3.8 Charles Swithinbank

Dr Charles Swithinbank is currently an Emeritus Associate of the Scott Polar Research Institute, University of Cambridge, England.

Dr. Swithinbank has been conducting research in the Earth's Polar Regions since 1947, beginning with his participation in the Oxford University Iceland Expedition. He was the youngest member of the Norwegian-British-Swedish Antarctic Expedition, spending 2 consecutive years with 15 other researchers and support staff at Maudheim Station. During this expedition, he participated in several oversnow traverses measuring several hundred kilometers in extent and lasting for many weeks at a time. His polar expedition record stretches into the 1990s. During these expeditions, Dr. Swithinbank has conducted research at British, U.S., and Russian stations in the Antarctic.

Dr. Swithinbank received a B.A. in geography in 1949, an M.A in 1953, and a D.Phil. in glaciology in 1955 from the University of Oxford, Pembroke College. His work with the Norwegian-British-Swedish Antarctic Expedition continued through 1955. He then spent 4 years as a research fellow at the Scott Polar Research Institute, located at the University of Cambridge. From 1959 through 1963, Dr. Swithinbank was a research associate and lecturer at the University of Michigan (where he earned his private pilot's license). From 1963 through 1986, he worked for the British Antarctic Survey (a British government institute that is part of the Natural Environment Research Council), first as Chief Glaciologist (1963-74) and then as Head of Earth Sciences (1974-86). During this time, he spent three winters and more than 20 field seasons in the Polar Regions. He continues to visit the Polar Regions frequently as a consultant for commercial expeditions in Arctic and Antarctic waters. Since 1986, Dr. Swithinbank has been an Emeritus Associate at the Scott Polar Research Institute, University of Cambridge. He has been involved in the interpretation of satellite images of Antarctica, mapping, and the development of ice runways for transport aircraft.

Among his extensive professional activities, Dr. Swithinbank has been a member of the International Commission on Snow and Ice (Vice-President 1979-83), International Glaciological Society (President 1981-84), and the American Association for the Advancement of Science (Life Member). He has received many awards from British, American, Scandinavian, and other organizations for his outstanding contribution to a wide variety of studies of, and expeditions to, the Polar Regions. Among these awards are the King Haakon VII of Norway-Medal of Merit (1952), the Scott Polar Research Institute-Watkins Award (1953), the Queen Elizabeth II-Polar Medal (1956), the King Gustav VI of Sweden-Retzius Medal (1966), and the United States Antarctica Service Medal (1974).

A2 – Presentation of Charles Swithinbank

Parallels between Antarctic travel in 1950 and planetary travel in 2050 [to accompany notes on "The Norwegian British-Swedish Antarctic Expedition 1949-52"]

Cost of the expedition (Slide 1)
Norway and Britain were recovering from World War II and food was still rationed. The total cost of the 16-man 2½-year expedition had to be less than £1 million (circa $40M today). Norway agreed to shoulder 50% of the costs, Britain and Sweden 25% each.

Capacity of the launch vehicle (Slide 6-7)
The only affordable vessel was *Norsel*, a 600-ton sealer owned by the skipper. All equipment and supplies had to be jammed into the holds or carried on deck. Initially it was planned that the ship would go south in 1949 and only return in 1952 to evacuate us. In the event, the budget allowed *Norsel* also to come in the middle summer season, bringing supplies, aircraft, and personnel.

Objectives (Slides 2, 12, 21-22)
To explore as much as possible of 1 million km^2 of unexplored territory. We were the first expedition to winter in Antarctica between 95°E and 57°W - nearly half the coastline of Antarctica.

It was understood that we must be self-sufficient in every respect for 2½ years. There could be no firm or detailed plans for inland exploration until we found where it was possible to make a landing.

