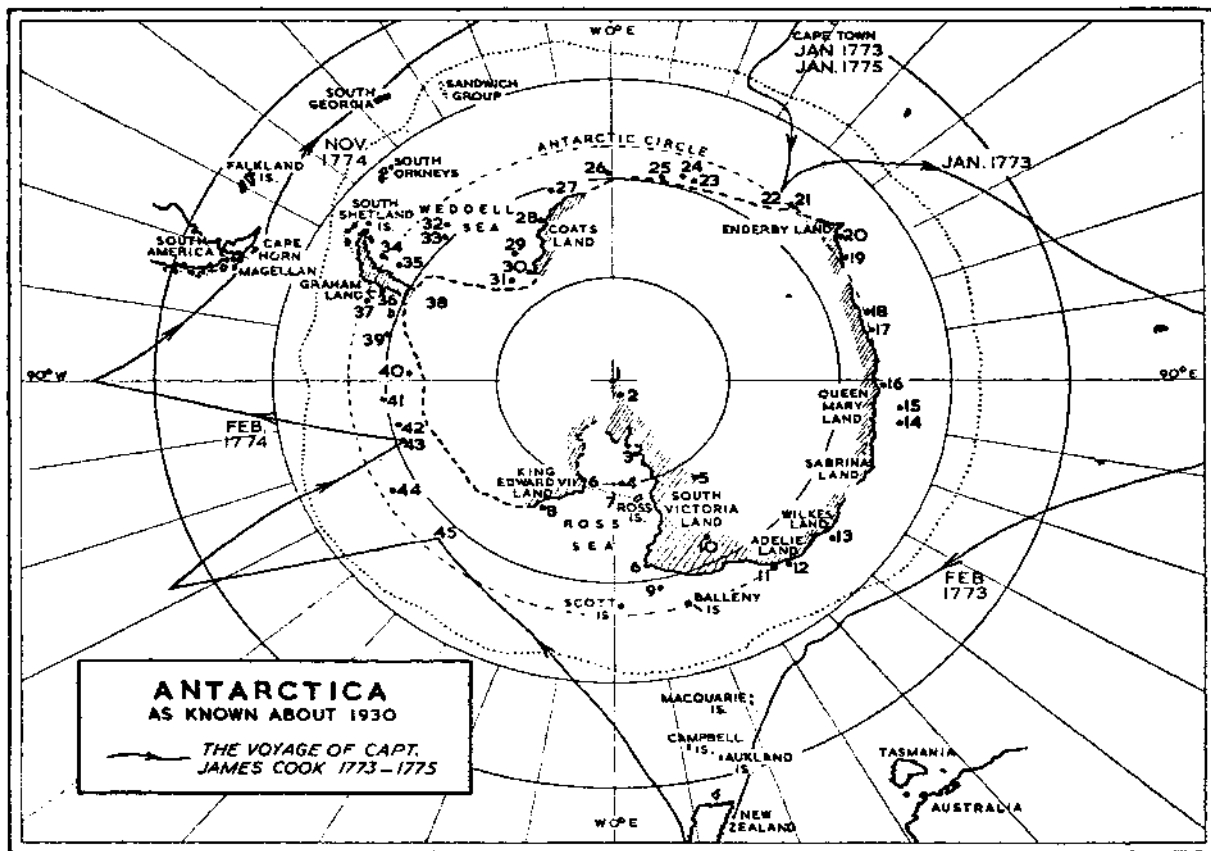


Fig. 5. ANTARCTICA as known from 1930 onwards

KEY

IIIIIIII Reasonably well determined areas

———— Possible coast line not accurately surveyed

..... Antarctic convergence where cold water from Antarctica sinks beneath warmer water of southern oceans

Positions reached by Antarctic Explorers by 1930

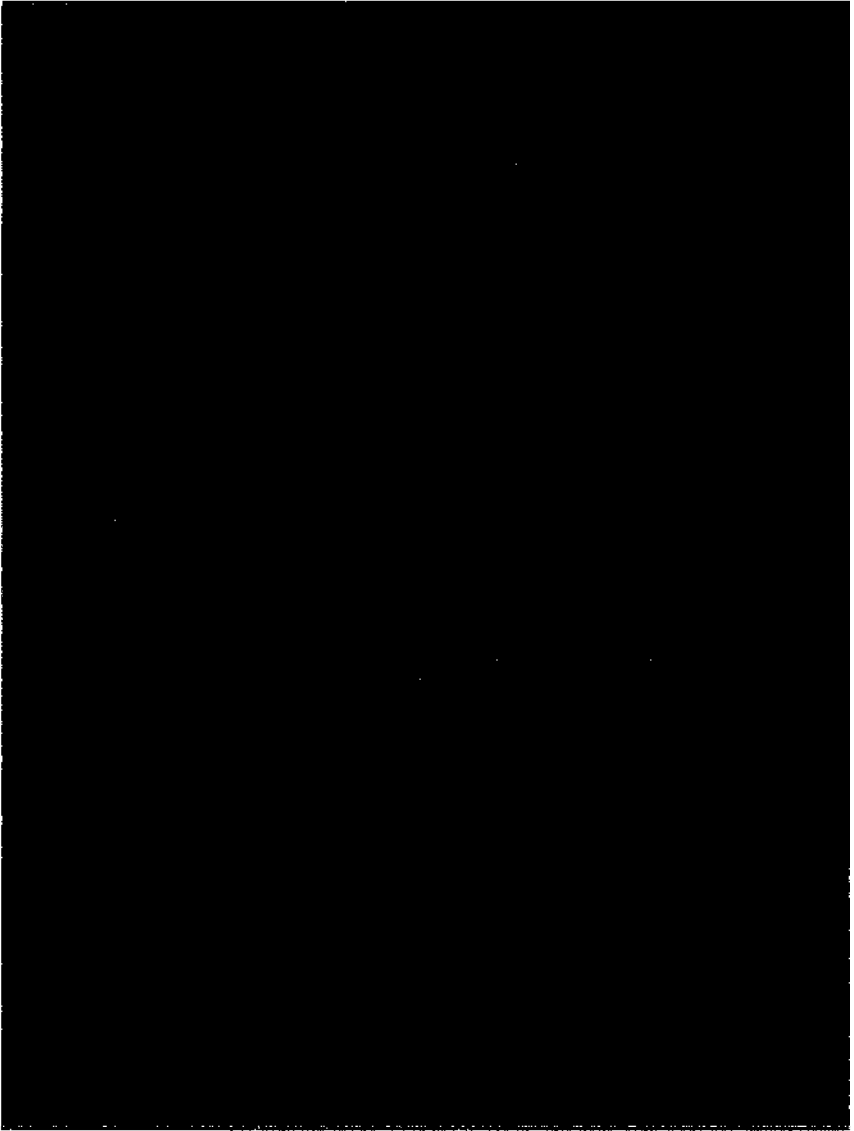
1	AMUNDSEN	12/1911	14	WILKES	1840	30	SHACKLETON	1915
	SCOTT	1/1912	15	CHALLENGER	1874	31	FILCHNER	1912
2	SHACKLETON	1/1909	16	DRYGALSKI	1903	32	MORRELL	1823
3	SCOTT	12/1902	17	CHALLENGER	1874	33	Ross	1843
4	ROYDS	1903	18	<i>DISCOVERY</i>	1930	34	NORDENSKJOLD	1902
5	SCOTT	1903	19	KEMP	1834	35	LARSEN	1893
6	BORCHGREVTNCK	1900	20	<i>DISCOVERT</i>	1930	36	BISCOE	1832
7	Ross	1842	21	MOORE	1845	37	CHARCOT	1905
8	SCOTT	1902	22	COOK	1773	38	WILKINS	1930
9	BALLENY	1839	23	BELUNGHAUSEN	1820	39	BELLINGHAUSEN	1821
10	DAVID	1909	24	WILD	1922	40	DE GERLACHE	1898
	(Magnetic S.P.)		25	BISCOE	1831	41	BELLINGHAUSEN	1821
11	WILKES	1840	26	BELLINGHAUSEN	1820	42	DE GERLACHE	1898
12	D'URVILLE	1840	27	ROSS	1842	43	COOK	1774
	MAWSON	1911	28	BRUCE	1904	44	BELLINGHAUSEN	1821
13	D'URVILLE	1840	29	WEDDELL	1823	45	COOK	1773

Davis and Sabrina commemorate them and the vessels they sailed in. Bellinghausen took an expedition to Antarctica in 1819-21, but not much is known of his work. One of the first great explorers was Sir James Clark Ross. He had explored with his uncle in the Arctic, but in 1839-43 he was himself in charge of the vessels *Erebus* and *Terror*. This scientific expedition discovered the Ross Sea, Ross Ice Barrier and Shelf and the volcanoes Erebus and Terror on Ross Island in McMurdo Sound.

His route into the Ross Sea along the meridian of 175° E. has been followed many times by expeditions such as those under Shackleton, Scott and Byrd, as well as by many whaling vessels, for the Bay of Whales promised rich hunting-grounds and the Ice Shelf seemed to give direct and short access to the South Pole.

In 1895 Borchgrevinck, a Norwegian living in Australia, sailed with Henrick Johann Bull who was trying hard to establish a whaling industry in Australia backed by Sven Foyn who had developed the steam catcher and harpoon gun into a most efficient means of catching and killing whales. Bull's whaling venture was not very successful, but on a voyage in 1900 he pushed through the pack ice into Ross Sea, and Borchgrevinck and Bull were the first men to set foot on continental Antarctica near Cape Adare.

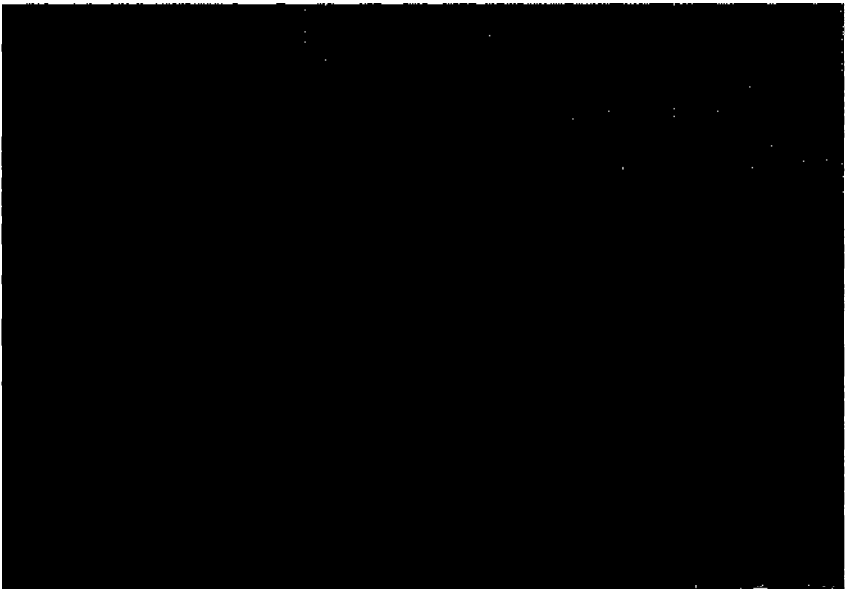
Borchgrevinck set up two huts for the party often who were to winter there. Many shallow-water fish, jelly-fish, seaweeds, etc., were found on the shore,



3 Captain Roald Amundsen at the South Pole, December 1911



4 Dr. Wilson, Lt. Bowers, P. O. Evans, Captain Scott, Captain Oates have their photograph taken by Lt. Bowers who pulled a string attached to the camera trigger



Paul Popper

5 Captain Scott taking a photograph of a pressure ridge on sea ice

which showed for the first time that the waters close inshore were not barren of life. From 15th May to 27th July the sun did not rise and gales and storms marked the passage of winter. Sledge journeys using dogs were made under great difficulties, but they did prove the usefulness of dogs as transport animals in the Antarctic. At times the dogs froze to the ice when temperatures of -52° F. were recorded. Adelie penguins returned to Gape Adare in October, when Hanson the biologist died and was the first explorer to be buried in that lonely land. In December the ice broke up and on 28th January their vessel, the *Southern Cross*, returned to pick them up. A landing on the Ross Barrier was made in the Bay of Whales and Borchgrevinck made a sledge journey with dogs to $78^{\circ} 50'$ S., the furthest south yet reached.

The physicist of Borchgrevinck's expedition was asked to go with the *Discovery* Expedition under Captain Robert Falcon Scott. The *Discovery* was built for work in the ice with specially strengthened bows. The physicist Bernacchi was the only one with antarctic experience. Shackleton, Scott, Wilson, Wilde and the others were making their first voyage south. They wintered in McMurdo Sound. Without any experience of the Antarctic they had a number of close shaves which were only prevented from being disasters by miracles of improvisation. The dogs were of the rather lightweight Siberian type and not Canadian huskies, and not enough dogs were taken for the work to be done. Sledging

rations were at starvation level allowing about \ lb. of pemmican and one biscuit per man per day. Underfed and overworked, the sledging parties performed heroic tasks.

Shackleton led the British Antarctic Expedition of 1907 taking Douglas Mawson with him as well as Raymond Priestley. Manchurian ponies as well as dogs were used as a means of transport, while a motor car was taken to help with the hauling of loads. After a fearful journey south through the ice and blizzards, they finally arrived at the Bay of Whales, but moved to McMurdo Sound. Shackleton made an attempt to reach the South Pole, getting to $88^{\circ} 33'$ S. and only about ninety miles from the Pole when lack of food and the lateness of the season forced him to return. Mawson and Mackay explored Mount Erebus; Priestley, Armytage and Brocklehurst explored to the west, and during their journey killer whales tried to bump them off the ice into the water. Mawson, David and Mackay also sledged to the South Magnetic Pole and back.

Mawson returned in 1911. For the first time a radio relay station was set up and manned on Macquarie Island. An iceberg over forty miles long and with over one hundred feet of ice above sea-level was encountered. The Mertz Glacier was seen and a landing made on Adelie Land, which was first plotted by the d'Urville Expedition. Mawson wintered here and a second party was put off on the Shackleton Ice Shelf. Mawson's party had a fearful

time in Adelie Land. This is probably the windiest point in the world. Rocks and debris were blown about by the gales of up to two hundred miles an hour. Fortunately the hut became drifted over early in the season so that it was not blown away, and a trapdoor in the roof served as an entrance. Dry snow blowing over the hut so charged it with static electricity that blue sparks and tongues of St. Elmo's Fire glowed from the explorers⁵ finger-tips, noses and hair.

