

INSTITUTE OF CURRENT WORLD AFFAIRS

JT-9
Measuring Glacier Flow
in Antarctica

319 W. Mifflin St.
Madison, Wisconsin

6 May 1961

Mr. Richard H. Nolte
Institute of Current World Affairs
366 Madison Avenue
New York 17. N. Y.

Dear Dick,

I wanted to let time and distance have an opportunity to put the past Antarctic in better perspective than is possible when one is in its midst; now, however, I'd best proceed before rigor mortis sets in.

So, to pick up the account of the doings of the University of Michigan Ross Ice Shelf Party - Charles Swithinbank, Dave Darby, Tom Taylor, and JT - from 3 November at Black Island...

Continuing the local work, we were moved from Black to White Island, where additional stakes set the previous season were remeasured and resurveyed for accumulation and movement data. The next move was to Brown Island, but here I dropped out to return to McMurdo for treatment of a persistent hack - thus missing one of the most interesting discoveries of the summer. On the ice near the Dailey Islands, Dave and Charles discovered the remains of over fifty fish and several kinds of benthic invertebrates. This is an ablation area, and the discovery by Frank Debenham (geologist with Scott's 1910-13 expedition) of "headless fish" led him to hypothesize that the Ross Ice Shelf was nourished by the freezing of sea water on its under surface. More recent studies show that this may be true only for the McMurdo Ice Sheet, where these remains have been found. The latest finds are additional supporting evidence. Some of the sponges and corals were still attached to rocks that presumably came from the sea floor. The fish remains (the largest intact specimen measured about 56" in length) were tentatively radio-carbon dated at up to 1100 years. (Details of the find are given in Science, March 17, 1961, p. 764-6.)

Nearly all of our supplies and equipment had arrived at McMurdo when Charles & Co. returned on 10 November. The next several days were spent uncrating, preparing, and repacking this gear for the main part of our field work. A marked improvement in weather conditions was largely nullified by a severe magnetic storm which caused a total communications blackout for several days, preventing all but very local flight operations.

Finally, on 22 November, good weather, adequate communications, and helicopter readiness coincided, and Charles, Dave, and Tom were taken to Mulock Inlet, to tackle the first of the

INSTITUTE OF CURRENT WORLD AFFAIRS

season's glaciers. I was temporarily detached to go with a U. S. Geological Survey team to establish a base line across the Skelton Glacier, next door to the Mulock. Two USGS topographic engineers had the task of obtaining a number of accurate tellurometer baselines and ground control points in the McMurdo Sound area for mapping purposes, and the Navy very rightly insisted that they not go out alone, as there would be up to 20 miles or more of very unhandy terrain between them. So a Bureau of Mines geologist and I provided the required second man at either end of the base line. We were to leave on the 23rd, but despite continuing good weather it was the 25th before we were put into the field. Two days later, the work completed, we were flown back to McMurdo.

I then rejoined the Ross Ice Shelf party in the move from Mulock to Barne Inlet - and an unhappy mixup. Like Mulock Glacier, Barne Glacier is very severely crevassed, making totally impractical any surface crossing of it to set in the ice movement stakes, which were put in at one-mile intervals. Instead, this was done by helicopter. Where it was safe for the helicopter to land, it did; otherwise it hovered and Charles was lowered by the chopper's winch, and the ice corer and stake were then passed down to him. When the stake was set, the process was reversed. At the base camp site, Tom Taylor followed the operation through a theodolite, noting the approximate bearings for each stake as it was set. Against the heavily crevassed background of the glacier surface a stake is nearly invisible, but with the helicopter as a guide, approximate angles could be taken, making relocation fairly easy. At Mulock the system had worked well.

At Barne, however, it misfired. Because of fuel limitations, the helicopters could not stay long, so Charles was anxious to set the stakes as expeditiously as possible. He and Dave boarded one as soon as our gear was unloaded, while Tom, laden with theodolite and tripod, hastened up an adjacent nunatak, and I puffed along behind. The helicopter had the jump on us; Tom paid a bit too much attention to optimum location of the theodolite while I tried to keep the chopper in sight; I had forgotten to take the binoculars (the width of the glacier not being known, the helo first flew across it, and the stakes were set on the return trip). So by the time the theodolite was set and ready I could no longer see the helicopter. We searched through the theodolite along the planned flight line, to no avail. I belatedly hied back down the nunatak to get the binoculars, and wheezed back up - in time to view the helo heading back to our camp. Seven stakes had been set, but we'd not got bearings on any. Had the helicopter slightly delayed its departure, had Tom set up more quickly, had I taken the binocs... The adverse combination of the three left us more than slightly displeased.

