<table>
<thead>
<tr>
<th>Subdivision</th>
<th>Glacier Action</th>
<th>Deposits</th>
<th>Character of Deposits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packard Drift episode</td>
<td>Possible minor readvances; general slow retreat or stagnation to present positions.</td>
<td>Packard Drift and associated deposits</td>
<td>Till and morainal debris, sandy and often very bouldery, some washed and sorted drift; knob and kettle areas; ice-cored moraines; little mantling by solifluction. Associated deposits include all those forming in the valley system today i.e. extensive alluvial and eolian deposits.</td>
</tr>
<tr>
<td>Vida Drift episode</td>
<td>Change in Glacial Regimen</td>
<td>Vida Drift and associated deposits</td>
<td>Till, and morainal debris, sandy; moderately preserved moraines; thick or broad outwash - kame deposits; associated debris lobes; minor mantling by solifluction (&gt; 9,700 years)</td>
</tr>
<tr>
<td>Victoria Glaciation</td>
<td>Probable minor readvances to, and stillstand at, 9 to 11 km beyond present positions followed by retreat.</td>
<td></td>
<td>Marked Difference in Preservation</td>
</tr>
<tr>
<td>Bull Drift episode</td>
<td>Strong westward advance of Upper and Lower Victoria Glaciers extending from 12 to 20 km beyond present positions; reduced invasion from inland ice plateau; followed by stillstand and retreat. (Major advance to and retreat from terminal positions of Victoria Glaciation.)</td>
<td>Bull Drift and associated deposits</td>
<td>Till, usually very silty; subdued topography but two large, well-preserved end moraines; extreme cavernous weathering of boulders and bedrock; isolated areas of erratic boulders; local lake deposits; associated debris fans; extensive mantling by solifluction ( 30,000 years)</td>
</tr>
<tr>
<td>Insel Glaciation</td>
<td>Many Glacier Reversals</td>
<td>Insel Drift and associated deposits</td>
<td>Marked Difference in Preservation</td>
</tr>
<tr>
<td></td>
<td>Strong advance of inland ice into and probably eastward through valley system followed by partial or complete retreat of glaciers</td>
<td></td>
<td>Till, very silty; no morainal topography, few upstanding resistant boulders; extensive mantling by solifluction. Very resistant, erratic ventifacts and associated frost rubble preserved on high benches.</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Packard Drift episode</td>
<td>Fourth Glaciation (youngest part)</td>
<td>Trilogy Glaciation (youngest part)</td>
<td>episode 2</td>
</tr>
<tr>
<td>Vida Drift episode</td>
<td>Fourth Glaciation (oldest part)</td>
<td>Trilogy Glaciation (oldest part)</td>
<td>episode 1 ?</td>
</tr>
<tr>
<td>Bull Drift episode</td>
<td>Second and Third Glaciations</td>
<td>Pecten and Loop Glaciations</td>
<td>episode 1</td>
</tr>
<tr>
<td>Insel Glaciation</td>
<td>First and Second Glaciations</td>
<td>&quot;oldest glaciation&quot;</td>
<td>&quot;A&quot; Glaciation</td>
</tr>
</tbody>
</table>
of discussion and are speculative in nature. Before this work in the Victoria Valley system, most studies of the glacial geology in southern Victoria Land and the McMurdo Sound region has been very localized or of a reconnaissance type. Published works of more detailed studies have been preliminary in nature. It is suggested that valid correlations must be based on more qualitative and quantitative data than are now available.

Many factors must be taken into consideration before even tentative correlations can be made of glaciations or parts of glaciations in areas of southern Victoria Land which are not contiguous. Without distinguished interglaciations it is difficult to delimit the scale of a glaciation or to determine the extent of an advance if it is not known how far ice receded following the last advance, or if ice receded completely or stagnated (see Bull and others, 1962, p. 72). In addition, many factors other than regional climatic character or latitude in the ice-free areas of Antarctica control the contemporaneity of advances, retreats, or stillstands, including: exposure, the presence of absence of bedrock thresholds at valley heads, and the position or action of sea level.
REFERENCES CITED


Calkin, Parker, The glacial geology of the Mt. Gran area, southern Victoria Land, Antarctica (in preparation).