Personnel (Slides 9-11, 21-22, 24-28, 32)
Limited by cost and logistics to 15 men: 8 science and 7 support staff. This ratio meant that scientists had also to serve in support capacities. The science staff was to consist of:

(a) A topographic surveyor to provide ground control for aerial mapping. The prime duty of the first explorer in any new land is to make a map showing what is there.
(b) Two glaciologists. The initial impetus for the expedition came from a Swedish glaciologist who had seen indications of glacier recession in aerial photographs taken by the Neu Schwabenland Expedition of 1938-39. His own work had documented contemporary glacier recession round the North Atlantic, which led to the question of whether climatic warming was also occurring in the southern hemisphere.
(c) One geophysicist to measure the thickness of the ice sheet where possible. Contemporary speculation was that the Antarctic ice sheet might be 300 m thick, whereas German work had claimed ice thicknesses of 3,000 m in Greenland.
(d) Two geologists. The idea of continental drift was a hot topic among earth scientists. We might find critical evidence.
(e) Two meteorologists. We could fill a vast gap between existing weather stations (>2,000 km in every direction). Also weather forecasting was important for Norway's whaling industry.

Selection of personnel (see Personnel)
Participation involved signing on for 2½ years; a 1-year expedition would have ruled out all but localized exploration. This limited the number of candidates. Four out of 15 were married. Selection was by interview and medical examination. At that time, the idea of female participation was not even discussed. The capacity of our small ship precluded any redundancy in staffing. In the event, three men drowned in February 1951. The rest of us, qualified or not, had to take over their jobs.

Insurance
Personnel were not offered life insurance nor, to the best of my knowledge, did the unmarried members insure themselves.

Analog training
This is vital (as with travel on other planets). Whilst only two out of 15 had ever been to the Antarctic, almost all had worked in the Arctic. I had undergone winter and summer training in Iceland and Lapland and was taught crystallography by Max Perutz.

Medical (Slides 24-28)
We had a young Swedish physician. He had to accept that in **no** emergency – however serious – could help be brought in from outside. Knowing that earlier expeditions had found that teeth rot in all climates, he took a three-week course in dentistry and prepared for trauma of any kind – in men or dogs. He was not found wanting. A geologist got a chip of rock in one eye and the eye had to be removed.

Salary
The tripartite committee agreed that compensation should be no greater than the same person would have been paid at home. Some of the single men, myself among them, would have been happy to go without any pay. The money, we felt, would be better spent on equipment.

Launch pad (Slide 6)
The small foredeck of *Norsel* could only accommodate three Weasel tractors, a large ice coring drill, dog food, spare parts and 62 sled dogs on top of it all. The rest of the upper deck was hidden under fuel drums. Both holds were full and a crated aircraft sat on the after hatch with a second aircraft on top of it. The Plimsoll line was below the waterline.

The base (Slides 3-9, 13, 37)
The coastline consisted of ice cliffs 20-25 m high – impossible to land on. We steamed from 5°E to 12°W searching for a low point where the ship could unload. Finally we found one at 10°56´W, far to the west of where we had hoped. Four hundred tonnes of cargo were unloaded and driven 3 km inland, where a base was established on floating ice shelf. Food for 3 years was taken in case the ship was unable to reach the base after the planned 2 years.

Only now did it become possible to make detailed plans. The science staff themselves decided on priorities in their own fields. This chain of events was as foreseen from the start of the expedition and proved best in the circumstances. In each pair of the science staff, one was senior and thus had the final say. The seniors met with the leader to decide on who was to use which tractors or dog teams in each season. Experiences gained in the first field season affected planning for the second. In the circumstances I can think of no better way.

Discipline on base was invisible. We worked from breakfast to supper with time only for a quick lunch. The leader set a roster for domestic duties in which all staff had to take part. Work involved clearing the exits from drift snow, cutting and bringing in snow blocks to make water, washing dishes and sweeping out. We took pride in handling our science programs without help, but if help was asked (for heavy lifting or moving), it was willingly given.

Aviation (Slides 4, 23, 31)
Constrained by what could be carried on *Norsel* and deployed while the ship was present. Two light aircraft in each of three seasons. In 1949-50, two Austers of the Royal Air Force; in 1950-51 two

Norwegian-built aircraft crewed by Widerøes Flyveselskap; and in 1951-52 two aircraft of the Royal Swedish Air Force. Together they took oblique aerial photographs covering some 100,000 km^2. The Weasel crews were required to carry fuel inland to extend the range of the survey aircraft. Today the roles have been reversed: aircraft fly fuel inland to extend the range of surface traverses.

Field work (Slides 14-23, 31-36)
After an initial reconnaissance with dog teams seeking a crevasse-free route inland, all three weasels, each one hauling two tonnes, made two journeys to a point 300 km inland to establish an (unmanned) Advance Base. Their cargoes consisted primarily of dog food, to facilitate lightweight scientific excursions radiating out from the Advance Base into areas of scientific interest. All Antarctic expeditions before 1957 made depot-laying journeys to provide for longer scientific traverses later. I expect that similar non-scientific traverses will be necessary in advance of long-range science journeys on other planets.