From here Mawson, Ninnis and Mertz made the worst journey in the world. Ninnis with his dog team and sled loaded with supplies broke through the ice-crust over a deep crevasse, from which nothing more was heard except the sound of a dog whimpering in pain far below and out of sight. With the dog-food gone and only a few of their rations and other supplies left, Mawson and Mertz set off to cover the three hundred miles back to their base. The dogs were eaten one by one as they died, but Mertz became ill and Mawson tried to haul him on the sledge. In one day he managed to travel just two and a half miles. Mertz died when they were still a hundred miles from base. Mawson struggled on. When the soles of his feet came loose he tied them back on with strips of cloth. He fell down a crevasse and after many hours managed to climb out. It then took him three hours to set up his pitiful little torn tent. A lucky find was a bag of food left behind on the outward journey. The ship *Aurora* sailed as he arrived back at the base and a gale

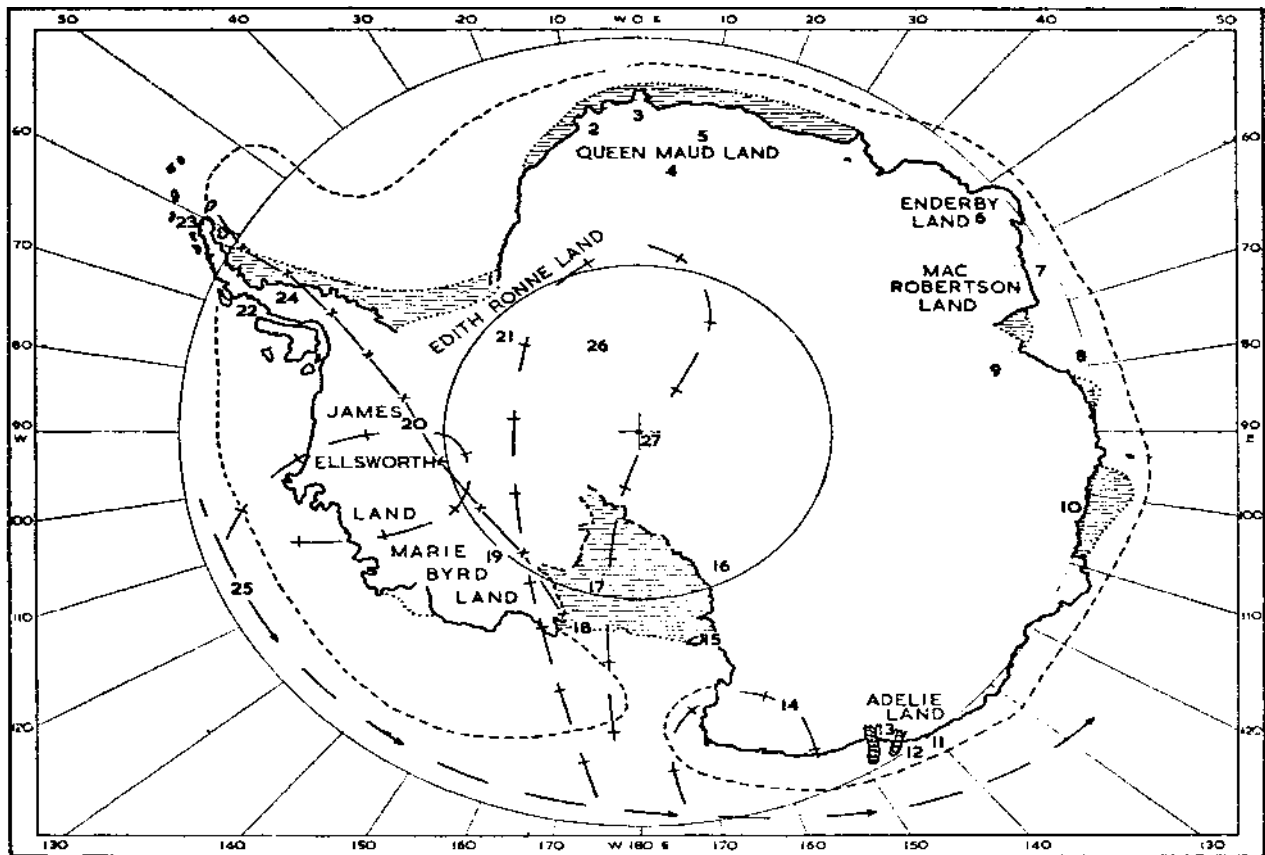


Fig 6. EXPLORATION OF ANTARCTICA 1930 ONWARDS

- 1 U.S.S. *Wyandot* and U.S.S. *Staten Island* explored 1,000 miles of this coast in 1957
Shackleton station from which Dr. Fuchs set out on his trans-Antarctic journey
- 2 R user-Larsen in flights from Norvegia 1930
- 3 Maudheim. British-Norwegian-Swedish expedition 1950-52
- 4 R user-Larsen 1930. Named after Queen Maude of Norway
- 5 Alfred Ritscher 1939. Air photo mapping 135,000 square miles
- 6 John Biscoe for Enderby Bros. 1831. R user-Larsen 1930
- 7 Mawson Base. MacRobertson Land discovered by Mawson in flights from *Discovery* in 1929-30
- 8 Lars Christensen, 1937. Norwegian whaling expert and fleet owner
- 9 Lincoln Ellsworth, 1939. Flight from Wyatt Earp
- 10 Operation High Jump, 1947. Discovered here ice free "oasis" and bare hills
- 11 Pointe Geologic Emperor Penguin rookery. French Antarctic base, 1950-52, 1953-
- 12 Mawson, 1911-13. First radio contact with Macquarie Island and so to Australia. Windiest place in the world, speed up to 200 m.p.h.
- 13 South Magnetic Pole, 1958 (68° S. 144° E.)
- 14 South Magnetic Pole, 1909 (72° S. 155° E.)
- 15 McMurdo Sound. Scott's Base. Sir Edmund Hillary. Main New Zealand base, 1957-58
- 16 Mount Albert Markham depot. New Zealand. Depot on Dr. Fuchs' route to Scott Base
- 17 Admiral Byrd lived alone here for nineteen weeks of winter, 1934
- 18 Bay of Whales. Borchgrevinck 1900. Amundsen Base, 1911. Little America, 1929, 1934-35, 1940-41) 1947 base for Operation Deep Freeze, 1956
- 19 Byrd Station. Set up by tractor trains from Little America, 1957
Marie Byrd Land, named after wife of Admiral Byrd
- 20 James Ellsworth, 1935. Flight from Graham Land to Little America-----xx-----
- 21 Edith Ronne Land, 1947-48. Wife of Finne Ronne, U.S.N.R., who wintered on Stonington Island. Edith Ronne and Jennie Darlington were first women to winter in the Antarctic
- 22 Stonington Island
- 23 Bransfield, 1820. British explorer charted Trinity Land here in 1820
- 24 Davis, 1821. American sealer sent first men to set foot in Antarctica here
- 24 Graham Land. Named after British admiral. Extensively explored by Falkland Islands Dependency Survey. Constantly occupied by British
- 25 Admiral Byrd, 1946-47. Aircraft carrier----- . Operation High Jump, U.S.N, flights by aircraft -----
Thirteen vessels, 4,000 men. Most of Antarctic coast was photographed
- 26 South Ice. Advance base for Dr. Fuchs on trans-Antarctic journey
- 27 South Pole. Amundsen, 1911. Scott, 1912. Byrd flew over, 1929. Dufek Operation Deep Freeze by plane, 1956. Siple and party dropped here, 1957. Aerodrome and permanent base, 1957-58. Regular air service to McMurdo Sound. Hillary by Ferguson tractor, December, 1957. Fuchs by sno-cat and dogs, January, 1958

prevented it from picking him up, so he and his companions, who had stayed at the base, spent another winter in Antarctica.

Scott's Second Expedition was in Antarctica at the same time as Mawson. Three world-famous scientists, Priestley, Debenham and Taylor, were part of that expedition. The *Terra Nova* landed the party in McMurdo Sound, but they were disturbed to find Amundsen at the Bay of Whales preparing with four companions and a large number of dogs to set out for the Pole. This made Scott hurry along his preparations for his own journey south. Priestley's party near Cape Adare spent a frightful winter, for which they were unprepared, as the *Terra Nova* should have picked them up before the winter set in, but was prevented from doing so. With an ice cave for a shelter, and seals, penguins and a few raisins and lumps of sugar as their main food supplies, they suffered terribly from cold, frostbite and food poisoning. They eventually struggled along the coast to Cape Evans to find a note there saying that the Cape Evans men had gone to look for Scott. Taylor and Debenham made a very detailed survey of the coast of South Victoria Land as well as many miles inland and showed that coal was present in large quantities.

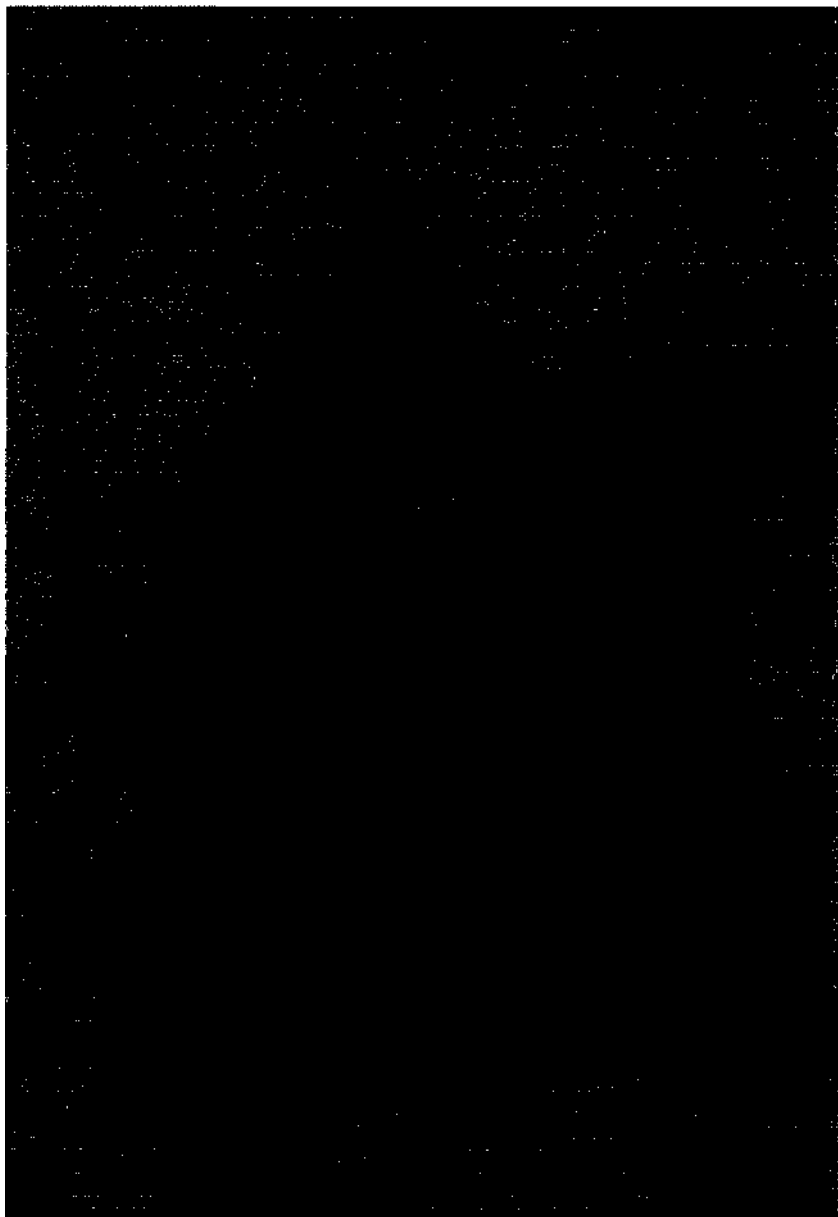
Meanwhile Captain Scott, Wilson, Oates, Evans and Bower had set out for the South Pole with the Manchurian ponies, loads of food and dogs pulling very heavily loaded sledges. Both men and animals

were on short rations from the start, A motor-sledge gave some assistance, but fairly soon broke down although it had done well enough for Scott to note that it would be very useful in future travel when a few faults had been rectified. The ponies found the going difficult as their small hooves broke through the surface and gave a lot of trouble. The hungry dogs gave trouble too for they looked upon the ponies as a good warm meal and tried to get at them. On the journey south dumps of food and fuel were left as planned. Finally their support party left them and they carried on for the Pole making scientific observations and records as they went, including a collection of rocks which added to their burdens. They averaged about fifteen miles a day. When they finally arrived at the Pole they found that Amundsen had been there with his dogs and lightly loaded sledges only a few days before. Bitterly disappointed, they retraced their steps, now pulling their sledges themselves. Blizzards, and injuries to Evans, delayed them. He had frost-bitten feet, hands and nose and it took them hours to get started in the mornings. Concussion followed a fall down a crevasse on 4th February and he died on 17th February. By 5th March, Oates had frost-bitten feet and on 17th March he walked out of their tent into a blizzard and was never seen again. Fuel was desperately short. The intense cold had hardened the leather washers sealing the fuel tins in the dumps, and the long hours of summer sunshine had evaporated the fuel and many of the tins were

half empty. Without the aid of hot food and warmth at night, for thirty-one days the three men pulled their sledges and carried out their observations until they were within eleven miles of their big One Ton Depot. A blizzard then raged for days and here they died unable to move in the face of those icy winds. Their records and collections of specimens were with them when they died.

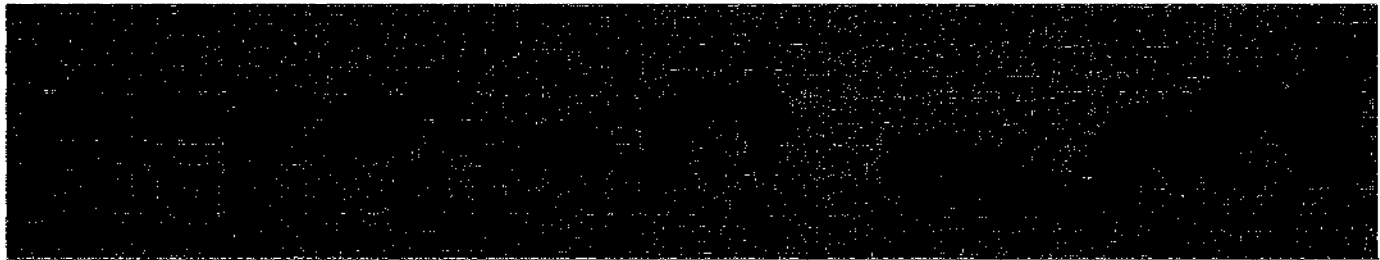
Shackleton's Third Expedition of 1914-17 ended in triumphant disaster. He planned to cross Antarctica from the Wedell Sea to the Ross Sea. His ship, the *Endurance*, was frozen into the ice on 15th January, 1915, and drifted with the pack ice around the Weddell Sea for over a thousand miles before it was crushed and sunk in October. Using their life-boats the crew reached Elephant Island in the South Shetlands. From there Shackleton, Worsley and four others took a twenty-foot boat and sailed it for over eight hundred miles to South Georgia in very bad weather. Shackleton crossed the mountains, which had never been explored, to reach the whaling station at Grytviken. His companions were rescued by him after having lived on raw seal meat, blubber and penguins for five months, using an up-turned boat as a shelter.

