cules, operating with the USARP-Scott Polar Research Institute ice-depth-sounding project, was also at the station, and the relief ship MV *Perla Dan* had arrived. This convergence led to a record for the base when 73 people were dining at the same time: the station complement is normally 32.

Overall, the project was a success since ground control for the U.S. photography of the Shackletons was completed and it should now be possible to enter upon the mapping stage. The accompanying control diagram shows the total scheme achieved in the two visits. Considerable geological work remains to be done, but the known area was greatly extended.

Electrical Depth Soundings in Antarctic Dry Valleys

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Electrical soundings to depths of approximately 150 meters were made at 26 sites in Wright and Taylor Valleys, Antarctica, during December 1969–January 1970. Resistivities measured ranged from 15 ohm-meters for water emanating from a saline discharge on the Taylor Glacier tongue (Black *et al.*, 1965), to over 150,000 ohm-meters for metamorphosed basement rock east of Lake Vanda in Wright Valley. Curves of apparent resistivity *versus* electrode separation (Lee-Partitioning Method) obtained near Lakes Vanda and Bonney reflect a surficial freeze-thaw zone extending to depths of less than 2 m, a permafrost layer having resistivities greater than 10,000 ohm-meters extending to depths of 30 m or less, and unfrozen, saturated glacial drift having resistivities in the order of 1,000 ohm-meters lying below the permafrost layer. Soundings made above present lake levels indicate that the permafrost zone thickens with increasing elevation.

Several curves obtained near shallow or completely dry lake beds in Wright Upper Valley indicate glacial drift and lake sediments containing little or no permafrost. From these curves, it is inferred that Lakes Vanda and Bonney are not underlain by permafrost. Electrical depth soundings obtained with electrodes placed in marginal ice streams adjacent to Taylor Lower Glacier indicate that the permafrost zone extends from near the surface to depths greater than 150 m.

A thin zone of permafrost bordering Lakes Vanda and Bonney and the absence of permafrost beneath the lakes suggest several alternative conditions which may have influenced the dry-valley geothermal history, viz:

1) Solar heating during deeper lake stages causing an abnormally thin permafrost layer throughout the former lake basins;

2) Deep valley dissection during glacial maxima resulting in valley thalwegs intersecting abnormally high isogeotherms;

3) Late Tertiary intrusive and extrusive activity producing abnormally steep geothermal gradients which, in turn, results in abnormally high temperatures near the surface;

4) Groundwater flow directed toward lake basins (temperate-zone lakes are areas of groundwater discharge) producing abnormally high temperatures near the dry-valley lakes.

These factors, to some degree, have all produced the permafrost regime presently observed in the dry valleys. Lack of a permafrost layer beneath the lakes necessitates a hydrologic connection between groundwater and lake water. Shallow lakes in Wright Upper Valley, with limited surface-water recharge, may be fed mainly by groundwater. A hydrologic connection between sub-icecap water and dry-valley lakes (McGinnis, 1968) cannot be determined from the present data; however, given a permeable rock unit connecting the two water bodies, groundwater would flow beneath the icecap toward the dry-valley lakes.

References

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Ice-Thickness Survey of Marie Byrd and Ellsworth Lands

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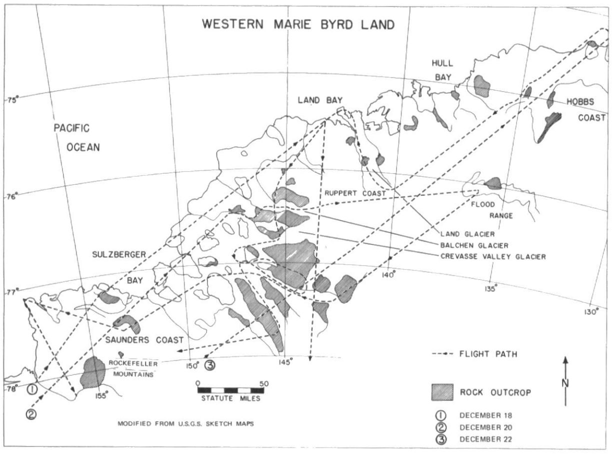
The purpose of this investigation was to obtain detailed information on the size, shape, and location of each of the islands which comprise Marie Byrd and Ellsworth Lands, and on the basins and troughs that separate these insular masses. This information was to be obtained through the use of the Scott Polar Research Institute's 35 MHz radio echo-sounder mounted in a C–130 aircraft. The program