Risks of travel (Slides 13-14, 18, 23, 29-30, 39, see also Medical)
We took risks - we knew we took them. Field radios at the time were low-powered and heavy. Communication with base was rare. We had no communication with friends or family at home, and in my view, that was for the best. The only time we could rest with a clear conscience was in blizzards. On one long journey we dumped the radio to be picked up later on our return, on the grounds that if we did have an emergency, nobody could reach us to help anyway.

Geology (Slide 20)
Our two geologists traveled far from the Advance Base during both field seasons. Carrying fuel supplies (dog food) for a month, man food (dehydrated) and rock specimens acquired along the way, they covered a vast area. The surveyor drove his own dogs with the geophysicist as assistant. While the geologists were hacking away at rocks, the survey team lugged a theodolite up peaks to extend a triangulation network.

Glaciology (Slides 21-22)
The glaciologists each had an assistant from the support staff, so they could either travel together or divided into two parties to cover more ground. At each camp they dug a pit to determine the rate of snow accumulation, drilled (by hand) to a depth of 10 m to measure ice temperatures, and in places set up and surveyed ice-movement markers to be resurveyed the following season.

Geophysics (Slides 33, 34-36, 38)
The principal object was to determine the thickness of ice by seismic sounding – the only means known at the time. After experiments as far as the Advance Base in the 1950-51 summer, both Weasels were devoted to a seismic sounding traverse in 1951-52 as far inland as supplies would allow. The party reached 620 km inland and found ice thicknesses of 2,500 m.

Conflicts
There was competition for use of the Weasels, particularly after was one of the three machines was lost in an accident. Apart from that, we solved our differences amicably. On returning to England, our Leader wrote in *The Times* of London (19 Feb 1952): “I do not think there has ever been a polar expedition with so little friction between members.” My own opinion is that, other things being equal, once away from home an international expedition encounters fewer difficulties than would a national expedition. Each one of us, to the best of our ability, leaned over backwards to suppress our national prejudices and preconceptions. That, surely, was the key to our success.

I do not recall any occasion on which the senior man from one country convened a meeting to discuss a *national* policy. It helped that the meteorology program involved a Norwegian and a Swede; glaciology and geophysics had Swedish, British, and Australian participants; and the geology/survey program had Canadian, British and Norwegian members. We knew that any alignment based on nationality would be disruptive, and that the success or failure of the expedition would be judged by its scientific results.

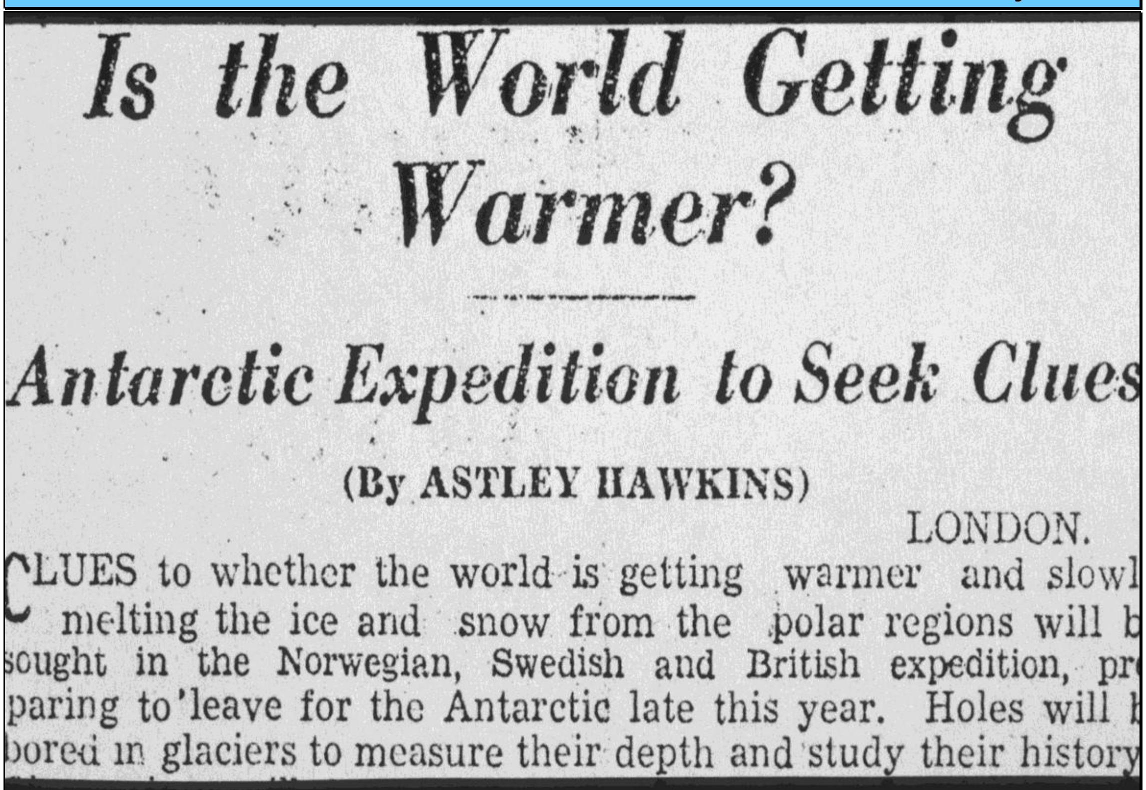
Sequelae (Slides 40-44)
Advance depot-laying generally fell out of favor because of the availability of aircraft.