INSTITUTE OF CURRENT WORLD AFFAIRS

We set up camp, and began a round-the-clock theodolite search for the stakes, in vain. On the plus side, we laid out and chained a base line, and Tom did local survey work. It had been arranged that when the helos returned they would try to find the stakes, and in this manner three of the seven were located and angles taken on them. Though less than hoped for, these, coupled with vertical air photos, will provide adequate information on the rate of flow of the Barne Glacier.

This experience, though unhappy, would have been salutary - had the project continued as expected. But from here on nothing went as expected.

At McMurdo, the aviation gasoline situation had suddenly become critical, so instead of being flown on to Shackleton Inlet as anticipated, we were returned to McMurdo; the rest of our operation was to be supported from NAAF Beardmore. The immediate problem was a lack of drummed avgas to send to Beardmore for this purpose, and when this might be available was an open question. The enforced hiatus could be utilized, however. Charles wished to remeasure stakes set off Cape Crozier and ones set in a line to the site of Scott's Corner Camp. I could get in a visit to the Pole.

Accordingly, I boarded a C-130 Hercules on 5 December, and landed at the South Pole Station after a three-hour flight - in marked contrast to my first flight to the Pole in November 1956, in an old R4D which took about seven hours for the same trip.

I had expected to stay only a couple of days at the Pole, but an interruption in flights lengthened this to eight days. Upon my return to McMurdo I found that after their Cape Crozier trip, Charles, Tom, and Dave had been flown to NAAF Beardmore with all the equipment. The Norwegian observer with Deep Freeze, Olav Liestøl, a glaciologist, was with them, more than taking up the slack left by my absence.

As it was impossible for me to join them right away, Charles had left word that I could fit in a trip to Byrd Station at this point. To make it more than a visit, I was asked to help lay out and flag a trail to the proposed site for the Byrd Auroral Sub-station, which was to be built in January. So, on 18 December, in company with Dr. Brian Roberts, British observer with Deep Freeze 61 (and my advisor at Cambridge University), I flew to New Byrd Station, construction site of the facility that will replace the present base. We spent a day there, then Brian returned to McMurdo and I got a lift for the five miles to Old Byrd.

The trail-laying operation was completed without untoward difficulty, three of us using a somewhat tired old IGY Sno-Cat, one Hectori II, a veteran of earlier traverse operations. Though under duress, Hectori II made the roughly-100-mile round trip without breakdown, which, while not a total surprise, was a great relief.

120°

100°

80°

60°

ANTARCTICA

● Operating Stations :1960

+ Stations used for summer operations only

- 21-CHILE-●
- 15-ARG-●
- 22-CHILE-●
- 11-ARG-●
- 37-UK-●
- 10-ARG-●
- 36-UK-●
- 39-UK-●
- 42-UK-●
- 43-UK-●
- 12-ARG-●

PALMER PENINSULA (GRAHAM LAND)

