

NEW ZEALAND
ATLAS
EDITED BY IAN WARDS

A. R. SHEARER GOVERNMENT PRINTER WELLINGTON 1976

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*Note: In the section headed 'Water Balance', '760 millimetres' should read '76 millimetres'.

MAPS

NEW ZEALAND TOPOGRAPHICAL This map, and the thematic base maps, are on the Lambert conformal (or orthomorphic) conic projection with two standard parallels, the meridians being straight lines, the parallels arcs of concentric circles. The standard parallels have been selected at latitudes 37° and 45°, the scale variation reading a maximum of +0.40 per cent near North Cape. The scale at any point is independent of direction; between the standard parallels it is a little smaller, and outside them a little greater, than the nominal scale of the map. For most purposes the scale can be regarded as constant.	2-3
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<p>The base map is a modern outline from the New Zealand Map Service, Series 1. The information of the early Polynesian settlement of the Pacific and their voyage path to New Zealand was supplied by the author based on her reading of most recent sources. The voyage path of Abel Janszoon Tasman was plotted by Graham Jeune, assisted by information from Commander G. B. W. Johnson, Wellington Harbour Board, and Commander I. S. Monro, Hydrographer RNZN, from the following sources: <i>Tasman, Abel Janszoon, Journal of his discovery of Van Diemen's land and New Zealand in 1642</i> . . . photo-lithographic facsimiles of the original manuscript in the Colonial Archives at the Hague with an English translation and facsimiles of original maps to which are added life and labours of <i>Abel Janszoon Tasman</i> by J. E. Heeres and observations made with the compass on <i>Tasman's voyage</i> by W. van Bemmelen, Amsterdam, 1898, <i>Abel Janszoon Tasman & the Discovery of New Zealand</i>, Department of Internal Affairs, Wellington, MCMXLII; <i>The voyages of Abel Janszoon Tasman</i>, Andrew Sharp, Oxford [1968]; photostat of F. J. Visscher's chart from the Huydecoper MS in the Mitchell Library, Sydney (Turnbull Library Map Collection); photostat from <i>Tasman's chart</i>, State Archives, The Hague (Turnbull Library Map Collection). The voyage path of James Cook is compiled from: 'A chart of New Zealand . . . by Lieutt. J. Cook . . .', reproduced from the original chart in the British Museum, The Friends of the Turnbull Library, 1969; <i>The Journals of Captain James Cook on His Voyages of Discovery: The Voyage of the Endeavour 1768-1771</i>, Vol. 1, with folio of charts, edited by J. C. Beaglehole; the point of entry into New Zealand waters, 6/7 Oct 1769, and the voyage path to the south-west of the South Island, were amended from information by Commander G. B. W. Johnson. The voyage path of De Surville was compiled from: 'Plan de la Baye de Lauriston . . . 1769' and 'Carte de la Nouvelle Zelande . . . 1769', both photocopies from MSS in the Bibliothèque Nationale, Paris (Turnbull Library Map Collection). Place names and spelling; The place names and chart information of <i>Tasman's voyage</i> (green) have been translated. The places named by <i>Cook</i> (red) are a selection of places from <i>Cook's chart</i> of his first voyage. The Maori place names (brown), from material supplied by the author, have been given modern spellings/translations for ease of identification.</p>																																																																	
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Population	64-65																																																																