Seismic sounding became an important part of the International Geophysical Year (1957-58). It was superseded by airborne radar sounding in 1966 when I flew an early version over the Antarctic Peninsula. Later work used C-121J, LC-130 and DHC-6 aircraft. Forty years later a similar instrument was used for sounding the Polar Ice Caps of Mars.

CHARLES SWITHINBANK

NORWEGIAN-BRITISH-SWEDISH ANTARCTIC EXPEDITION 1949-52

CS 24 July 2009 1


Is the World Getting Warmer?

Antarctic Expedition to Seek Clues

(By ASTLEY HAWKINS)

LONDON.

CLUES to whether the world is getting warmer and slowl
melting the ice and snow from the polar regions will b
sought in the Norwegian, Swedish and British expedition, pr
paring to leave for the Antarctic late this year. Holes will b
bored in glaciers to measure their depth and study their history

Buenos Aires *Herald* (10 March 1949) 2

Ice front (20 m   high)

3

Auster taking off to search the ice front for a dock

4

Maudheim (Jan 1951)

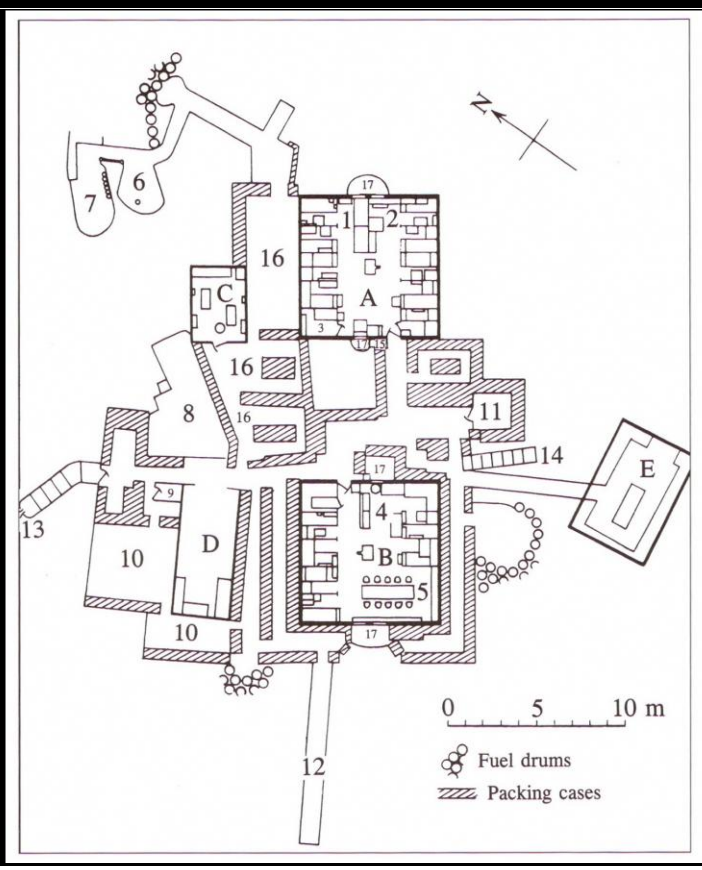
5

Ice dock (Jan 1950)