Debenham, F., 1921a, Recent and local deposits of McMurdo Sound region in British Antarctic ("Terra Nova") Expedition, 1910: British Mus. (Nat. Hist.), Geol., v. 1, no. 3, p. 63-100.

Debenham, F., 1921b, The sandstone etc., of the McMurdo Sound, Terra Nova Bay, and Beardmore Glacier regions, no. 4a of The sedimentary rocks South Victoria Land, in British Antarctic ("Terra Nova") Expedition, 1910: British Mus. (Nat. Hist.), Geology, v. 1, no. 4, p. 104-110.


Mannerfelt, C. M., 1949, Marginal drainage channels as indicators of the gradients of Quaternary ice caps: ibid., p. 194-199.


--------, 1961, Multiple glaciation in the Wright Valley, McMurdo Sound, Antarctica (abs.): Pacific Science Congress, 10th, Honolulu, 1961, p. 317.


Rozycki, S. Z., 1961, Changements Pleistocenes de l'extension de inlandis en Antarctide orientale d'apres l'étude des anciennes plages elevees de L'Oasis Bunger Queen's Mary Land (Pleistocene changes in the extension of the inland ice of East Antarctica, according to a study of ancient raised beaches of Bunger's (asis, Queen Mary Land): Biuletyw Peryglacjalny, no. 10, p. 257-283.


United States Antarctic Research Program (USARP), 1960-63, Antarctic status reports nos. 13 through 52: Washington, National Science Foundation.


Fig. 1. Aerial view from 15,000 ft looking southwest into the Victoria Valley system. Symbols are: d, barchan dunes; dm, whaleback sand mantles. U.S. Navy photo, TMA-353, no. 197, F 31, 19 Dec '57
Fig. 2. Index map of southern Victoria Land showing the location of the Victoria Valley system and area of plate 1.
Fig. 4. Aerial view from 20,000 ft, looking southwest along McKelvey Valley (left) and Galham Valley (right). Symbols are: ID, Insel Drift; BD, Bull Drift; s, solifluxion deposits. U.S. Navy photo, TMA-540, no. 234, F 33, 7 Nov '59.
Fig. 5. Aerial view from 20,000 ft looking northeast into Victoria Valley. Symbols are: BD, Bull Drift; VD, Vida Drift; PD, Packard Drift, dl, debris lobe; ---, 20 m contour above present surface of Lake Vida (390 m) and possible shoreline of the lake during Vida Drift episode. Control points: a, 14 m east base of outwash fan, b, 22 m (2 m high ridge) on alluvial fan, c, 21 m base of hummocky area on alluvial fan, d, 22 m base of debris lobe and break to 5° slope, f, 20 m upper third of kamefan where algal peal sample taken. Elevations locate some glacial benches. U.S. Navy photo, TMA-540, no. 232, F 31, 7 Nov '59.
Fig. 6. Aerial view from 20,000 ft, looking northeast into the Victoria Valley system. Elevations indicate some glacial benches. U. S. Navy photo, TMA-542, no. 241, F 31, 7 Nov '59.
Fig. 7. Orientation of 58 cirques bordering the Victoria Valley system shown in 10° segments.
Fig. 8. Elevations of north-facing (o) and south-facing (+) cirques (usually on south and north sides of valleys, respectively), and profiles of McKelvey, Narvik, and part of Victoria Valleys plotted along an east-west line.
Fig. 9. Mean monthly temperatures of McMurdo Sound covering 11 to 13 years between 1901 - 1916, and 1957 - 1961 (after Loewe, 1963).
Fig. 10. Maximum-minimum temperatures, precipitation, and cloudiness during the 1958-59, and 1961-62 field seasons.
Fig. 11. A portion of the terminus of Lower Victoria Glacier showing layers of wind-blown sand. View northwest in January, 1961.

Fig. 12. Barrier of Upper Victoria Glacier, View north.
Fig. 13. Webb Ice Fall. Looking west. Note ice-cored moraine in foreground at left.