South Shetland Islands

41-UK
9-ARG
South Orkney Islands

- 40-UK
- 14-ARG
- 38-UK
- 19-CHILE
- 20-CHILE
- 13-ARG

WEDDELL SEA

FILCHNER ICE SHELF

7-USA
8-ARG

35-UK

ANTARCTIC CIRCLE

BEARDMORE GLACIER

2-USA +

ROSS SEA

3-USA

4-USA

SOUTH POLAR PLATEAU

Pole of Inaccessibility

34-USSR +

32-USSR

+33-USSR

75° +31-USSR

27-NOR

30-USSR

18-BELG

24-JAPAN

23-FRANCE

32-USSR

WILKES LAND

AMERICAN HIGHLAND

16-AUSTR

17-AUSTR

5-USA

28-POL

65°

29-USSR



SCALE OF NAUTICAL MILES

Courtesy of American Universities Field Staff

120°

100°

80°

60°

140° WEST

180° EAST

140°

40°

20°

0°

20° WEST

40° EAST

20°

40°

INDEX OF ANTARCTIC STATIONS—1960

UNITED STATES		FRANCE	
1. NAF. McMurdo Sound	Lat. 77°51'S Long. 166°37'E	23. Dumont D'Urville	Lat. 66°40'S Long. 140°01'E
2. Little America V	Lat. 78°11'S Long. 162°10'W	JAPAN	
3. Byrd	Lat. 79°59'S Long. 120°01'W	24. Showa	Lat. 69°00'S Long. 39°35'E
4. Amundsen-Scott South Pole	Lat. 90°00'S	NEW ZEALAND	
5. Wilkes (Temporary Custody of Australia)	Lat. 66°15'S Long. 110°31'E	25. Scott	Lat. 77°50'S Long. 166°44'E
6. Hallett (Jointly with N.Z.)	Lat. 72°18'S Long. 170°18'E	26. Hallett (jointly with U.S.A.)	Lat. 72°18'S Long. 170°18'E
7. Ellsworth (Temporary custody of Argentina)	Lat. 77°43'S Long. 41°07'W	NORWAY	
ARGENTINA		27. Norway Base (Temporary custody of South Africa)	Lat. 70°30'S Long. 02°52'W
8. General Belgrano	Lat. 77°56'S Long. 38°29'W	POLAND	
9. Orcadas	Lat. 60°45'S Long. 44°43'W	28. Oazis (To be Re-est. 1960)	Lat. 66°16'S Long. 100°44'E
10. Melchior	Lat. 64°20'S Long. 62°59'W	U.S.S.R.	
11. Primero de Mayo	Lat. 62°59'S Long. 60°43'W	29. Mirny	Lat. 66°33'S Long. 93°00'E
12. San Martin	Lat. 68°08'S Long. 67°07'W	30. Lazarev (Est., 10 Mar. 1959)	Lat. 69°56'S Long. 12°58'E
13. Almirante Brown	Lat. 64°53'S Long. 62°53'W	31. Komsomalskaya	Lat. 75°00'S Long. 93°00'E
14. Esperanza	Lat. 63°16'S Long. 56°49'W	32. Vostok	Lat. 78°27'S Long. 106°52'E
15. Teniente Camara	Lat. 62°36'S Long. 59°57'W	33. Sovietskaya	Lat. 78°24'S Long. 87°35'E
AUSTRALIA		34. Pole of Inaccessibility	Lat. 82°06'S Long. 55°00'E
16. Mawson	Lat. 67°36'S Long. 62°53'E	UNITED KINGDOM	
17. Davis	Lat. 68°34'S Long. 77°58'E	35. Halley Bay	Lat. 75°31'S Long. 26°36'W
BELGIUM		36. "A" Port Lockroy	Lat. 64°50'S Long. 63°30'W
18. King Baudouin	Lat. 70°26'S Long. 24°19'E	37. "B" Deception Island	Lat. 62°59'S Long. 60°34'W
CHILE		38. "D" Hope Bay	Lat. 63°24'S Long. 56°59'W
19. Bernardo O'Higgins	Lat. 63°19'S Long. 57°54'W	39. "F" Argentine Island	Lat. 65°15'S Long. 64°16'W
20. Gonzalez Videla	Lat. 64°49'S Long. 62°52'W	40. "G" Admiralty Bay	Lat. 62°05'S Long. 58°25'W
21. Arturo Prat	Lat. 62°29'S Long. 59°38'W	41. "H" Signy Island	Lat. 60°43'S Long. 45°36'W
22. Aguirre Cerda	Lat. 62°56'S Long. 60°36'W	42. "J" Ferin Head	Lat. 66°00'S Long. 65°24'W
		43. "Y" Horseshoe Island	Lat. 67°49'S Long. 67°17'W

Additional Sub-Antarctic Stations (Not Shown on Map)

Macquarie Island (Australia)	54°29'S, 158°57'E
Kerguelen Island (France)	48°40'S, 69°14'E
Campbell Island (New Zealand)	52°32'S, 168°59'E
Marion Island (South Africa)	46°53'S, 37°52'E
Gough Island (South Africa)	40°19'S, 19°54'W
South Georgia (U.K.)	54°16'S, 36°31'W

INSTITUTE OF CURRENT WORLD AFFAIRS

I returned to McMurdo on the 26th, and learned that Charles and the others, using the two Eliason motor toboggans, had accomplished the stake-setting and survey work on the Beardmore Glacier, and were nearly ready to leave for the Nimrod. One motor toboggan had broken down on the Beardmore, so they had just one machine for the Nimrod trip. I had hoped to get to the Beardmore camp before they departed, but weather and aircraft delays put the flight off until 2 January, by which time they were well en route.