<p>Prepared from information supplied by the Department of Statistics on a base map from the New Zealand Map Service, Series 1. The area of any one screened (light red) circle is centred on and proportional to the population it represents, and is completely independent of any other screened circle and/or solid (dark red) symbols that fall within it. All population within gazetted Urban Statistical Divisions has been shown as urban, which will account for the apparent lack of rural population around larger cities. Some of the cities and boroughs in the Auckland vicinity have been grouped within four main areas represented by individual screened circles:</p> <table border="0"> <tr> <td>Northshore</td> <td>Auckland West</td> <td>Auckland Central</td> <td>Auckland South</td> </tr> <tr> <td>Takapuna (city)</td> <td>Henderson (borough)</td> <td>Auckland City</td> <td>Papatoetoe (city)</td> </tr> <tr> <td>Devonport (borough)</td> <td>Glen Eden (borough)</td> <td>Newmarket (borough)</td> <td>Otahuhu (borough)</td> </tr> <tr> <td>Northcote (borough)</td> <td>New Lynn (borough)</td> <td>Mt Albert</td> <td>"</td> </tr> <tr> <td>Birkenhead (borough)</td> <td></td> <td>Mt Eden</td> <td>"</td> </tr> <tr> <td></td> <td></td> <td>Mt Roskill</td> <td>"</td> </tr> <tr> <td></td> <td></td> <td>One Tree Hill</td> <td>"</td> </tr> <tr> <td></td> <td></td> <td>Onehunga</td> <td>"</td> </tr> <tr> <td></td> <td></td> <td>Ellerslie</td> <td>"</td> </tr> <tr> <td></td> <td></td> <td>Mt Wellington</td> <td>"</td> </tr> </table> <p>Other screened circles in the vicinity of Auckland are centred on:</p> <table border="0"> <tr> <td>East Coast Bays (borough)</td> <td>Te Atatu (county subdivision)</td> <td>Titirangi (county town)</td> <td>Manukau (city)</td> </tr> <tr> <td>Glenfield (county town)</td> <td>Kelston (county town)</td> <td>Howick (borough)</td> <td>Papakura (borough)</td> </tr> </table> <p>Groupings in the Wellington vicinity are:</p> <table border="0"> <tr> <td>Wellington (city)</td> <td>Upper Hutt (city)</td> <td>Tawa (borough)</td> <td>Wainuiomata (county borough)</td> </tr> <tr> <td>Lower Hutt (city)</td> <td>Porirua (city)</td> <td>Petone (borough)</td> <td>Heretaunga-Pinehaven (county town)</td> </tr> </table> <p>Groupings in the Christchurch vicinity are:</p> <table border="0"> <tr> <td>Christchurch (city)</td> <td>Riccarton (borough)</td> <td>Hornby (county borough)</td> </tr> <tr> <td>Waimairi (county)</td> <td>Sockburn (county borough)</td> </tr> </table> <p>Groupings in the Dunedin vicinity are:</p> <table border="0"> <tr> <td>Dunedin (city)</td> <td>St Kilda (borough)</td> <td>Green Island (borough)</td> </tr> </table>		Northshore	Auckland West	Auckland Central	Auckland South	Takapuna (city)	Henderson (borough)	Auckland City	Papatoetoe (city)	Devonport (borough)	Glen Eden (borough)	Newmarket (borough)	Otahuhu (borough)	Northcote (borough)	New Lynn (borough)	Mt Albert	"	Birkenhead (borough)		Mt Eden	"			Mt Roskill	"			One Tree Hill	"			Onehunga	"			Ellerslie	"			Mt Wellington	"	East Coast Bays (borough)	Te Atatu (county subdivision)	Titirangi (county town)	Manukau (city)	Glenfield (county town)	Kelston (county town)	Howick (borough)	Papakura (borough)	Wellington (city)	Upper Hutt (city)	Tawa (borough)	Wainuiomata (county borough)	Lower Hutt (city)	Porirua (city)	Petone (borough)	Heretaunga-Pinehaven (county town)	Christchurch (city)	Riccarton (borough)	Hornby (county borough)	Waimairi (county)	Sockburn (county borough)	Dunedin (city)	St Kilda (borough)	Green Island (borough)
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TOURIST RESOURCES 202-203
 This map was designed in the Cartographic Branch, Department of Lands and Survey. For a base, a cardboard model was made by L. P. Lee, which was then photographed by National Publicity Studios (who also prepared the sea vignette). The drawing was then done by D. W. Lawrence from a selected perspective. Type sizes reflect tourist density.