Maudheim 3 days old

7

Plan of Maudheim, our habitat for two years



8

Lunch

9

Ice coring to
100 m depth

Ice crystal studies in cold lab at -20º C

11

Tell Ice Age Like a Tree

NEW YORK (NANA)—Ice has "rings" which date it just like a cross section of a tree, it appears.

A report recently from the joint British-Scandinavian Antarctic expedition under Capt. John Giaever reported that their glaciologists had brought to the surface ice which fell as snow at the time the Germans under Bismarck invaded France 80 years ago.

St John's *Evening Telegram* (15 Sep 1950)

12

Main habitat after the first winter 13

Dogfights were common 14

Slow going with 500 kg on the sledge

15

Travel habitat
(note hand-cranked generator for radio)

16

Weasel hauling 2 tonnes (mostly dogfood) 17

Crevasse! 18

Weasels approaching mountains 19

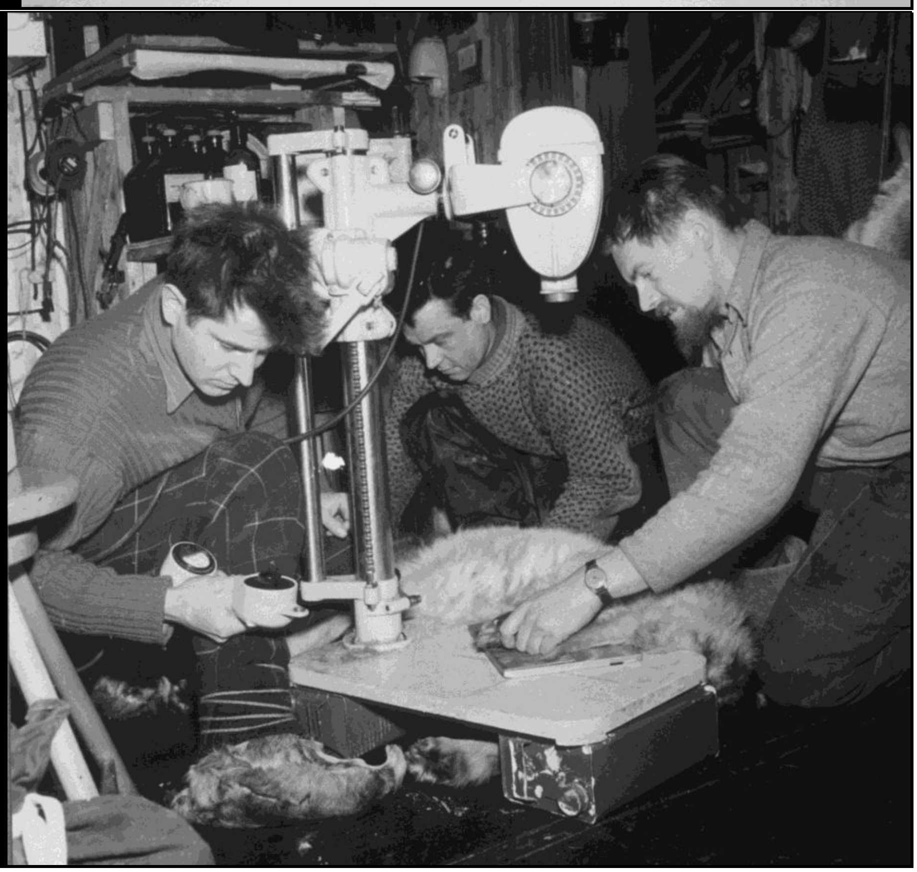
The Advance Base at Pyramiden 20

We drilled to 10 m at every camp for ice temperatures

Measuring snow density and annual layers

22

How pilots learn about whiteout



Dr Wilson (veterinary) surgeon

Dr Wilson (cranial surgeon)

25

Dr Wilson (dental surgeon)

26

Dr Wilson (eye surgeon)

27

Dramatic operation in Antarctic saves man's sight

USING "home-made" instruments and assisted by men who had no medical experience, Dr. O. Wilson, a member of the joint British-Scandinavian Antarctic Expedition, performed an eye operation on a British geologist and saved him from total blindness.