Fig. 14. Aerial view from 20,000 ft looking southwest into western Barwick Valley. Symbols are: BD, Bull Drift; VD, Vida Drift; PD, Packard Drift; ic, ice-cored moraine; kk, knob and kettle topography. U.S. Navy photo, TMA-540, no. 228, F 33, 7 Nov '59.
Fig. 15. Map of the Packard Glacier.
Fig. 16. Barrier of the Packard Glacier in January, 1962. Looking west.

Fig. 17. Cavernously weathered boulder of gneiss in the Bull Drift of Clark Valley
Fig. 18. Textural relationships of particles of sand and silt-clay from active layer of till deposited by upper Victoria Glacier. See plate 2 for sample locations.
Fig. 19. Polygon and furrows in ice-cored moraine, western Barwick Valley.
Fig. 20. Frost rubble of weathered dolerite on the Inset Range. View southeast. Note white map case 25 cm square.

Fig. 21. Till sheet of Insel Drift. View southeast from near Bullseye Moraine in McKelvey Valley.
Fig. 22. Pattern of some glacial meltwater channels cut in bedrock of southwestern Victoria Valley.
Fig. 23. Typical weathered and abraded surface of Bull deposits showing boulders completely and partially worn to ground level.
Fig. 24. Aerial view from 6,000 ft (approximate) looking north from Wright Valley into Bull Pass. Symbols are: BD, Bull Drift; br, bedrock (Ferrar Dolerites); df, debris fan; c, marginal channels; s, solifluction. U. S. Navy photo, TMA-350, no. 154, F 31, 1 Jan '58.
Fig. 25. Glacial meltwater channel series in Bull Drift southwest of Lake Vida. Till blankets downslope channels cut in bedrock and in turn is cut by marginal channels trending obliquely to the older bedrock channels. Numbers 1 through 5 show probable sequence of channel cutting and indicate possible submarginal origin. Note channel to left of downslope arrow which makes sharp bend toward lake. This may be a subglacial chute. U. S. Navy photo, 27 Jan '62.
Fig. 26. Stream cut in debris fan below Bull Pass in Wright Valley showing sand and gravel with layer of pecten shells (outlined).
Fig. 27. Slope profiles formed by mass-wasting.
Fig. 28. Solifluction sheet of Balham Valley. Looking west over Balham Lake toward inland ice plateau. See also Fig. 27.
Fig. 29. Map showing inferred extensions of glaciers in Wright Valley and the Victoria system during the Victoria Glaciation.
Fig. 30. Cavernously weathered boulders on Vida ground moraine of lower Victoria Valley. Looking west toward Lake Vida.

Fig. 31. Lag pavement of pebble ventifacts in ice-contact fan, east end of Lake Vida.
Fig. 32. Front of debris lobe at the north margin of Lake Vida (see also Fig. 5). Scale shown by man at foot of slope, right center. Looking northwest.
Fig. 33. Sketch showing a possible origin of terminal deposits of Vida Drift in the Lake Vashka area, Barwick Valley.
Fig. 34. Lateral moraine terraces of the Packard Drift (Webb Glacier). Glacier moved from left to right. View north across Webb Lake, Barwick Valley.

Fig. 35. Kettles in Packard till. View northwest across Webb Lake to Webb Glacier, Barwick Valley.
Fig. 36. Ice-cored moraine at terminus of a cirque glacier north of Lake Vida. Looking northeast.
Fig. 37. Active talus slope of dolerite on western border of Webb Glacier. Looking southeast.

Fig. 38. Mudflow levee at the west side of upper Victoria Lake. Note 90 cm high ice axe in channel (center).
Fig. 39. Debris tongue of upper Victoria valley showing adjacent lower solifluction fronts. Looking east over terminus of Lower Victoria Glacier.

Fig. 40. Stone-fronted terrace riser and subsurface exposure made by blasting in debris tongue, western Barwick Valley. Riser is 3 m high and hole is 1.1 m deep.
Fig. 41. Dune belt and portion of sand sheet in upper left. View southeast.

Fig. 42. Portion of whaleback eolian mantle showing interstratified snow. View southwest across Lake Vida.