Shackleton was probably the last of the "heroic" explorers, for since his time the Antarctic has been explored by scientists like Debenham and Priestley and engineers going into the Antarctic to probe its secrets and to try out new inventions under very arduous conditions, rather than men challenging



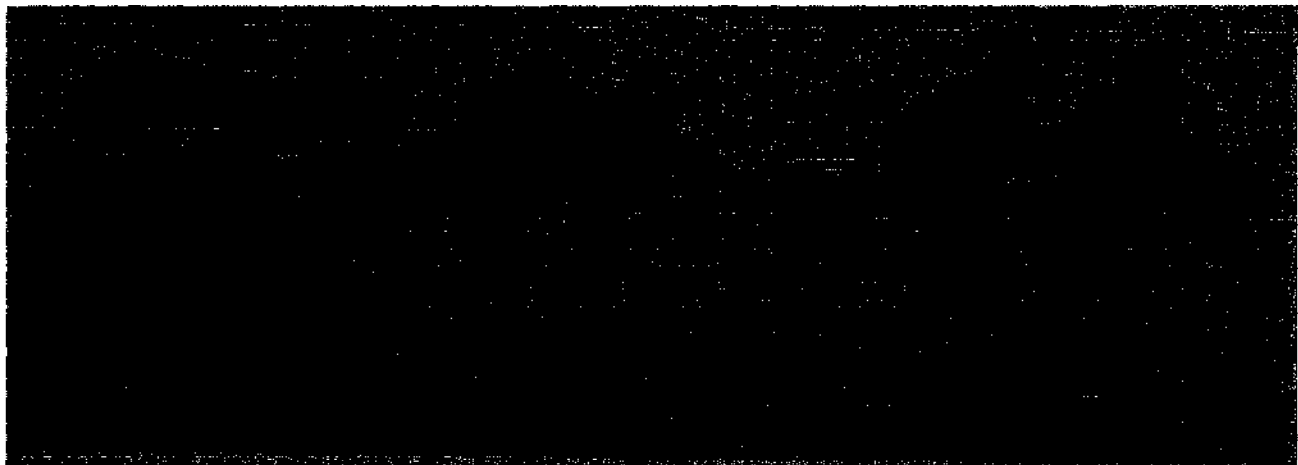
Reprinted by courtesy from ' Shackleton' by Margery and James Fisher

7 Hurley and Shackleton at Patience Camp. On the ice floe after the *Endurance* had sunk. Shackleton tends the stove which is melting snow. Hurley scrapes fat off a sealskin



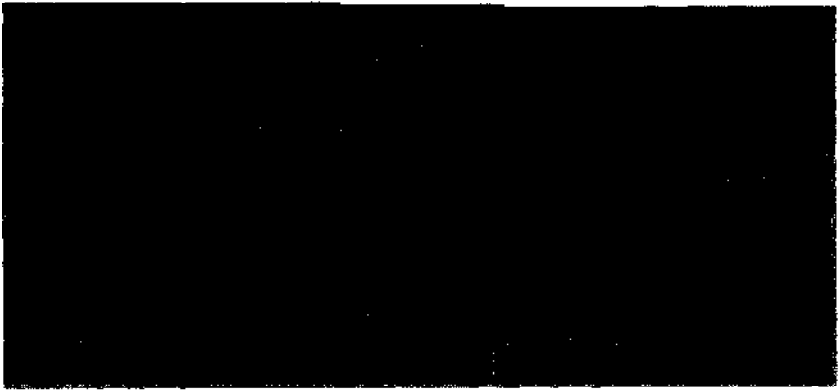
8 Pony transport as used by Scott's Antarctic Expedition, 1911

Paul Popper



9 Manhauling sledges by members of Scott's Southern Party

Paul Popper



Paul Popper

10 Motor tractor used by Scott's Expedition. The engine is in the box in front of the driver



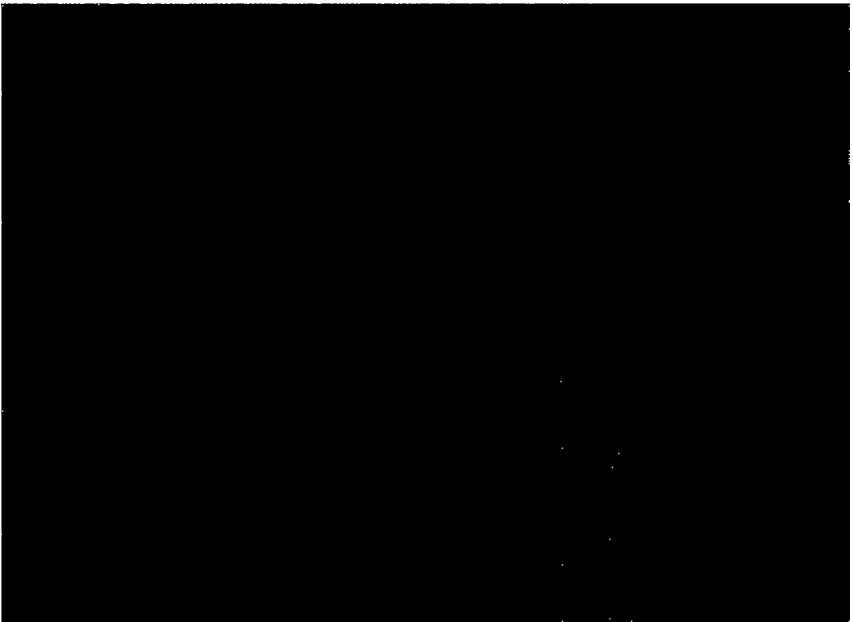
Planet, News

II Ferguson farm tractor used by Hillary in his dash to the Pole. Special fuels and oils were used. The engine, gear box and batteries could be warmed before starting. The electrical equipment was insulated with plastics as rubber becomes brittle at low temperatures. Special rubber tracks were fitted for use in the snow



U.S.A. Information Bureau

12 Admiral Byrd in his hut near Little America 1933



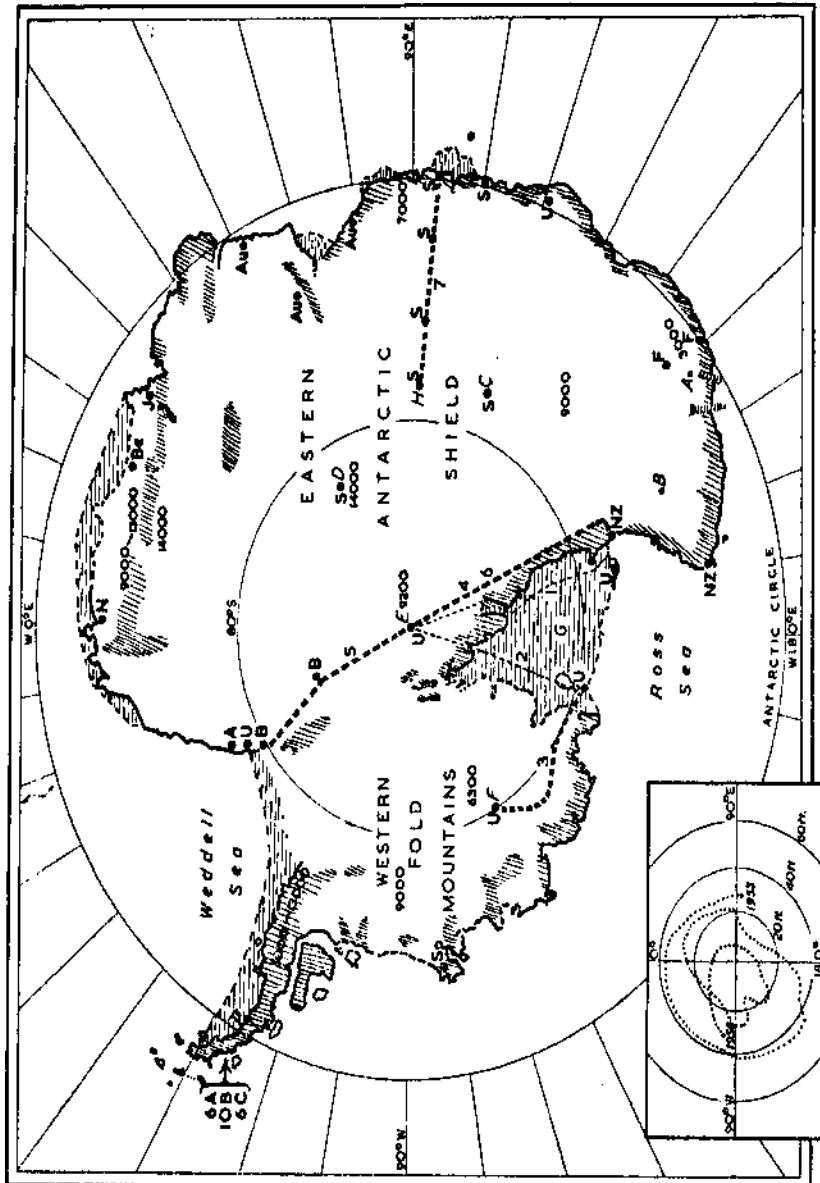
Trans-Antarctic Expedition

13 Dr. Fuchs standing between Sir Edmund Hillary (*left*) and Admiral Dufek U.S.N. (*right*) at the South Pole, January 1958

the elements in an effort to reach the Pole. From 1928 the aeroplane has played a major part in such exploration.

In 1928 Hubert Wilkins flew from a rough airstrip on Deception Island over six hundred miles down the Graham Land Peninsula before returning to base. At the same time Admiral Byrd was setting up his base at Little America on the Bay of Whales. Several flights inland were made and in November, 1928, a successful flight over the Pole was made covering the journey there in about ten hours. Since then, reaching the South Pole has been rather incidental to scientific discovery. In 1934 Admiral Byrd returned to Little America with fifty men, tractors, radio station and snow-mobiles. During that winter he spent four months by himself in an isolated hut over one hundred miles from the main base to carry out weather observations. He almost died from the poisonous fumes from his stove.

In 1935 Lincoln Ellsworth led another expedition during which he flew from Graham Land almost to the Ross Barrier before he had to make a forced landing. They then sledged to Little America from which they were later rescued. From 1928 onwards the U.S.A. has maintained an almost continuous programme of research and exploration in Antarctica under Admiral Byrd, Siple and Dufek. In 1946-7 an enormous task force of aircraft carriers, warships and even submarines carried out a long summer operation around the shores



WANDERINGS OF THE SOUTH POLE
1953-1956

Fig. 14. ANTARCTICA 1958

- 1 Route followed by Shackleton (1909) using Manchurian ponies and manpower
- " " " Scott (1911-12) using Manchurian ponies, Siberian dogs and manpower
- " " " supply planes (1957) from McMurdo Sound to South Pole
- 2 " " " Amundsen (1911) using Eskimo sled dogs
- 3 " " " U.S. Navy (1956) 13 tractors and 26 sledges with total of 500 tons freight
- 4 " " " Hillary (1957) Ferguson farm tractors and light sledges
- 5 " " " Fuchs (1957) sno-cats and husky dogs.
- 6 " " " Fuchs and Hillary (1958) sno-cats and sledges
- 7 " " 3, U.S.S.R. (1957-8) to Pole of Inaccessibility

I.G.Y. Bases 1957-8

A	ARGENTINA	B	BRITISH	C	CHILE	J	JAPAN	NZ	NEW ZEALAND	Sp	SPAIN
Au	AUSTRALIA	Be	BELGIUM	F	FRANCE	N	NORWEGIAN	S	SOVIET RUSSIA	U	UNITED STATES OF AMERICA

9,200 Estimated height of land. Antarctica is a high plateau about 10,000 ft.

||||| Known mountain ranges above general plateau.

The South Poles

- A South Magnetic Pole, 1955
 - B South Magnetic Pole, 1909
 - C South Geomagnetic Pole, 1958
 - D Pole of Inaccessibility
 - E South Geographical Pole.
- Spin pole wanders around this

Other Items

- F Ice here 10,000 ft. thick.
- G Ross Barrier 600-1,400 ft. thick
- H U.S.S.R. winter station on way to D

of Antarctica to demonstrate their ability to operate under extreme arctic conditions. They photo-mapped much of the continent, especially the coastline.

In 1955-7 Operation Deepfreeze established stations at many points in the continent as part of the International Geophysical Year programme, and altogether twelve nations set up forty-two stations. Scott Base was the main supply base and aerodrome for Amundsen-Scott Station at the South Pole. Heavy aircraft operated from the air-strip on the Ross Ice Shelf until the ice began to break up and part of the aerodrome threatened to float away. Helicopters, Otter aircraft used as spotters, snow-mobiles, weasels, bulldozers, supply-dropping by parachute and all modern techniques were used to get men and materials safely to the various stations and to the British Antarctic Expedition. But even so a few lives were lost and the Antarctic is by no means conquered. You get on best with the Antarctic if you learn to live with it.

The most continuous exploration and survey of Antarctica has been carried on by the Falkland Islands Dependencies Survey, usually known as F.I.D.S. Stations at Stonington Island, Hope Bay, Deception Island and elsewhere have been continuously occupied by F.I.D.S. parties since 1934. The experience and knowledge gained on the ground under leaders such as Rymill, Bingham and Fuchs using dog transport and support aircraft was

of great value to the British Trans-Antarctic Expedition.

The leader at each F.I.D.S. base is a magistrate and maintains a post office so that British claims to this sector of the continent are backed up by official residence and occupation.

What the Country is Like

ANTARCTIC means anti-arctic, the opposite of the Arctic. It is at the opposite end of the polar axis on which the earth spins; it is a land mass whereas the Arctic is ocean covered by ice; no animals except a few spiders and such small creatures live on the antarctic continent, but the Arctic Ocean is comparatively rich in fish, seals, walrus and polar bear and the lands surrounding the Arctic are well able to maintain the Eskimos. In winter the emperor penguin is the only animal to stay on the continent of Antarctica. All other birds, seals and penguins move north to the warmer parts of the southern ocean along the edge of the ice. One link between them is the arctic tern which breeds in summer in the Arctic and then flies south to spend summer in the Antarctic.

In Antarctica there are no polar bears, foxes or land animals to attack the other animals; only the skuas and such birds live on other smaller creatures. Because of this the seals, sea elephants and penguins are not frightened of anything on land, so that men have been able to kill them quite easily, and without protection they would be quickly wiped out for the sake of their oil, skins and furs.

In some ways, of course, the Arctic and Antarctic are alike. Both have long winters when the sun

never rises; both have long summers when the sun never sets for weeks on end. In both areas intense cold and blizzards are ever-present dangers to travellers, but in the Arctic, even when far out on sea ice, Steffanson showed that it is possible to obtain food. In Antarctica, once away from the coast and the seals and penguins, no food supplies of any kind are available and every bit of food must be carried along by the explorers. For these reasons it has been necessary for men to learn how to live in Antarctica where conditions are so different from those in any other part of the world.