ILLUSTRATIONS

End Paper: RAKAIA RIVER TERRACES	<i>Lloyd Homer, Geological Survey</i>
The outwash plain was built by alpine debris and is dissected by a braided river, with headwaters in the main massif. The terraces are formed throughout phases of warm and cold climate by the processes of plain building and periodic spreading and cutting with consequent terrace structuring.	
Frontispiece: MOUNT COOK	<i>NZ Aerial Mapping</i>
Called Aorangi, the Cloud Piercer, by the Maori, the three peaks of New Zealand's highest mountain are, in this view from the south, Southern, left, Mid and Northern.	
CAPE REINGA	<i>Robin Smith Photography Ltd</i>
p 8	The site of a lighthouse marking the sea lane between the north of New Zealand and Three Kings Islands. It is the traditional departure point for spirits of the Maori leaving for the other world.
THE TAUPO VOLCANIC ZONE UNDER SNOW	<i>National Publicity Studios</i>
p 12	Linking the regions to the north and south is the great Taupo Volcanic Zone. Seen under winter snow from above Mt Ruapehu, the active cone of Ngauruhoe almost obscures the several craters of Tongariro. The western cliffs of Lake Taupo lie beyond.
AT TOMOANA	<i>NZ Aerial Mapping</i>
p 16	Rich Hawke's Bay farmland extends from the site of an Agricultural and Pastoral Society Show, an annual event in most rural districts to display new farming methods, products and a way of life.
WELLINGTON CITY	<i>J. H. Johns</i>
p 20	The capital, with its wharves verging the deep water of a drowned depression, its commercial and political centre partly on reclaimed land, and its residential suburbs now mainly beyond the encircling Green Belt.
THE AVOCA VALLEY	<i>J. H. Johns, NZ Forest Service</i>
p 24	100 kilometres to the north-west of Christchurch, it shows typical Canterbury high country, with the boulders of a braided river bounded by tussock grassland of the foothills of the Southern Alps.
THE EGLINTON VALLEY	<i>NZ Aerial Mapping/J. H. Johns</i>
p 28	Broadly glaciated and now under beech forest, the valley lies between the Earl and Livingstone mountains. It is part of Fiordland National Park and provides the land route between Lake Te Anau and Milford Sound.
LANDFORMS	<i>NZ Aerial Mapping/J. H. Johns</i>
p 70	The deep and extremely fine dissection of the ridges of the southern Richardson mountains in Central Otago. The tussock-clad ridges contrast with beech forest on the shady, southern aspect.
A SELECTION OF SPECIES OF NEW ZEALAND FLORA	<i>J. T. Salmon</i>
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SPECIMENS OF NEW ZEALAND FAUNA	<i>J. H. Johns</i>
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p 118	Snail, <i>Paryphanta lignaria annectens</i> Powell } <i>J. H. Johns, NZ Forest Service</i> Kakapo, <i>Strigops habroptilus</i> } <i>D. V. Merton</i> New Zealand Sea Lion (female), <i>Otaria hookeri</i> } <i>A. Wright</i> Takahe, <i>Notornis mantelli</i> } <i>C. R. Veitch</i> } <i>Wild Life Service</i>
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p 137	To show soil zones and land forms.
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CITRUS FRUIT ORCHARDS, KERIKERI	<i>NZ Aerial Mapping/J. H. Johns</i>
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- AUCKLAND
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- PUKEKOHE MARKET GARDENS AND TOWNSHIP
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- THE TUTAEKURI RIVER, HAWKE'S BAY
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- THE COASTLINE AT TONGAPORUTU, NORTH TARANAKI BIGHT