was to be integrated with that of SPRI under Dr. Gordon Robin, a similar but more extensive ice-thickness survey of a large portion of Antarctica. A series of flight lines was proposed which, it was believed, would cover the area and result in a maximum of data. Flight time allocated for this project was 100 hours.

The Texas Technological University party, which included geologists Wade and Wilbanks and geophysicist Lawrence D. Osborn, arrived at McMurdo Station on November 1, 1969. The program was plagued with delays caused by installation troubles, poor flying weather, radio blackouts, and equipment failures. The first check-out flight was made on December 9. Three successful or partly successful flights (see map) were made to Marie Byrd Land on December 18, 20, and 22. The total flying time was 26 hours, 10 minutes. The data obtained are being processed at the Scott Polar Research Institute.

During the interval November 1–December 5, the three-man party took advantage of the time available to become familiar with the basement complex in the Marble Point and Taylor Valley areas.

Electromagnetic Sounding at Byrd Station

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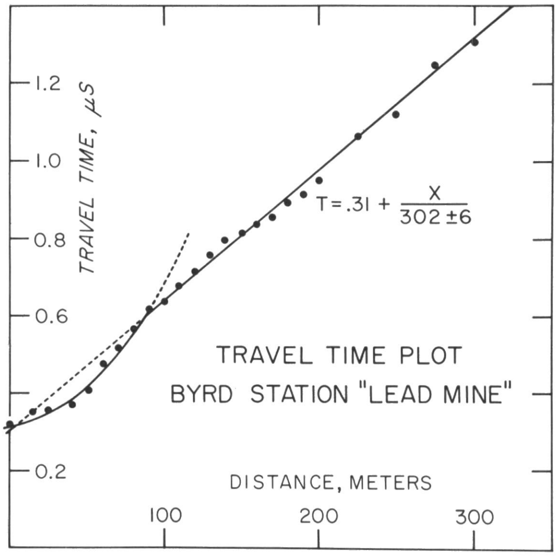
Electromagnetic echoes from interfaces within the antarctic ice sheet are commonly observed. Propagation-velocity measurements in East Antarctica utilizing wide-angle reflections from these interfaces (Clough *and* Bentley, 1970) have suggested the need for reducing the distance between transmitter and



Preliminary travel-time plot for wide-angle reflections to receiving antenna at 42-m depth.

receiver. To evaluate this approach, detailed wide-angle reflection profiles were obtained during the 1969–1970 summer field season near Byrd Station, where vertical echoes occur from several depths to about 1,000 m, and where correlation may be possible with features in the ice cores taken from the deep-drill hole.

The reflection measurements comprised a common-reflection-point profile 1,300 m long, and single-ended profiles 700 to 800 m long, the latter taken in opposite directions from the center of the longer profile. Photographic records were made at 2-m intervals along each profile. With this close spacing, it should be possible to examine the horizontal continuity and dip of the reflecting interfaces, and to improve the correlation of echoes from the same interface, thus improving the accuracy of the velocity determinations.

In addition, travel-time profiles were made for waves traveling one-way paths from a transmitter on the surface to receivers placed approximately 42 and 21 m below the surface in the "lead mine." These profiles should yield velocities through the upper snow layers, and should record the occurrence of electromagnetic wave propagation along the surface at the free-space velocity. The travel-time plot for one of these profiles (see figure) shows the direct wave (equivalent to half a wide-angle reflection) at transmitter-receiver spacings of less than 90 m, and a probable "refracted arrival" through the air at greater distances.

Reference

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