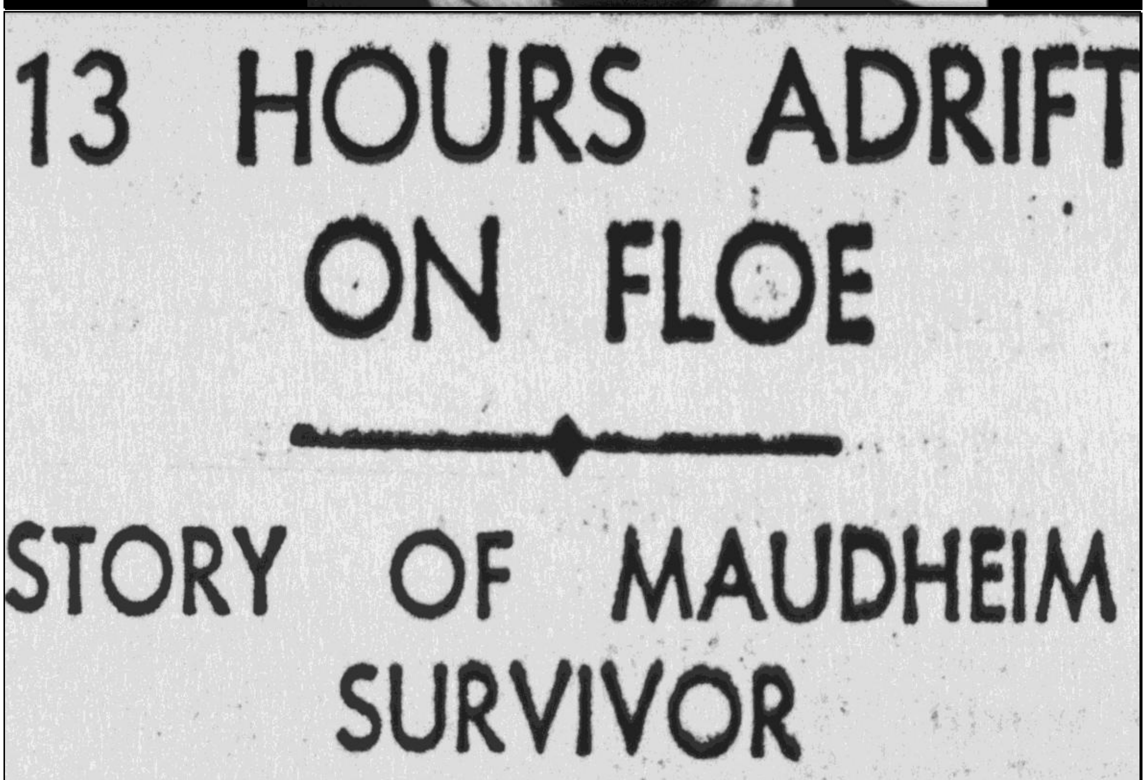
Dr. Wilson, who had never even seen such an operation performed, received his instructions by wireless from an eye

Johannesburg *Star* (2 October 1951)