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p 228 The coastal bench shows the stranded ridges of successive uplifts of coast, each ridge being marked by a line of sand. The ridge at the foot of the cliff, *middle right*, is about 4900 years old, while the three seaward ridges were formed, successively, about 3100, 515 and 120 years ago. The last was caused by the 1855 Wairarapa earthquake. In the middle distance are raised and tilted terraces of earlier shore lines. The whole series is a tectonic calendar of coastal uplift. *Lloyd Homer, Geological Survey*
- MT EGMONT AND THE ENCIRCLING NATIONAL PARK
p 229 This vertical photograph shows the circular spread of lava from a central volcanic vent. The defined outer circle, which has a six-mile radius from the central cone, distinguishes the forest of the National Park from the surrounding farmland. *NZ Aerial Mapping*
- FANTHAMS PEAK, *left*, AND THE SUMMIT OF MT EGMONT
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- THE TARANAKI PLAINS
pp 230-231 Looking over the coast to the town of Hawera and Mt Egmont. *NZ Aerial Mapping/J. H. Johns*
- THE WELLINGTON FAULT LINE
p 232 along the western side of the harbour and the Hutt Valley. This remarkable photograph, taken by the RNZAF from 30 000 feet, shows the active fault running through the centre. The north-south ridges to the south-east are drowned to form the Wellington Harbour, the primary reason for the location of the city. The depression of the Hutt Valley and the Trentham basin lies to the north-east, with the Wairarapa and the Manawatu plains beyond, far right and left. *E. R. Schroder, RNZAF*
- THE DROWNED VALLEYS OF THE MARLBOROUGH SOUNDS
p 233 This drowned valley system contrasts with the faulted system of the north-east side of Cook Strait. The intricate drowned ridges are not markedly cliffed by wave erosion. The photograph looks seawards down Pelorus Sound. *J. H. Johns, Lands and Survey*
- A WEST COAST STAND OF KAHIKATEA OR WHITE PINE
pp 234-235 Dense forests of white pine, the tallest indigenous species, formerly flourished on fertile alluvial soils in both North and South Islands. Its timber, entirely free from smell, was ideal for butter boxes and churns. Stands are now reduced to fragmented remnants threatened by farm development. *J. H. Johns, NZ Forest Service*
- NELSON CITY AND PORT
p 236 beyond the reclamation and mudflats between the foothills and Boulder Bank. *Lloyd Homer, Geological Survey*
- THE PUNAKAIKI ROCKS
p 236 skirted by the coastal highway between Westport and Greymouth. *V. C. Browne*
- LIMESTONE CAVES AT PATURAU, NORTH-WEST NELSON
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- THE SOUTHERN ALPS
pp 238-239 between Mt Elie de Beaumont, *left*, and Mt Cook, the highest peak on the right, lie beyond Westland podocarp forest. The view is from Okarito Trig. *J. H. Johns, NZ Forest Service*
- THE KARAMEA RIVER VALLEY
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- RIVER TERRACES AND FOOTHILLS FLANK THE CLUTHA RIVER
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- THE CANTERBURY PLAINS
pp 242-243 spread to the sea from the Southern Alps. The accordant summit level on the skyline marks the uplifted block of the axial ranges of the Southern Alps. Vast quantities of debris have been deposited as confluent fans by the major rivers of the Canterbury plains, such as the Waimakariri river shown on the right of the photograph. The smaller Hawkins River on the left, a tributary of the Selwyn, occupies an inter-fan depression. *NZ Aerial Mapping*
- THE ONAMULUTU VALLEY
p 244 nestles in the foothills beyond the Wairau river. The pattern of finely textured dissection is characteristic of large tracts of greywacke *Lloyd Homer, Geological Survey*