One of the first puzzles, which the work of Dr. Fuchs and others may be able to solve, is where Antarctica comes from. Some geologists have a theory that a very long time ago parts of what are now America, Africa, India and Australia were all joined together as one large land mass which they call Gondwanaland. Over centuries of time, possibly due to slowly moving currents in the semi-viscous mass on which the earth's crust floats, this Gondwanaland has split up and the various parts have drifted into their present positions, wrinkling the ocean floor in front of them to push up the fold mountains of the world. If this is true, and if Antarctica was once part of Gondwanaland, then it might contain rich minerals like the other ancient continental blocks. Recent geological and ice surveys suggest this might be true, for the mountain chain running from Graham Land to the Ross Sea appears to be a continuation of the fold mountains

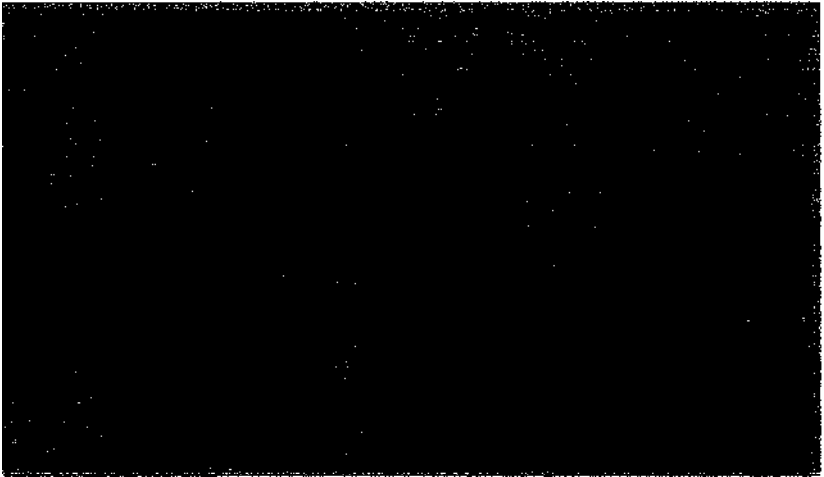
of Chile, and eastern Antarctica may be a continental block similar to Brazil.

Another puzzle to be solved is that of the ice. How thick is it? How long has it been there? How long will it stay there? By seismic soundings along the route followed by Dr. Fuchs and at other places it has been shown that in places the ice is about eight thousand feet in thickness. It rests on solid rock and in places extends below sea-level, having forced the land down by its weight, but it is not floating on the sea except at such places as the Shackleton Shelf and Ross Ice Shelf where these ice-sheets several hundred feet in thickness occupy vast areas of the sea as they slowly move outwards to break off eventually as huge tabular bergs, floating islands of ice many miles in length. With eight times as much ice below the water-level as above, they move in the direction of the ocean currents below the surface, which may be directly opposite to that of the surface wind and so it is possible for the tabular berg to travel against the smaller ice-floes. Such conditions are very dangerous for vessels trapped between the two streams of moving ice. The melting of this ice adds vast amounts of fresh water to the oceans of the world. All around Antarctica is a line of convergence (Figs. 2 and 19) where this cold water meets the warmer water of the Southern Ocean and sinks beneath it. Here, about latitude 50° S., the warm tropic air meets the cold polar air and this is the region of depressions and storms, so that the Roaring Forties give place to the



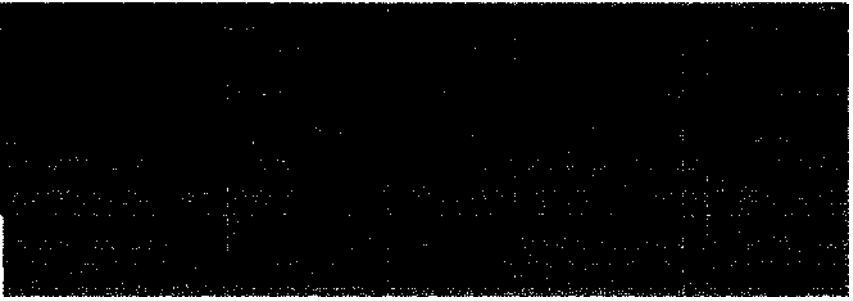
New York Times and U.S.A. Information Bureau

15 Crevasse detection during "Operation Deep Freeze". Two of these huge mine detectors are pushed out in front of the snow mobile to detect crevasses and weak places in the snow cover



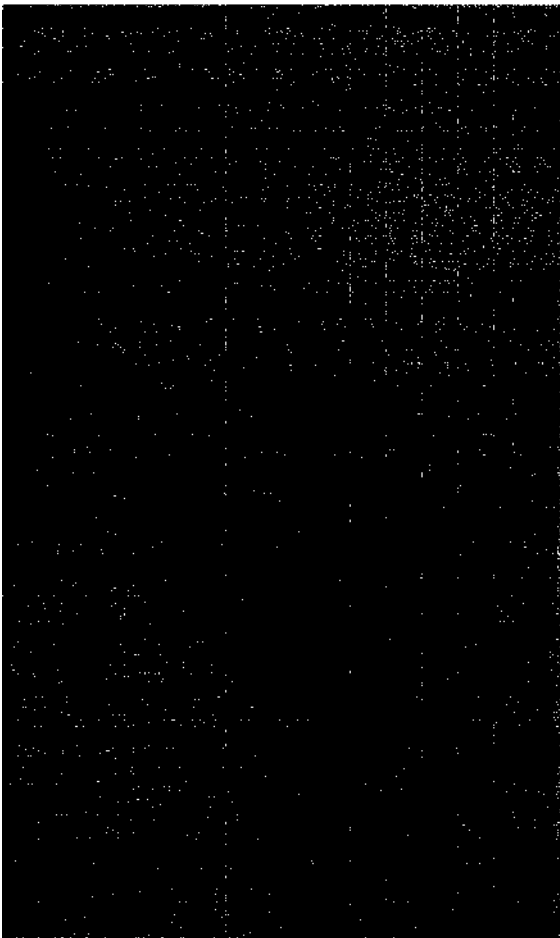
New York Times and

16 Filling in crevasses during "Operation Deep Freeze". The man is guiding the tractor by reins attached to its controls. The marker flags have been planted by men lowered by helicopter to test the snow cover with long probes



U.S.A. Information Bureau

17 Present day Antarctic transport



18 The South Pole from the air. The Amundsen-Scott Station is 2,400 feet from the actual pole which is marked by a circle of barrels. The marks in the snow are made by supplies dropped from the air and the tractors and sledges moving about the station

U.S.A. Information Bureau

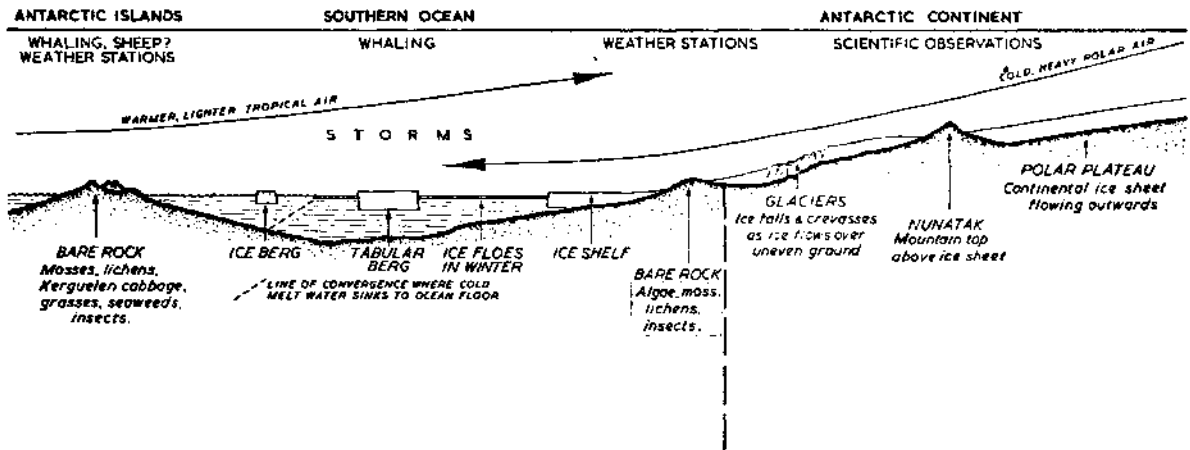


Fig. 19. A CROSS SECTION OF ANTARCTICA

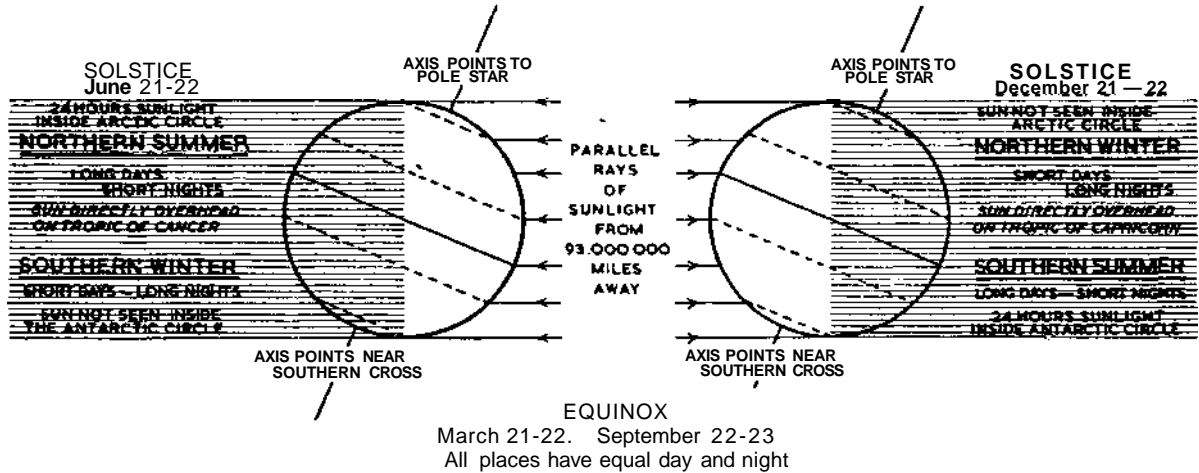
Furious Fifties and the Shrieking Sixties. Sudden fog and snow-storms and rapid changes of wind are features of the climate.

About 350 million years ago, Antarctica enjoyed a tropical climate and there are great coal deposits there, so it may once have been part of Gondwanaland, or the earth may have tilted so that what is now an ice-covered continent may have been the tropics of those days. If all the ice of Antarctica melted, the level of the oceans would rise about
 would feet. This would have tremendous effects on ports and harbours, much low-lying land would be flooded by the rising water and there would be big changes in the world climates.

Antarctica is as big as Western Europe plus Australia or about twice as big as the U.S.A. It has mountains over fifteen thousand feet and most of the Polar Plateau is about eight to ten thousand feet above sea-level. For half of the year it is in darkness and for half the year in sunlight. From about October to February most places have very long hours of daylight. Temperatures are not much below freezing point and in some coastal areas the snow and ice melts and bare rock appears. In McMurdo Sound the sun does not set from 21st October to 20th February, and it is not seen at all from sixty days before 21st June to sixty days afterwards. It is this time factor which has always made the exploration of the Antarctic difficult for with the winter darkness come extremely low temperatures,¹

¹ 2nd May, 1958: Russians recorded—106.9⁰ F. at station H (See Fig. 14) and the worst cold was still to come.

CHANGES IN LENGTH OF DAY AND NIGHT DURING THE YEAR



Length of daylight at the Northern Winter Solstice

Latitude	Arctic Circle	60	40	20	Equator	20	40	60	Antarctic Circle
Daylight hours	0	5-40	9-11	10-48	12	13-13	4-50	18-30	24

(The slight variation from theoretical times is due to the wobble of the earth on its axis.)

Fig. 20. CHANGES IN LENGTH OF DAY AND NIGHT DURING THE YEAR

the sea freezes over for many miles from the land and it is impossible to approach this ice without the risk of being trapped, crushed and sunk. Only one oasis of warmth appears to exist in Australian antarctic territory where photographs show an area free of ice and some growth of moss even during the winter.

During the summer travelling season many things trouble the explorers. The sun being continuously in the sky the everlasting brightness from the snow can cause snow blindness and very painful sunburn. "Even, the roof of the mouth may be blistered by the reflected rays of the sun. Anyone who has been in the Antarctic for any length of time suffers from red-rimmed eyes and a blistered skin. They also suffer from not being able to sleep because of the perpetual light. Today a fairly standard form of headgear is a complete flannel hood with small eye, nose and mouth openings worn with snow goggles to protect the entire face from exposure. Another difficult condition is "white out" when haze and reflected light turns everything to the same dead whiteness and there are no shadows to indicate the shape and size of objects. It is extremely difficult to see obstacles, even steep drops a few feet away. The traveller has no idea where his next step will take him unless he uses a long stick to probe the path ahead.

The wind is also a constant source of trouble. Cold heavy air is continuously flowing down from the Polar Plateau to the coast. Moving slowly it may keep a fine powder of snow drifting along a few

inches above the ground so that the traveller cannot see his feet. This snow drifts into every little chink in the clothing, building or vehicle so that after a few hours in the open a vehicle may be filled with snow and on the leeward side will be a drift hundreds of yards in length. It is this drifting and the low angle of the sun which makes objects stand out in such strong relief when seen from the air on a sunny day. Footprints, having compacted the snow a little, may stand out as small islands above the windswept lower level. Stronger winds scour the snow surface into ridges and ripples known as "sastrugi". Travelling over such a formation with a sledge is like trying to drive across a badly ploughed field with the furrows widely spaced and a foot or more deep. When crossing such rough areas the sno-cat crews are strapped in and wear crash helmets. Such going is very rough on both men and machines and frequent stops for maintenance of the machines are very necessary. Travelling over sastrugi with dog sledges often leads to upsets and overturned loads and the distances travelled each day will be small.

Strong winds pour down from the plateau at times at speeds up to two hundred miles per hour. After such a blizzard the shape of the landscape will be changed, huts drifted over and all stores buried. The sea ice may have been blown away carrying stores, tents or men with it.

In such conditions men have had to learn how to live often by very painful experience.

III

Learning How to Live in Antarctica

THE careless man is the man in trouble. All loose things such as compass, gloves, goggles, etc., are tied on so that they go with you wherever you go whether it is on a simple trip out to feed the dogs or a stroll over to a near-by rock to sit and read a book. One man had the terrifying experience of falling down into an unsuspected crevasse a few yards from the hut and had to climb out alone as his companions had not missed him, nor heard his shouts. A blizzard coming on while the dogs are being fed will wipe out all sight of the hut a few yards away and without compass or guide-rope a man may search for hours vainly trying to find shelter. With the use of aircraft, too, a new rule has been learned; just as the young sea-elephants on Kerguelen Island sometimes die by staying too long in one place and so melting the snow until they are too deeply sunk in it to get out, so the aerodrome men have found it unwise to leave tins and other rubbish scattered about, for as the sun heats them, they melt the snow beneath and so produce holes and soft places over the airfield which have to be filled in before it is safe for aircraft to land or take off.

Fire is the next great danger, for the strong winds quickly whip up a blaze and in the absence of water a fire is very difficult to control. The French main

base at Point Martin in Adelie Land was burnt out in a sixty-mile gale despite everything the men could do with fire extinguishers. Many huts are of wood with insulating materials which are all fairly easily set on fire. With electric wiring and apparatus, paraffin stoves, petrol engines for producing electricity, garage stores, etc., about, there is much very burnable material at these bases and for this reason stores are kept well spaced out and the huts are connected by tunnels through the snow in an attempt to prevent any possible fire from spreading. Fire is also a danger when on the march, for the pressure-cooking stoves can cause trouble especially when men are handling them with stiff frozen fingers or when wearing gloves.