28

Hallgren swam to an ice floe

29

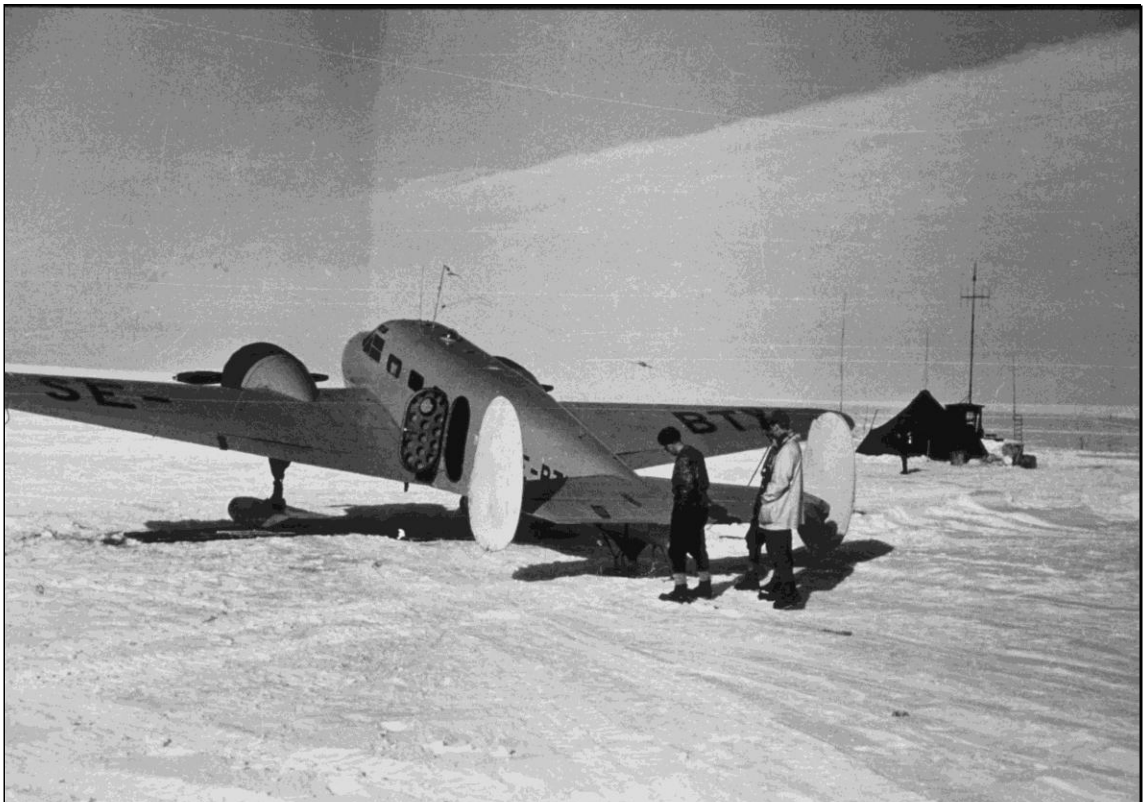


13 HOURS ADRIFT ON FLOE

STORY OF MAUDHEIM SURVIVOR

Calcutta *Statesman* (25 April 1951)