It was planned that two helicopters would fly to the Beardmore camp and from it support our work and that of a party which was to go to Plunket Point, at the head of the Beardmore Glacier. Additional support would be provided by an R4D from McMurdo. The plan was reasonable, but never consummated.

The helicopters and the R4D, with seven members of the Plunket Point party were to fly to Beardmore a day or two after the flight which I was on. This was delayed by the diversion of the helicopters to other tasks and by some mechanical troubles with the aircraft. Then the weather turned sour again. The helicopters set out from McMurdo on the 17th, but were turned back by bad weather.

Charles, Tom, and Dave, meanwhile, had reached the Nimrod and completed operations there. Everyone had fully expected the helicopters to be on hand to assist with this, and to fly the party back to the Beardmore camp. Charles had figured the fuel supply for the motor toboggan on the basis of a one-way trip, plus a 50% reserve. This proved to be just enough for the round trip, and they arrived back at Beardmore on the 19th in a fair blizzard.

Blizzard conditions continued for several days, but on the 27th the R4D arrived with five members of the Plunket Point party, two others having had to drop out because of the delay. The two helicopters were also en route, but after landing about 100 miles from Beardmore to refuel from drums of gas they were carrying, one developed clutch trouble and was unable to continue. Its crew came on in with the other chopper, and then returned with the R4D to McMurdo to get parts and go back out to fix the downed chopper. Bad weather and further difficulties with aircraft combined to postpone the arrival of the second helicopter for twelve days. It finally reached Beardmore on 8 February. It had originally been expected that both helos would be at Beardmore by 1 January.

While awaiting the second chopper, the one then at Beardmore made one flight to retrieve the broken-down motor toboggan at Mount Hope, and we accomplished what local glaciological work we could. We also resorted our gear in the hope of a helicopter trip to the Shackleton Glacier.

INSTITUTE OF CURRENT WORLD AFFAIRS

At Beardmore, CDR Buddy Krebs, the senior helicopter pilot and VX-6's Operations Officer, had obtained two extensions of the original cut-off date for field operations from Beardmore in hopes of accomplishing the Shackleton Glacier and Plunket Point trips, but the weather held bad and time ran out. The day after the second helo arrived he was directed to cancel further field operations, and when a break in the weather came two days later both machines took off for McMurdo. Then on 17 February a C-130 landed on its way back from the last flight of the season to the South Pole Station, picked up all of us at Beardmore, and returned us to McMurdo. I'd spent 6½ rather frustrating weeks at NAAF Beardmore; Charles, Dave and Tom a month since their return from the Nimrod; and the Plunket Point party three weeks.

The Ross Ice Shelf Party accomplished about half the work planned for the season. Most of the local work around McMurdo got done, though this was, in a sense, icing on the cake. Of the cake itself, four glaciers were staked - two without the expected helicopter support - while four or five were left undone.

This experience was not the exception to the rule, unfortunately; several other field parties found themselves cut quite short. The most successful parties were those least reliant upon air support.

The poor flying weather in October set things back at the start; November's communications blackout largely nullified a period of good weather. Parties reliant upon air support were hampered throughout the season by locally or generally poor weather much of the time, and operational problems and some downright bad luck with aircraft took an additional toll. Air Development Squadron Six (VX-6) was heavily committed at the start of the season, and the commitment naturally grew rather than decreased as the season progressed. Occasionally, opportunities slipped by without advantage being taken of them. The planning and scheduling of operations - both by the scientific parties and by the Navy - were not always faultless. There were some misunderstandings by each group of the problems confronting the other.

The experiences of the Deep Freeze 61 summer season should lead to overall improvements and better results in Deep Freeze 62. Though not yet fully realized, the potential is great.

Very sincerely,


Jack Tuck