There are times when on a sunny day the men can go about in their singlets, or even without them, but generally good warm clothing is an absolute necessity when moving about in the Antarctic. The clothing issued to the F.I.D.S. teams consists of a string vest, woollen shirt, pullover, down jacket with hood, windproof parka, flannel mask with nose and eye-holes, windproof trousers, down trousers, pyjama trousers, Long Johns—long woollen pants—mukluks, felt over boots, two pairs of woollen socks. On their hands they wear silk gloves, woollen gloves, duffle gloves and finally leather over gloves. In this way there are three or four layers of clothing over the body, the inner layer to keep warm air next to the skin and to help air circulation and moisture reduction. The outer layers are to keep out the

snow and the wind. Nylon outer garments are now being worn as snow will not stick to them. Dark goggles to keep out snow glare complete the outfit. In many ways the outfit is the modern equivalent of Eskimo clothing, but even warmer and more windproof and without the need for being kept soft like the skin clothing. As the men have little or no opportunity to wash or change while on the march they get exceedingly dirty. All loose hair and skin gradually accumulates in their boots and has to be shaken out at intervals.

Since nothing lives or grows away from the coast all food supplies must be carried for any journey. For a long trip many depots of food may have to be laid down along the route to be followed before the trip actually starts. Today supplies may be dropped from aircraft, but explorers take with them at least twice as much as they think they will need in case of being held up by bad weather. F.I.D.S. rations carried on sledging trips are based on pemmican made of lean beef and animal fats. Oats, biscuits, dried potatoes, dried onions, concentrated chocolate, oatmeal, tea, cocoa, vitamin tablets, make up the standard pack. A very usual meal is "hoosh". This is a kind of stew based on pemmican with other things added to give it variety. Seal meat and blubber, penguin flesh, skua breast meat and eggs are collected and stored during the summer season and preserved for the winter. Large stores of seal meat have to be laid in for feeding the dogs which each need as much as 9 lb. of meat each day. At

some of the F.I.D.S. bases they have erected greenhouses to take advantage of the long summer days. Compost is used in which to grow salad greens, but they have spring onions on the menu only on fixed days to prevent annoyance to one another.

A F.I.D.S. base hut is usually 72 feet by 27 feet and will accommodate fifteen men. It houses, within its double insulated walls, mess-room, dormitory, kitchen, bathroom, workshop, wireless office, meteorological office, generator-room, dark-room for photographic work, store-room. Solid anthracite fuel is used for the cooker. With two 6-watt generators run off petrol engines it is possible to have electric light and fires. Each window has three thicknesses of glass to keep in the heat. On entering the lobby the snow and frost is beaten out of the outer garments to keep the floor of the hut dry. Double doors are also fitted to keep in the warmth.

One of the real luxuries for the men is the bathroom. Each man has his turn at this. He has to cut the snow needed for his bath water and the newcomers very quickly learn how much snow is needed to make a lot of water. Clothes washing and bathing may be done in the same water, but in some cases they now have electric washing machines to deal with the laundry. It can be quite a treat to be offered the first use of someone else's bath water.

Since everything has to be taken to the Antarctic,

the stores for one man for one year are quite generous and include besides food:

5,000 cigarettes, 12 lb. tobacco and one pipe, twelve dozen boxes of matches, six packets of pipe-cleaners, 26lb. chocolate, 10 lb. boiled sweets, twelve packets of chewing-gum, four tooth-brushes, twenty different types of tooth-paste to give variety, twenty-six tablets of soap, one tin dubbin, one nail brush, two sticks shaving-soap, one safety razor, six packets razor blades, one shaving-brush, one face flannel, one comb, one bottle hair cream, one boot brush, two writing-pads, two packets envelopes.

In addition each base has a good library, record player, radio, games, cards, amusements, magazines, encyclopaedias and a host of other things to occupy any spare time the men might have. Today, of course, film shows are a feature and at the bigger bases supplied by air they are kept up to date with the latest films, while visits and parties between near-by stations can be quite gay affairs. Mid-winter day is celebrated on 22nd June.

Although tractors, sno-cats and weasels are now standard means of travel and the use of the aeroplane has become general, the dog team is still a most valuable means of travel and haulage.

Husky dogs for the British Antarctic Expedition and for F.I.D.S. bases generally are bred according to a very definite plan and trained at Hope Bay and other Graham Land bases. The king dogs

weigh from 85 to 100 lb. each and the bitches 60 to 75 lb. They have a long coat of hair with a woolly undercoat and a thick layer of fat under their skin. Coated with seal oil it is both warm and very waterproof and very smelly. Their paws are large and they have strong legs and deep chests. They are fierce and even savage fighters with one another especially if contending for the team leadership. With men they are generally quite friendly but have been known to attack them and can be very self-willed at times especially when food is about. In camp they are attached by their own chains to a long chain firmly pegged down at each end. This gives them freedom to move about and roll in the snow, but prevents them from getting at each other. Before starting a journey the sledge is very firmly staked down and the main trace laid out and pegged down at each end so that the dogs cannot race off with it. The dogs are then attached to the main trace by the harnesses. The words of command sound something like: *Weet*—start, *ar*—stop, *irrrra*—left, *auk auk*—right. A team of nine huskies can do the work of a 2½ h.p. engine on a ration of six pounds of pemmican a day each and will haul a sledge with a load of half a ton for twenty-five miles.

The sledges are of the Nansen type in which the components are bound together with cords and raw-hide thongs. They are made of tough and resilient ash runners about twelve feet long with short upright pillars to which are attached the cross-pieces which in turn support the long pieces of wood which

carry the load. A spliced cane cow-catcher at the front enables the sledge to ride up over rough ice. Handlebars give the driver a good grip to help to steer. Being lashed together, the whole structure can be taken to pieces and stored in a small space in a ship or a hut. When it is being used it is rough and springy and will "give" as it goes over rough ground in a way that a rigid structure could not do without breaking. It weighs about 120 lb., but will carry a good load of over half a ton if need be.

A footbrake with long spikes which can be pressed down into the snow helps the driver to control it. For going down long slopes a rope is slung underneath the runners to act as a drag. When the journey is completed and camp is to be made one man very quickly drives in a picket to hold the sledge while the second man drives in a picket at the front of the main trace; this is to keep the team spread out in line and stop the traces being tangled as the dogs try to get at each other. Their hunk of food is then very quickly given to them. They are very hungry animals and have been known to eat greasy rags and dishcloths, and a husky running loose will in a few minutes snap the heads off scores of penguins.

IV

Antarctic Animals

PLANKTON

The basis of all animal life in the Antarctic is plankton. Plankton is made up of many living things with a wide range of size and complexity of body structure. Many are one-celled plants and animals only a fraction of a thousandth of an inch across. Some are quite large shrimp-like creatures two or three inches long. The biologist on an expedition will look in his nets for such things as Algae, Diatoms—single-celled plants, Protozoa—single-celled animals, Coelenterates—jelly-fish, Molluscs—sea fritillaries, Ctenophores—sea butterflies, small Crustaceans—water fleas, larger Crustaceans—fairy shrimps and many other small animals which can be so great in numbers that the sea is thick like pea soup. Many of these animals are brightly coloured and some are phosphorescent so that the plankton may colour the sea yellow or green and at night it will glow with a greenish light. All these plants and animals like cold water with a low salt content and prefer long periods of darkness. Antarctic conditions are ideal for them and the long light summers suit those animals which breed during the summer season. The plankton—the name comes from a Greek word meaning wanderer—are not strong swimmers and drift with

whatever current of water they are in. They seem to maintain their position by changing their depth according to the season and so drift backward and forward keeping always near the ice.

This association of small creatures, each one living on something smaller than itself, and supported by the large amounts of oxygen and carbon dioxide in the cold water, in turn feeds all the browsing animals of the Antarctic. The baleen whales, crab-eating seals, whale birds, fishes and some, penguins feed directly on the plankton. As much as a ton of the shrimps called krill have been taken from the stomach of a baleen whale. Feeding on the browsers are the predators, the sea leopards, seals, fish, skuas, some penguins, and the killer whales. Thus a whole chain of life is supported by the plankton. Incidentally, as we shall see, it also helps to support us, for we in turn catch the whales and use them for meat and margarine.

PENGUINS

This is the most common antarctic animal after the plankton animals. Penguins are found only in the southern oceans and mostly on the fringes of Antarctica. The clown of them all and the most generally known is the Adelle penguin. These saucy and inquisitive busybodies sound like cockneys with twangy voices. They are about twenty inches tall and wear a smart black and white outfit which looks like evening dress. Both males and females

wear the same outfit and one of the difficulties faced by biologists is to find out just how the males and females recognize each other. For their rookeries they choose sheltered bays out of the path of the main blizzards. One such rookery at Geologie Point in Adelie Land has about fifty thousand penguins on the beach during the nesting season. They spend the winter out on the edge of the ice or on the Antarctic Islands, but in October and November they arrive at the rookery and begin to pair off. Having paired off and found a nesting site they make a nest of a little circle of pebbles often stolen from their nearest neighbour. Eggs hatch out in late November or early December and the parents then have a busy time going fishing and then coming back for the young to dip their beaks down into their parents' crop to get their meal. When the penguins are entering the water they keep a good look-out for such dangers as the leopard seal and will try to nudge one another in first as a test case. Once one has gone in safely all the rest will follow. To get back on to the ice, or to land where the beach is steep, they come zooming up out of the water like a bullet and skid to a stop on their bellies before solemnly waddling off on their stumpy little legs. But on those legs they will walk many miles to find open water, and from the open water to the rookeries can be seen trudging long lines of parents, bringing back the food to their young, and then setting out once more for a long trek back to the feeding grounds. They leave the rookeries for their

winter quarters about April when daylight becomes short and the ice begins to close in on the land.

Emperor penguins are the only large animals to remain on the continent during the winter. One of the latest studies of their life has been made by French scientists at one of the few penguin rookeries near Geologic Point in Adelie Land.

Emperor penguins arrive in early March (autumn) and by the end of March about 15,000 are in the rookery. An adult emperor stands about thirty-two inches tall and when in good condition weighs about 60 to 90 lb. The back is blue with silver reflections. The head is jet black like the wings. On the cheeks and at the throat is a yellow patch. The female has a faint blue line around the beak. All the rest is dazzling white. The couples seem to recognize one another by singing or crooning so that their voices can be heard and identified by their mates. By May the females are laying their single egg. Once the egg is laid it is taken by the male and tucked up on to his feet to keep it from the cold ice and covered by a loose flap of downy skin on his belly so that it is hidden from view. Standing holding the eggs the males huddle together on the ice like rugby players in a scrum with their backs turned to the wind. Once the female has laid her egg she goes off to find open water and to feed. She does not return until the eggs are hatching in July.

From May to July the egg, weighing about 1 lb. and some four inches in diameter, is held warmly between the legs of the male. He is handicapped by



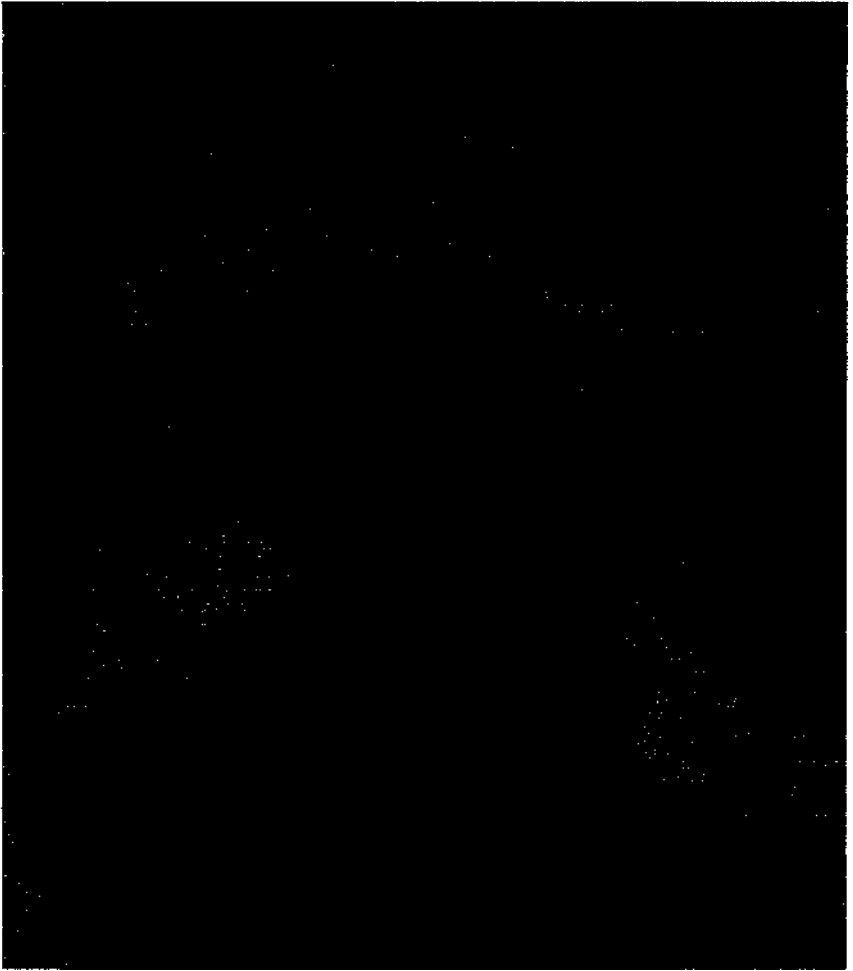
21 *Left:*
Emperor penguin

Paul Popper



22 *Right:*
Royal albatross and
day-old chick

Paul Popper



Trans-Antarctic Expedition

23 Sno-cat trapped in a crevasse on the way to South Ice. Sno-cats have four independently driven tracks and they can still travel even if one track is removed. Engine, battery and cabin are heated by petrol heaters. They can haul loads up to five tons

his load and can only shuffle about with small movements of his feet so you can see what destruction a husky could cause in such a rookery. During this incubation period he does not feed and slowly loses his thick fat. As soon as mother returns he hands over the chick to her and goes off to feed. A male penguin has sometimes been seen shuffling slowly towards the feeding grounds many miles away with the egg between his legs to look for his wife who has been slow in returning. When the mother returns she takes the chick on to her feet and feeds it from her specially constructed stomach, which has a membrane across it to form a kind of bag in which the food does not get digested. From this bag the chick gets a good supply of plankton, squid, shellfish, etc. As the walk from the edge of the ice may be some two or three weeks' journey, you can see the need for this protective bag.

These birds are specially adapted to their cold winter climate. Their feathers are densely packed waterproof quills which keep out the wind and the water. Their short legs and high blood pressure make sure that their extremities do not get frozen. An inch-thick layer of blubber under the skin helps their very efficient central heating system to keep them warm. By standing packed tightly together, almost like a swarm of bees, with the outer layers moving inwards in a kind of slow rotation they manage to conserve their heat even in the bitter cold. Stupid, slow and utterly defenceless on land, they must be protected or they would be wiped out.