30



Beechcraft 18R of the Royal Swedish Air Force

31

Yarning

32

Seismic traverse heading south (10 Nov 1951) 33

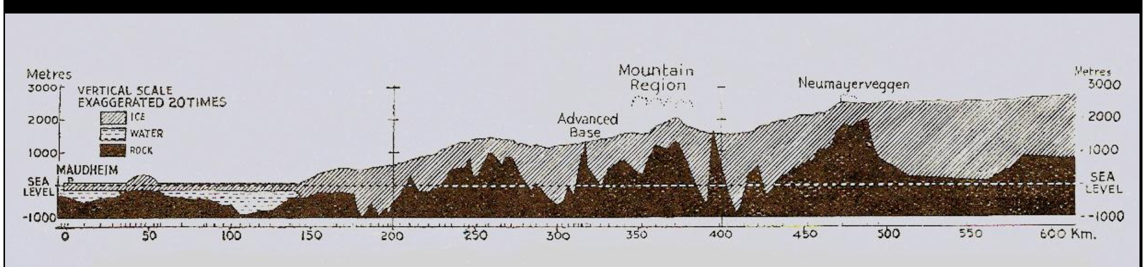
Mars traverse (Rawlings 2007) 34

In seismic caboose 35

Farthest south (Dec 1951) 36

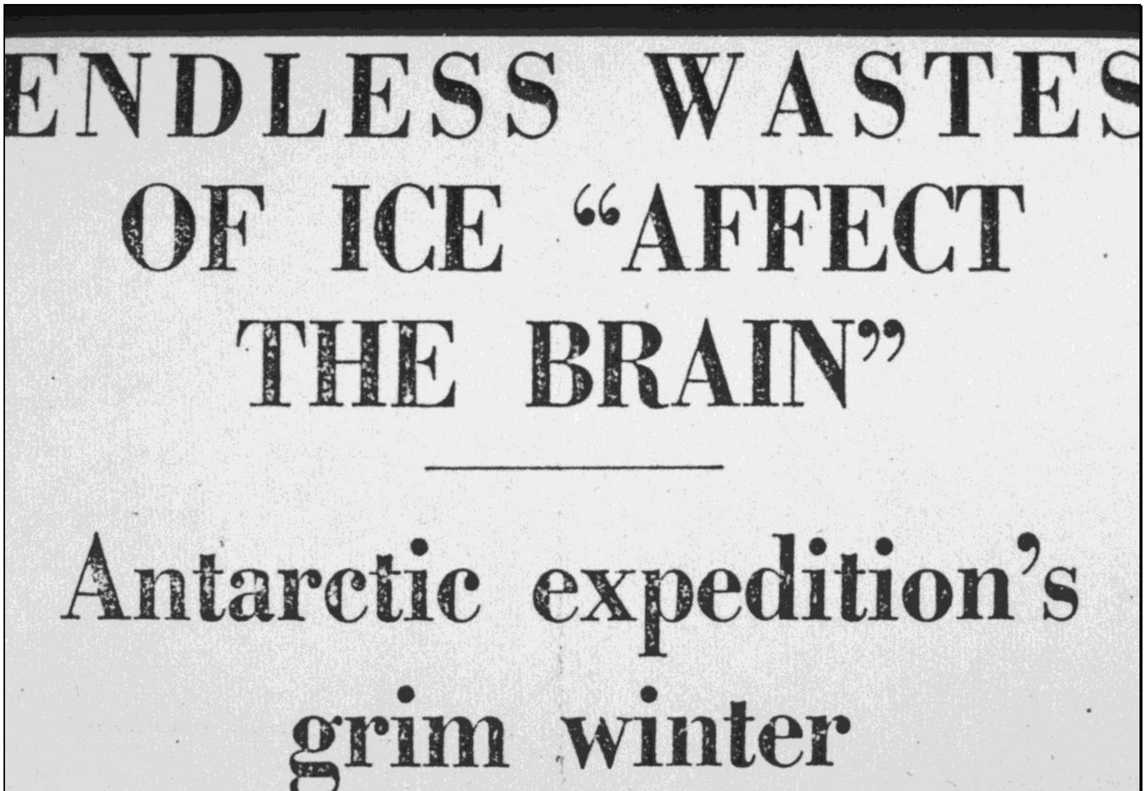
Maudheim (Feb 1952)

37



600 km seismic traverse
(*Nature*, Vol. 171, 1953, p. 55)

38


ENDLESS WASTES OF ICE "AFFECT THE BRAIN"

Antarctic expedition's grim winter

Johannesburg *Star* (14 Sept 1951) 39

First airborne radar sounding (12 Jan 1967) 40

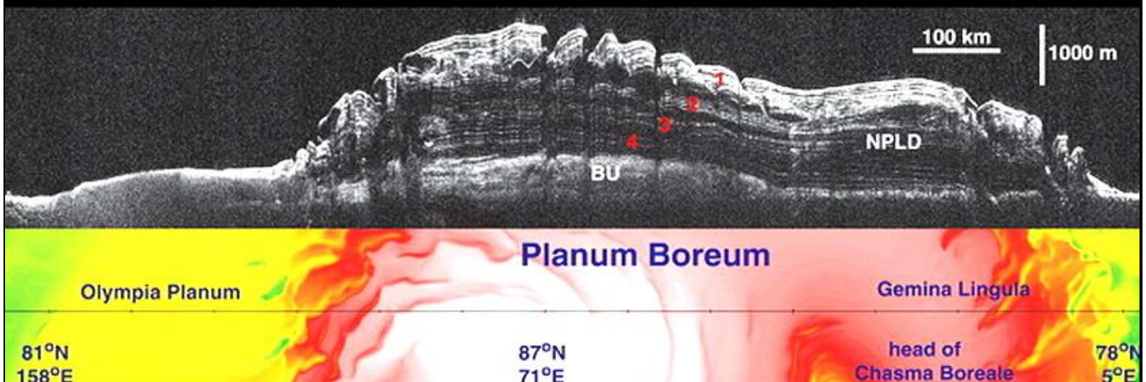
'Super-Constellation' (C-121J) with 35 MHz antenna (Dec 1967) 41

LC-130 ice radar antenna (Dec 1978) 42

150 MHz antenna on Twin Otter
(Jan 2009)

43

Fig. 1. (Top) Radargram from SHARAD orbit 5192



R. J. Phillips et al., Science 320, 1182 -1185 (2008)

Mars North Polar Ice Cap