In the sea they are exceedingly swift and their only enemies are the sea leopard and killer whale.

Six species of penguins live within the antarctic region, including the Adelie, King, Emperor, and Rock Hopper. Not all of them have rookeries on the continent of Antarctica; some live on the warmer islands to the north. Their main enemies on land are the gulls, skuas and petrels which attack them chiefly during their breeding season.

SKUAS, ALBATROSSES AND PETRELS

The biggest of all the antarctic birds are the albatrosses. Their wings are very long and narrow, being about nine inches from front to rear and twelve feet from wing-tip to wing-tip. With such wings they can sail on light breezes for days on end with little or no wing movement, looking down for food. Their long hooked beaks, with which they could snap off your fingers, are ideally suited for tearing flesh from dead fishes and mammals. They nest in November on the Antarctic Islands where there is grass and other plants from which they build a raised nest. One large egg is laid after a beautiful courtship in which dancing and displays take place. The young ones do not fly until they are about ten months old, after they have had several moults and have got their adult plumage. They are the aristocrats of the birds in the Antarctic.

The birds which prey mainly on the penguins are the skuas, petrels and sheathbills. The largest of the

skuas is a powerful bird with a wing span of over four feet. Equally at home on land or water they live while at sea on small fish, Crustacea and anything else the sea offers. They will chase the petrels and make them disgorge their food. They steal eggs from the nests of penguins and also carry off young penguins if they get the chance. They are a nuisance to explorers as they can very rapidly clean up any seal carcasses or other food left about. They breed and lay their eggs in December in rough hollows in the ground and as the penguins have the same nesting time the latter find themselves providing eggs and chicks as food for the skuas and their young. Further north on Kerguelen Island and other islands where the rabbit has been introduced, the skua will hover over the warrens waiting for some foolish young rabbit to show itself. They will fly at men and seem to want to strike their heads with their feet. They are shot as an addition to the diet at F.I.D.S. bases as their breast meat especially is very tasty.

Giant petrels have a greyish brown plumage, enormous beaks often stained with blood, pale grey-green eyes and long thin feet, and they live on carrion. The petrels have the horrible habit of spitting the contents of their crops as a stream of sticky red fluid at anyone who disturbs them and for this and their carrion eating are known as stinking petrels.

The sheathbills are the scavengers of the penguin rookeries. White birds as big as pigeons, they move

about the rookery keeping a sharp look-out for lost or broken eggs or young chicks in difficulty. All are very quickly cleaned up.

ANTARCTIC MAMMALS

All the antarctic mammals live in the sea and only come on to the land, if at all, for breeding. The seals include the crab-eating seal which is a clean-living animal with flesh free from parasites. The Weddell seal on land is a clumsy hulk weighing some six to eight hundredweights of flesh and blubber in a shiny velvet skin. They have magnificent moustaches and make weird and wonderful whistling and pipings, flute-like notes and raucous bellowings. They eat shellfish, sea slugs, octopuses, but do not seem to eat penguins. The meat is infested with all kinds of parasites which come from their food. The best parts are the flippers which are said to taste like turkey.

The sea elephant is the biggest of all the seals. It is up to twenty feet long and weighs about two tons. As much as twenty barrels of oil may be obtained from a fully grown sea elephant. They feed during the winter in the open sea living on squids and such small sea creatures. They return to land in September when the young ones are born and breeding takes place. During this time the adults feed very little. By November the mothers, having left their young ones as fat as balloons from the rich milk diet they have had, go out to sea to feed. The young

ones follow when they have lost their fatness. Both adults and young return for the moulting season in December and then all go off to sea again until the following September.

The beast of prey amongst the seals is the sea leopard. This is the hunter seal with the long slinky neck, sharp needle pointed teeth and a lithe sinuous body about twelve feet long. It waits along the edge of the ice for the penguins. With a shake of the head it kills them like a terrier worrying a rat. The claws and beak are snapped off, the skin shed and the penguin swallowed.

An interesting incident is reported by W. Ellery Anderson, the leader of the 1954-6 F.I.D.S. party at Hope Bay. Between the mainland and Carlson Island was an open area of water in which they saw about two hundred rorquals and killer whales, thousands of seals, penguins and some leopard seals all living together in perfect harmony.

A few weeks later the area of open water had decreased as the sea ice continued to close in and some of the men actually patted killer whales on the head as they came up to breathe. Later still they found only a small hole where four rorquals were coming up to breathe and the surrounding ice littered with the corpses of dead seals.

The Whaling Industry

HUNTING the whale has been the business of the Norwegians, Basques, the Eskimos and coastal Indians of North America and the Maoris for many centuries. In Europe, first the shallow waters near the coast were hunted with the whales being driven ashore by men in canoes. Later the hunters had to go further and further from their homes as the whales became scarcer. In the sixteenth century Basque fishermen were going as far afield as the river St. Lawrence. Spitzbergen was used as a base by men from England, the Netherlands, Germany and the Basque country in the seventeenth century. As the whales decreased in numbers the whalers had to seek them off Greenland. The whales of the North Pacific and the Bering Sea were being hunted in the 1840's by whalers from North America while British whalers were hunting the cachalot all over the world's oceans, even rounding Cape Horn to pursue it into the Pacific.

The use of mineral oil in increasing quantities as a lubricant and fuel helped to cause a halt to the slaughter of the sperm whales while the disuse of whalebone for corset stays and other finery such as "ostrich feather fans" and plumes on uniforms made whalers lose interest in the baleen whales. The need for edible oils for making into margarine

and cosmetics increased the demand for whale oil, and whale meat was found a good food both for human beings and animals, but the hunting of them could not really have been carried on with today's efficiency but for the persistence of the Norwegian Sven Foyn who developed and perfected the idea of using a harpoon gun mounted high on the prow of a steam-driven whale-catcher. Until then the methods followed were those described in *Moby Dick*. A rowing boat was lowered from the whaling vessel and by brute force was rowed up alongside the whale. The harpooner in the prow hurled his harpoon of wood and steel into the whale. Then followed a mad ride with the small boat being towed by the whale as it tried to escape. Finally a lance was thrust repeatedly into the whale until some main vein was cut and the whale thrashed about in its death-throes sometimes smashing the boat and killing the men.

Today the most highly scientific methods are used and nothing of the whale is wasted. The whales hunted are mostly of the baleen family, that is they have whalebone plates in their mouths and feed on plankton, especially the shrimps called krill.

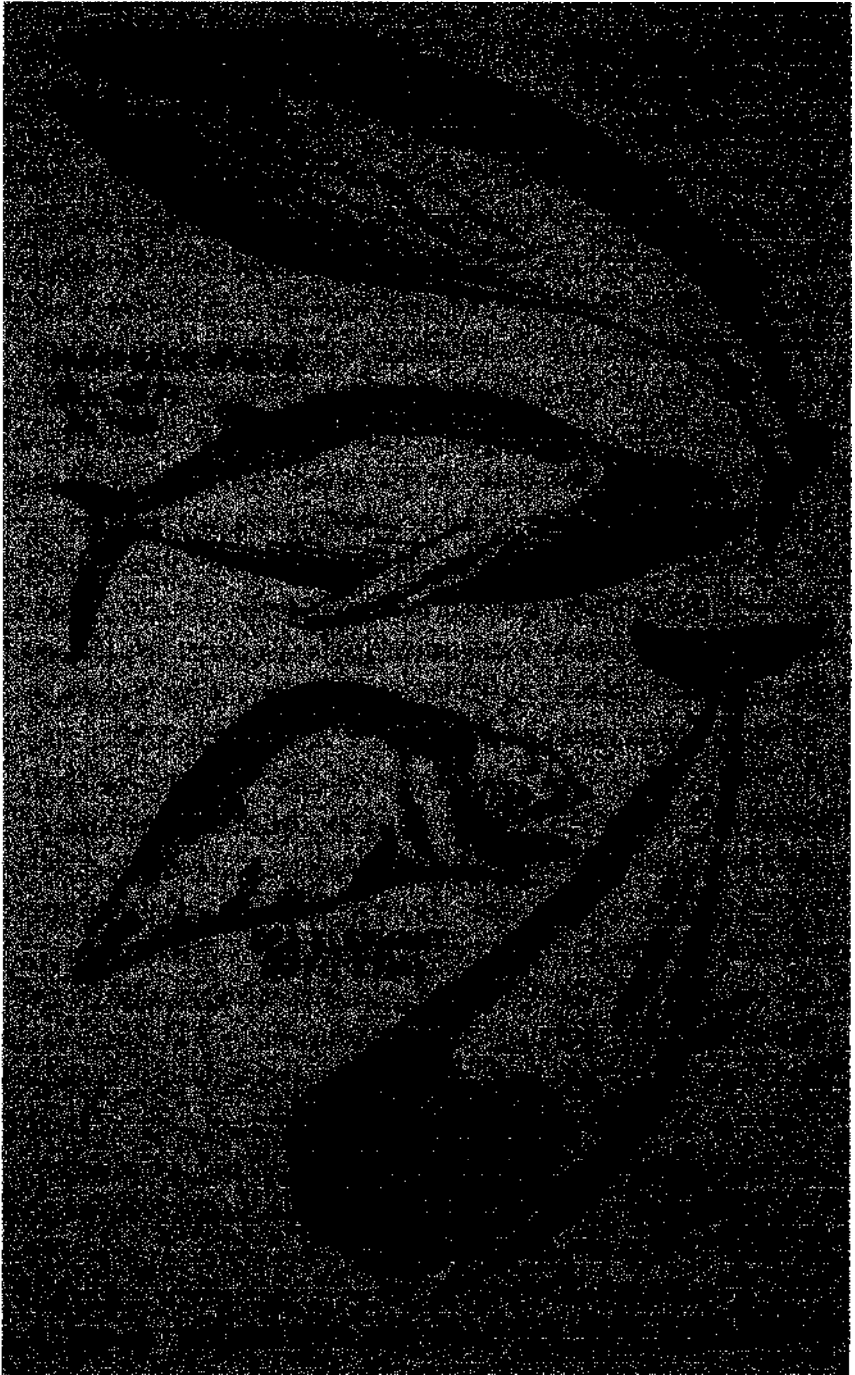
The blue whale is the biggest and by now the rarest. It is blue grey in colour with a whitish belly. It may be twenty feet long when born and suckles for about twelve months. When fully grown it may be one hundred to one hundred and twenty feet in length and weigh up to one hundred tons. It is the largest animal that has ever lived. Its tongue is as

big as a fully grown elephant and like the elephant the whale is a warm-blooded mammal with the remnants of a hairy coat. The bones in its fins resemble those in our hands. It needs to come to the surface and breathe air every five or ten minutes. To keep it warm it has a layer of blubber up to eighteen inches thick under its skin. A seventy-ton whale will give about half that amount of oil. These blue whales move about the ocean according to the season looking for krill, their favourite food. It opens its huge mouth and takes in a few tons of sea water. Closing its mouth it squeezes out the water and the krill is trapped against the fringing baleen plates or whalebone curtains hanging from its top jaw. These three to four hundred horny plates are triangular in section and the edges are like fringes so that the whole set of plates acts as a giant strainer.

The common whale or fin whale is more sociable than the blue whale and may be found in groups of ten or more. It too feeds on plankton as well as small fish including herrings. It can swim at twenty knots and when irritated will attack small boats. It may be eighty feet when fully grown and is the most commonly caught at present.

The sei and humpback whales grow up to fifty feet long and like warmer water than the others. The sei is long, slim and elegant. The humpback is ugly and more rounded and has very long flippers. It is very bad-tempered.

The sperm whale or cachalot has teeth and not whalebone. The teeth in the bottom jaw are



pointed and curved and weigh up to 5 lb. each. Like the other toothed whales, the bottlenose, narwhal, beluga, porpoise and grampus it lives on fish but also on giant cuttle-fish. Scars on the bodies of captured sperm whales and the contents of their stomachs show that these cuttle-fish attain gigantic proportions and may have arms up to thirty feet long. The sperm whale may be seventy feet long with its head about twenty feet. It has a big flat forehead and spouts somewhat sideways. To keep this huge bony head afloat it has a chamber in its head filled with very fine sperm oil which is excellent as a lubricant for delicate machinery. A fully grown whale may have 350 to 400 gallons of this oil in its head. Lumps of ambergris from this whale have been used for centuries as an absorbent for fine perfumes and once fetched their weight in gold.

Whale oil is the most important product of the industry and is used for making margarine, cooking-fat, soap and other toilet preparations. It is used in the manufacture of jute, as a cooler and lubricant when machining and tempering steel. Spermaceti oil is used mostly as a basis for face creams and cosmetics. Whalebone for corsets, etc., has largely been replaced by plastics but it is still used for some types of brushes. Whale meat which was once left for the sharks, the birds and the other sea creatures is now sold for human consumption, especially in Japan. It is used in some tinned meats and animal foods. Nothing from the whale is wasted, even the bones are ground up and used as fertilizer.

Norway and Britain jointly operate the factory ships which refit at Newcastle or Sandfjord in Norway. The factory ship of some 25,000 tons takes on immense quantities of stores before leaving for the south. On the way south they may call at ports such as Curacao in the West Indies to refuel and then pick up the catchers at Walvis Bay, an old land-based whaling centre. Cape Town is the last refuelling port and then the vessels make for the whaling grounds ready to begin operations when the official season opens in December.

Amongst the other things needed to keep this floating factory self-sufficient for the many months it is in the Antarctic are: live pigs to provide fresh meat, 200,000 lb. potatoes, 80,000 lbs. meat, 100,000 lb. salted and smoked meats, 60,000 lb. flour, 25,000 lb. sugar, 10,000 lb. butter, 20,000 lb. margarine, 10,000 lb. jam, 6,500 lb. coffee, Post Office supplies, reference, fiction and non-fiction library, ship's stores, clothing, cameras, films, tobacco, sweets, razor blades, and all the things about three hundred men will need while at sea for about ten months. Each day the cooks will produce about one hundred and sixty yards of sausages for breakfast and supper, and bake about two hundred large loaves. In addition the factory ship must act as the main supply ship for the catchers and oil tankers which accompany her. For catching the whales they will take about two hundred warps each of 120 fathoms of 7" manilla (seven inches in circumference) and four hundred warps each of 120

fathoms of 4¼" manilla, seventy-five warps of nylon, together with about 1,600 harpoons and ammunition, spares for machinery, spare propellers for the catchers, hawsers as much as 30" in circumference and 7" steel cables. On board there is a fully equipped operating theatre and hospital ward with doctors for dealing with any injury or sickness. A laundry, carpenter's shop, blacksmith's shop and engineering workshop, an electric power station producing 2,000 kilowatts, and a radio station, are also on the ship. The governments keep inspectors on board to check each whale caught to see that the international agreements have not been broken and they also have a laboratory to carry out biological investigations into the life and habits of the whales. The main whaling countries, with the unfortunate exceptions of Russia and Japan, have agreed to preserve the whaling industry by not killing more than a certain number each year. The Control Commission specifies that whales must not be killed before 5th December. They must be over seventy feet long for blue whales and over fifty feet long for fin whales. They must not be mothers with young. The ships have radar and helicopters to help with spotting the whales, direction-finding equipment, depth sounders, and inter-ship radio telephones so that the catchers can talk to the factory ship and to each other. Despite all these advantages whales are still difficult to catch for they seem to learn new dodges for avoiding the whale catchers and no longer follow their old habits. Also many whalers

say that the whales are not growing up so quickly now because they do not get enough time /or feeding and resting and are kept too much on the move. When the agreed total of 16,000 blue whale units have been caught the ships are told by radio to stop hunting. Two fin whales equal one blue whale and sperm whales do not count. In any case the season ends on 1st April.

The whale catcher is no longer a little rowing-boat. It is now a vessel of about 300 to 500 tons about 500 feet long with a 2,000 h.p. engine to push it through the water at a speed of 15 knots when cruising and like a destroyer at full speed. They are fully equipped with every modern device to help them in their task and with such things as hot baths for the crews and electric cookers in the galley. Mounted high on the prow is the harpoon gun and the harpooner is the "prima donna" of the crew. On his skill and judgement depends the entire success of the operation and the wages of the entire whaling force. In addition to his basic salary each man gets a certain fraction of the proceeds of each whale. The gunner gets from £7 10s. to £30 per whale and it is on record that in 1957 one gunner got £240 for eight whales in a row.

Once the whale is sighted by the look-out in the crow's nest the gunner is in control giving orders to the steersman according to what he thinks the whale will do in its efforts to escape. When the gun is fired and the harpoon hits the whale, a 6-lb. bomb goes off to kill the whale and the flukes of the

harpoon open *to* prevent the whale shaking it off. The harpoon warp is hauled in by powerful winches, and the whale is blown up with compressed air to keep it afloat. A small marker flag on a thirty-foot bamboo pole is plunged into the carcass to indicate which catcher made the kill. The position of the whale is signalled to the collecting vessel and the catcher sets off again to look for another whale. In bad weather a small transmitter may be attached to the whale to signal its position to the collecting vessel. The busy boat collects the whales and tows them back to the factory ship. At the factory ship the whale is hauled up a ramp at the stern on to the flensing plan. Here the blubber is peeled off in long strips. Steel cables are used to haul away the blubber while the flensers detach it from the carcass with their long-handled and razor-sharp flensing knives. Should a knife slip or a cable fly across the deck, or the whale's stomach burst, the men may be seriously injured as they are knocked flying across the deck. The blubber is cut into chunks and fed into the funnels leading to big pressure cookers on the deck below. Here it is steam-heated and cooked at a pressure of 60 lb. per square inch. This extracts all the oil which, after filtering and purification, is run off into big tanks where it is stored either until a tanker comes to collect it or until the factory ship returns to its home port.

The livers weigh about a ton each and the heart and kidneys about half a ton each. From them valuable oils are obtained which are very rich in vitamins.

The digesters or pressure cookers can handle about 500 tons of oil in a twenty-four-hour day so that the factory ship will have produced in a good season some 20,000 tons or more of whale oil from 2,000 whales, besides hundreds of tons of meat and fertilizer and in doing so will have used about 32,000 tons of fuel oil in its engines.

The carcass is then pulled to the next stage where all the meat is cut off and finally on the bone plan the bones are cut up by circular saws and band saws and in turn go into digesters to have their oil removed. The different kinds of oil are stored in separate tanks for they will fetch prices varying according to their qualities. The grax or ground-up bone and offal from which all useful materials have been extracted, and for which there is no storage space, is drained off into the sea and provides a rich feeding ground for many sea-birds and other creatures.

At the end of the season the men will have been paid a total of something like £250,000 in wages and when they get home they are rich men. They have been known to take a taxi all the way home from the docks although they lived over a hundred miles away.

The average annual production of whale and sperm oil over the last ten years has been:

Whale oil from Antarctica 2,033,000 barrels. Sperm oil
213,000 barrels

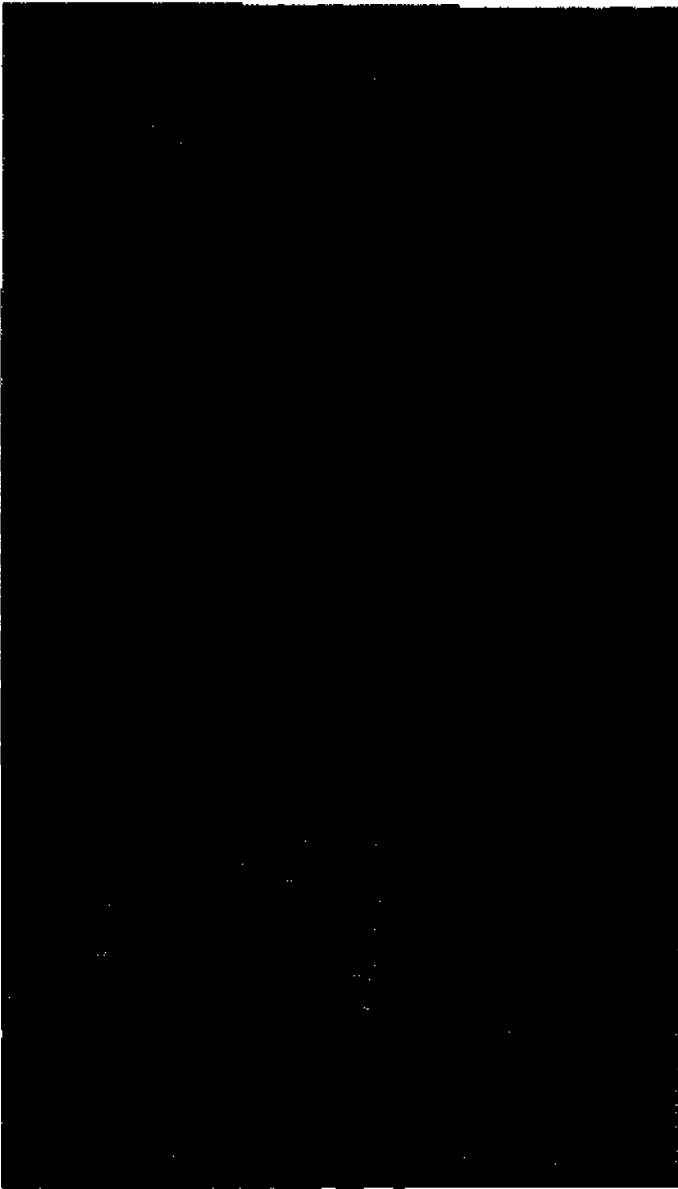
Whale oil from elsewhere 255,000 barrels. Sperm oil
236,000 barrels

6 barrels == 1 ton approximately

The price of whale oil has varied from £67 10s. to £172 nos. per ton and is now (1958) about £80. Sperm oil has varied from £42 IOS. to £146 and is now £72 per ton.

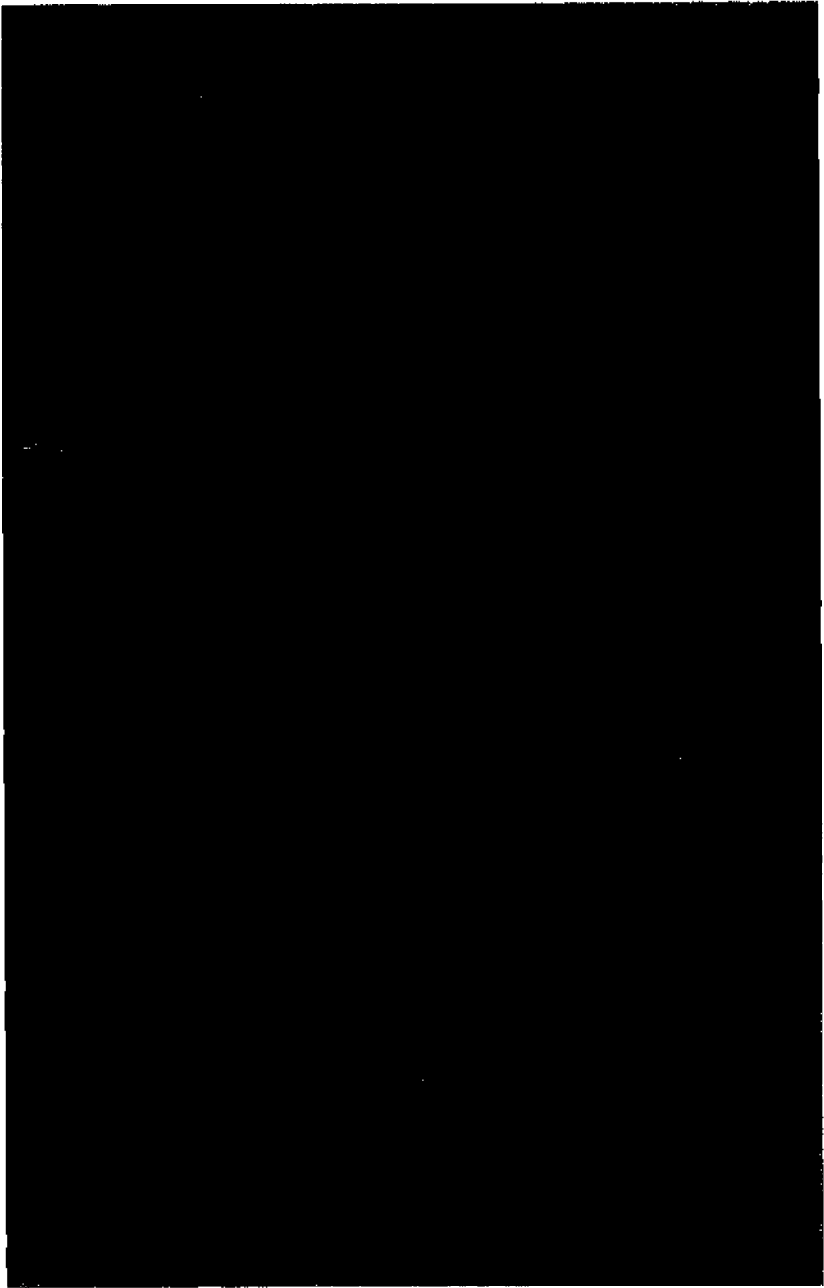
Being with the whaling fleet is an exciting job. From December to April they do nothing but eat, sleep, work, eight hours on, eight hours off, continuously. The stench of the whales is awful. Fog, ice, blizzards, the dangers of the flensing plan, all make the job exceedingly hard and dangerous, but each year there is great competition for the places on these floating factories and their attendant vessels.

Besides the whalers the only enemy the whales fear is the killer whale. These slim fast swimmers hunt in packs like wolves. Attacking a huge blue whale or fin whale they will try to tear open its mouth to get at its tongue. Once the tongue has been ripped out the whale bleeds to death and the killers feed on it at their leisure. The killers feed also on other sea creatures. From the stomach of one was taken thirteen porpoises and fourteen seals. They will range along the edge of the ice and try to tip into the water anything on it which looks like a seal. Ponting, who was the photographer on Scott's expedition, was trying to take photographs of some killer whales when they came under the ice and broke it up to try to get at him. When he did not fall into the water they reared up to look for him and then made for him again.



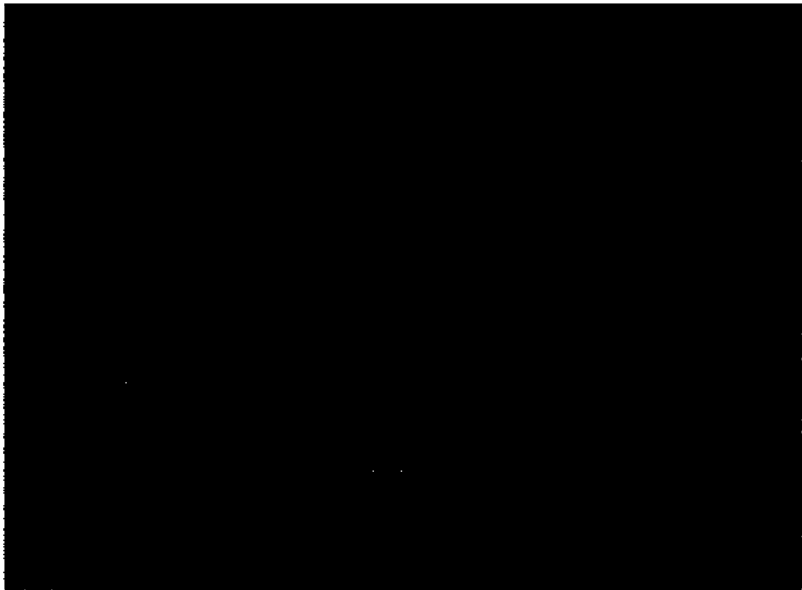
Paul Pop_

25 Whale catcher about to harpoon a whale. Two whales blow a few yards in front of the catcher. The harpoon gun is loaded and the warp is coiled in front of the gun. A second harpoon lies on the deck on the right



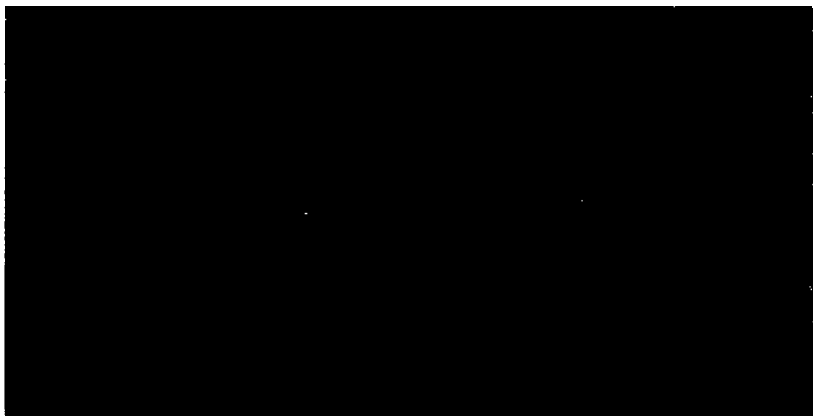
Paul Popper

26 A large fin whale drawn up on the slipway of a factory ship



Paul Popper

27 Flensing a whale. The lower jaw has been removed and the whale bone can be seen at each side of the top palate. A cable has been attached to the tip of the tongue which the man on the right is cutting out with his flensing knife

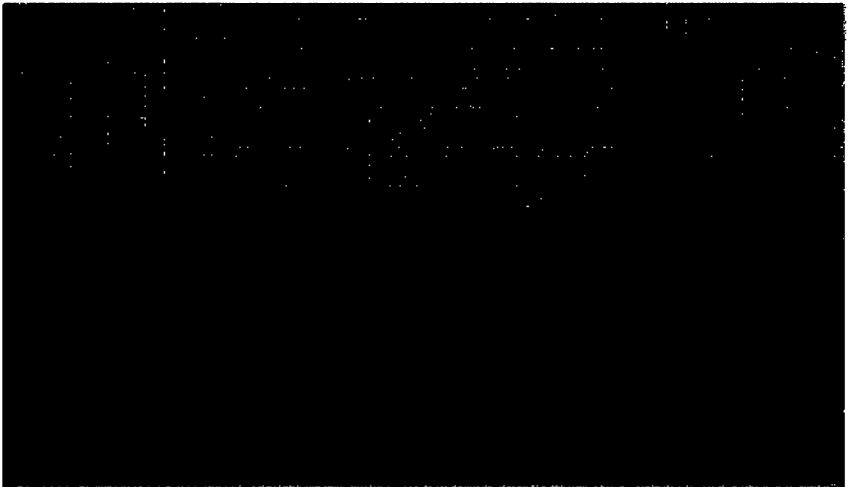


F. G. Bird and F. J. D. S. Bureau

THE FALKLAND ISLANDS



29 A shepherd's house on the campos



30 A gang of sheep gatherers with their dogs

VI

The Antarctic Islands

DOTTED about in the Southern Ocean are a few small islands which form stepping-stones to the continent of Antarctica. The largest group and most densely populated are the Falkland Islands.

THE FALKLAND ISLANDS were first sighted in 1592 by John Davis and again by Sir Richard Hawkins in 1594. In 1690 Captain Strong named them after Lord Falkland, the Treasurer of the Navy. Port Louis was established as a settlement for Acadians in 1764 by de Bougainville after the fall of Canada to the British. In 1765 Commander John Byron anchored in what he called Port Egmont and formally took possession of the group for King George III. Captain MacBride was sent to do a detailed survey and was surprised to find the de Bougainville settlement. From then on, disputes have always arisen over the possession of the islands, for in addition to the French and British claims, the islands came into the section of the world given to the Spaniards by Pope Alexander VI and from their claim has come the present-day claim of Argentina. Chile also claims them as being a continuation of the Andes. The islands have been continuously settled and administered by the British since 1834 and all the inhabitants until quite recently were mainly of

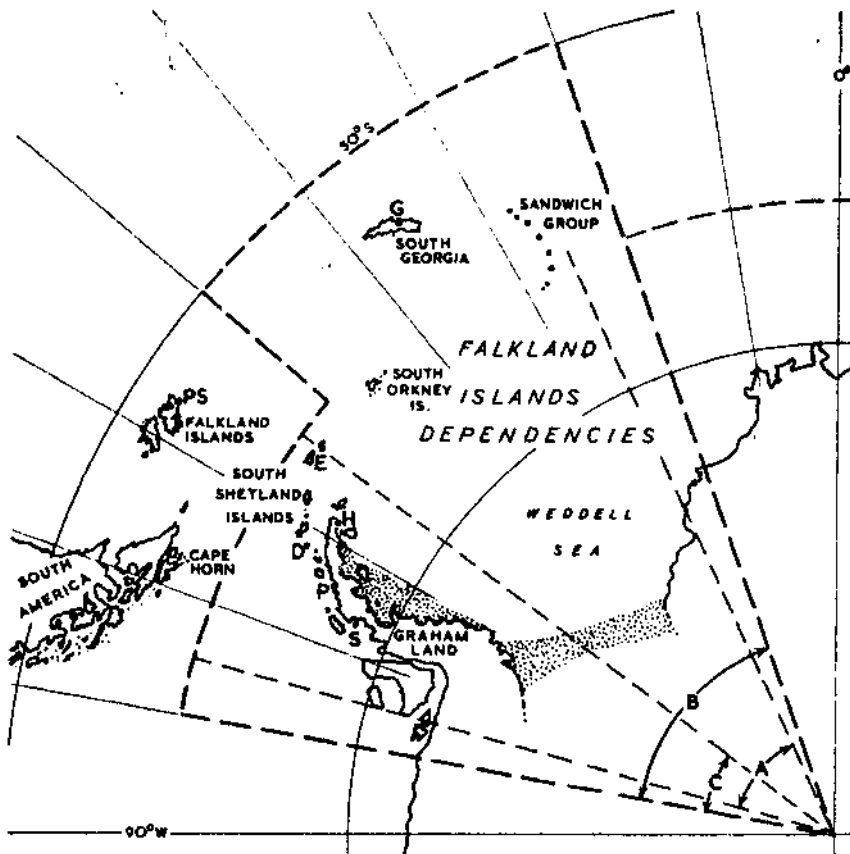


Fig. 31. THE FALKLAND ISLANDS DEPENDENCIES

- | | | | |
|---|----------------------|----|------------------------------------|
| A | Claimed by Argentina | B | Administered by Britain since 1834 |
| | | C | Claimed by Chile |
| D | Deception Island | S | Stonington Island |
| E | Elephant Island | PS | Port Stanley |
| H | Hope Bay | G | Grytviken |
| | P | | Port Lockroy |

Scottish descent. Neither Argentina nor Chile will submit their claims to the International court and so the matter rests.

In many ways these islands are much like the Hebrides, low undulating islands covered with peat bogs, marshes and tundra-like grasses and plants. The constant damp and drizzle, salt-laden winds and overcast skies discourage tree growth and the biggest plants are the berry-bearing bushes similar to the bilberry of the Pennines. A few planted trees grow in sheltered places.

Cattle at one time provided food and a source of income for the islanders, but after 1834 sheep were introduced and now it is the major industry of the islands. All the marketing is done through the Falkland Islands Company who send all the produce to Britain. This company also holds, amongst many others, the largest sheep run on the islands, 300,000 acres. The vegetation is so sparse that each sheep needs about four or five acres of grazing ground to keep it in reasonable condition and each shepherd will look after some four to five thousand sheep. It is a lonely life and since there are practically no roads most of the islanders have their homes on the sea-shore. The loneliness was leading to men and their wives leaving the islands, but under the very enlightened governorship of Sir Miles Clifford their conditions have been greatly improved. Radio telephones have been installed so that they can talk freely with one another and also with the Government officers in Port Stanley. A sturdy naval fishery

vessel has-been bought to go to any homestead where help is needed. An internal air service made it possible to get help even more quickly to the sick or injured and each homestead was provided with a good medical kit for first aid. A hospital was built, boarding-schools were started and many children were brought to the boarding-schools in England run by the Dorset County Council. Family allowances were introduced, also an Old Age Pension Scheme so that much of the financial worry was taken from the parents and old people. In Port Stanley was the permanent headquarters of the Falkland Islands Dependencies Survey and so a very ready response was able to be made when any survey party needed help. The only real roads are in Port Stanley which has a population of about 2,500. A new town hall was built which also gave the people a cinema, dance hall and library, and electric light and power were made available.

All the produce of the islands comes to Britain, but the islands do not really pay their way. Their chief source of revenue is a tax on imports of whisky. Since most of the people are of Scottish descent they like a tot of something to keep them warm. The islands' chief importance is as a staging post to Antarctica and as a possible aerodrome on the trans-Antarctic air route which may one day connect the southern continents as the trans-polar air route connects Europe and America.

Penguins and many other antarctic creatures breed on the rocky and picturesque coasts and their

flesh and eggs form a welcome addition to the diet of the islanders. Amongst other things one of their enjoyments is pony racing which H.R.H. The Duke of Edinburgh enjoyed on his visit to Antarctica.

SOUTH GEORGIA is a rocky and mountainous island noted for its whaling station at Grytviken where repair depots contain stores and repair facilities for the whaling fleets worth some five million pounds or more. It is also known because on the hill behind the village is the grave of Sir Ernest Shackleton who died here of heart failure while preparing for his last attempt to reach the South Pole. It was only fitting that the base from which Dr. Fuchs began his crossing of Antarctica should have been named Shackleton Base, for this was the route that Shackleton had intended to follow.

KERGUELEN ISLAND belongs to France and at one time over five hundred sealing and whaling vessels operated from it. Today they have gone and there is a government research station studying the problems of Antarctica. It is a rocky volcanic island and is famous for the Kerguelen Cabbage discovered by Captain Cook and used by whalers as a fresh vegetable to prevent scruvy. Its cabbage-like leaves have a strong oil in them which makes them very pungent to smell, but very eatable. It was much used in soups and stews. Rabbits left here to breed and to provide an emergency ration for stranded whalers have destroyed nearly all the

cabbage plants and specimens are not easy to find. The island is a reserve for seals, sea elephants and other antarctic animals.

MACQUARIE ISLAND belongs to Australia and like Kerguelen it is a base from which the problems of Antarctica are studied and also a reserve for antarctic animals.

VII

The International Geophysical Year, 1957-8

INTERNATIONAL Geophysical Years were held in 1882 and 1932 so that a combined study of the Arctic could be made by scientists from all the interested nations. As a result of those studies we know a great deal about the Arctic and it is commonplace now for men to travel for months on end about the Arctic Ocean on "permanent" ice islands, while anyone can book a ticket for air travel between Europe and North America via the North Pole, or very near it. From these studies we have learned that much of our weather begins by changes of conditions in the Arctic and from the information provided by the Arctic weather stations we can more readily predict what kind of weather we are likely to have. We do not possess the same information about antarctic conditions and so Britain, U.S.A., U.S.S.R., Australia, Africa, New Zealand, South Africa, Argentina, Japan, Norway, France and Chile joined together to set up about fifty stations to study all possible aspects of Antarctica and to pool their knowledge. Very briefly their main studies concern:

Geophysics: the shape and size of the earth and what it is made of.

Meteorology: how conditions in the atmosphere of Antarctica affect weather conditions over the whole world.

- Geomagnetism: what causes the Magnetic South Pole to wander and what effect this has on problems of navigation.
- Aurora and air glow: the electro-magnetic effects of the aurora australis and how these affect radio communication.
- Ionosphere physics: the properties of the ionosphere which can be more readily studied by men at the Pole during the winter darkness when the effects of sunlight are not present.
- Cosmic Ray activity: in the clear dust-free air over the Pole the amount and extent of cosmic ray activity can be studied more easily. This is very necessary knowledge to future space travellers.
- Glaciology: what is happening to the world's largest ice-sheet.
- Oceanography: a study of the Southern Ocean and especially a study of what affects the growth and movement of plankton.
- Seismology: earth movements.
- Gravity: changes in the pull of the earth's gravitational field at different places and what causes these changes.
- Star activity: the clear skies again allow better observation and photography of the stars than is possible from places further north. A better knowledge of the stars will help us to understand our own universe and help in problems of navigation.

When we know as much about the Antarctic as we do about the Arctic, then one day there may be permanent aerodromes at a number of places on the ice shelves and you may be able to book a ticket for a flight from Australia or New Zealand to South America or South Africa via Antarctica. It might also serve as a giant deepfreeze in which the world can store its surplus foodstuffs until times of shortage.

Sources consulted

The Encyclopaedia Britannica a.

Chambers's Encyclopaedia.

The Antarctic Manual, Royal Geographical Society

The Voyage of the Discovery, Capt. R. F. Scott. John Murray

Scott's Last Expedition, Capt. R. F. Scott. John Murray

The South Pole, R. Amundsen. John Murray

The Home of the Blizzard, Sir D. Mawson. Hodder & Stoughton

Little America, Admiral R. E. Byrd. Putnam

The Book of Polar Exploration, Edith L. Elias. Harrap

The Desolate Antarctic, Admiral Lord Mountevans. Travel Book Club

White Horizons, D. Liversidge. Odhams

Huskies,* R. Dovers. Bell

Antarctic Adventure,* Mario Marrett. William Kimber

The Lonely South, Andre Migot. Hart-Davis
Seventh Continent, A. Scholes. Allen & Unwin
The Antarctic Problem, Christie. Allen & Unwin
A Book of Recent Exploration, C. E. Key. Harrap
Thar She Blows, * H. Mielche. Hodge
Anare†, Dr. P. G. Law and J. Bechervaise. O.U.P.
The Voyage of the Pourquoi Pas in the Antarctic, * Dr. J.
 B. Charcot. Hodder & Stoughton
Such is the Antarctic, Lars Christensen. Hodder &
 Stoughton
The Great White South, H. G. Ponting. Duckworth
Expedition South, W. E. Anderson. Evans Bros
Southern Lights, J. Rymill. Chatto & Windus
Shackle ton, Margery and James Fisher. Barrie
 Books Ltd.

Articles in *The National Geographic Magazine*:

We are living at the South Pole, Dr. Paul A. Siple.
 July 1957
All-out Assault on Antarctica, Admiral R. E. Byrd.
 Aug. 1956
Admiral of the Ends of the Earth, M. B. Grosvenor.
 July 1957
Tear of Discovery opens in Antarctica, D. S. Boyer. Sept.
 1957
National Geographica Map updates Antarctica, Sept.
 1957
Across the Frozen Desert to Byrd Station, P. W. Frazier
 and C. L. Larsen. Sept. 1957

Books marked * will probably appeal most to young pupils for their lively style, *Anare†* for its lovely colour photographs which are bettered only by the later photographs in *The Crossing of Antarctica* by Sir V. Fuchs and Sir E. Hillary which was published after this book had been completed.

Articles in *The Geographical Magazine*:

Explorers' Maps, R. A. Skelton. Oct. 1954

*Christmas in the Falkland**, Sir Miles Clifford. Dec.
1954

The Lives of the Seals, R. M. Lockley. Oct. 1955

The Trans-Antarctic Expedition, Sir Miles Clifford.
Jan. 1956

I.G.Y. The stage is set, G. Robin. July 1957

The Hazards of the Antarctic, R. H. A. Steward, Sept.
1957.

Articles throughout the I.G.Y. in the *Daily Telegraph*, *News Chronicle* and the *Motor* of January 15th, 1958, etc.

Articles in *The Geographical Journal*:

General atmospheric circulation and weather variations in the Antarctic, Lumb & Britton. Sept. 1955

The Falkland Islands and their Dependencies, Sir Miles Clifford. Dec. 1955

A.N.A.R.E., Dr. P. G. Law. Mar. 1956

Operation Deepfreeze, Lieut.-Com. M.J.N. Foster.
Mar. 1957

Airborne surveying in the Antarctic, P. G. Mott. Mar.
1958

Information supplied by the B.P. Trading Ltd. and Hector Whaling Co. Ltd. Displays in the Hall of Whales of the Natural History Museum, London.

for further reading

SHACKLETON

by

Margery and James Fisher

'Most compelling of all biographies of adventure'

MANCHESTER GUARDIAN

'The authors of this book modestly offer it as "an interim study of a great man", a bridge, as it were, between the warm judgment of his contemporaries and the cool, later appraisal of history. But Shackleton being the great man he was, their achievement has quite outrun their purport. The work is, in effect, a superb and comprehensive tribute to the explorer. That they have succeeded in making it so . . . is the measure of their objective skill in collaboration. Long after the book is closed the reader will recall with a sense of wonder those photographs of the Endurance beset by ice-floes and of the pattern of ice-flowers formed in treacherous array.'

THE SCOTSMAN

'Here is Shackleton in triumph and disaster, in public and in private life. There are glimpses enough and to spare of this ebullient lion of a man'

THE TIMES

30S. net.

Demy 8vo., 576 pages

with 48 plates and 37 maps and drawings

Barrie and Rockliff