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hill country throughout New Zealand. Indigenous forest covers the far ridges, while in the middle distance cleared and grassed ridges are reverting to secondary growth on the shaded slopes. There are exotic trees and improved pastures on the valley floor.

- CHRISTCHURCH V. C. Browne
 p 245 The international airport at Harewood is in the foreground, with the business district beyond Hagley Park in the centre. Sumner lies to the top left, with Lyttelton Harbour beyond the Port Hills at the top right.
- DUNEDIN NZ Aerial Mapping/J. H. Johns
 p 245 The city lies at the head of Otago Harbour with Macandrew Bay in the foreground and Ravensbourne middle right.
- MT COOK, left, AND MT TASMAN NZ Aerial Mapping
 pp 246-247 with the Ball, Hochstetter and Tasman glaciers. Ascents of Mt Cook often begin after a climb up the Haast ridge to the right of the Hochstetter Icefall, which drops from the Grand Plateau at the foot of Mt Tasman. Climbers then cross the Plateau, skirt Mt Tasman to climb first the Linda glacier between the two massifs and finally the high Northern Peak.
- BENMORE, THE EARTH DAM AND POWER STATION NZ Aerial Mapping/J. H. Johns
 p 248 with the great stretch of artificial lake.
- THE UPPER TAIERI RIVER NZ Aerial Mapping/J. H. Johns
 p 249 flows through tussock grassland. The range and basin topography of Central Otago is illustrated by the block of the Rock and Pillar Range, right, and the down-faulted Styx basin.
- THE OBELISK ON THE OLD MAN RANGE, OTAGO NZ Aerial Mapping/J. H. Johns
 pp 250-251 Subalpine vegetation and stark schist tors characterise the higher ranges of Central Otago.
- THE ALPINE FAULT AND THE WEST COAST National Aeronautics and Space Administration (US)
 BETWEEN JACKSON HEAD AND THE GREY RIVER
 p 252 This photograph was taken from an Earth Resources Technology Satellite at a height of about 500 miles. The colours are false and show contrast only. The darker brown areas indicate podocarp forest on ridge slopes, while the lighter red areas show pasture, farm land or perhaps freshly planted exotic forest. The dark areas of inland water, for example Lake Brunner, show clear water, and contrast with the light green of the moraine of the upper arm of Lake Tekapo and other shingle or sediment saturated water. Similarly, the green of the river beds indicates the shingle areas of a braided river rather than water, shown as a dark thread. Light brown areas near Tekapo show dried out tussock or other grassland pasture. The large areas of white are cloud, but areas of snow on the tops also show white. In the sea, the light green along the shoreline shows shingle and sediment, and the dark area, clear sea water.
- MILFORD SOUND NZ Aerial Mapping/J. H. Johns
 p 253 The valley lies between the Wick, left, and Darran mountains. Mitre Peak is on the left of the Sound. In the foreground is the Gulliver River which leads through to the Cleddau, along which the highway continues to Milford. It is an area of classic landforms resulting from valley glaciation.
- THE LAMMERLAWS NZ Aerial Mapping/J. H. Johns
 pp 254-255 This subalpine, tussock-covered Otago upland shows a dissection pattern caused by small streams cutting into an uplifted landscape.
- SIX ANTARCTIC VIEWS First five: Antarctic Division DSIR
last: R. H. Wheeler
 p 256 The south fork of the upper Wright Valley; the summit camp, Mt Erebus Expedition 1967-68; descending the traverse on Axel Heiberg Glacier; Emperor penguins, Cape Crozier; the Wright Valley; Victoria Glacier, Upper Victoria Valley.
 These pictures are of the more diverse, western side of the Ross Dependency. Those on the left of the page and on the bottom right are scenes from the eastern flank of the Trans-Antarctic Mountains that 'obstruct' the ice cap. The upper and centre right photographs are of Ross Island, some 60 kilometres from the mainland coast.
 The Axel Heiberg glacier is tiny compared with the Byrd, Nimrod or Beardmore glaciers. The flat, featureless Ross Ice Shelf is seen as the horizon in the top right of this picture. In the photograph to the right, the Ross Ice Shelf again appears, this time in its distal section at Cape Crozier at the eastern extremity of Ross Island. Adult Emperor penguins of the local colony are escorting their maturing chicks at the foot of a block calved from the 'Barrier', the terminal cliff of the Shelf and the birth place of the characteristic flat-topped Antarctic icebergs.
 The ice-free landscapes, top and bottom left and bottom right, are exceptional features of Antarctica, with a climate and situation that do not sustain ice-filled valleys. These Dry Valleys are not merely scenic and accessible but are prized geological 'windows' in the almost unbroken shroud of the ice of the continent. Both the Wright Valley photographs show rare and scientifically informative exposures of rock, here consisting of alternate layers of warm-coloured tan sandstone and contrasting black dolerite which long ago was injected horizontally whilst molten between the sandstone strata. In this unvegetated oasis, the tan provides visual relief to the surrounding eternity of the whites and blues of sky, ice and snow. In the blue of the middle distance of the upper Wright Valley can be detected both the rock contrast and the consequent benching (hill, middle left). The floor of the valley in both Wright Valley photographs is littered with morainal debris, largely resistant dolerite, which is often wind sculptured by sand abrasion and bears a lustrous polish. The photograph, bottom right, of another Dry Valley, the Upper Victoria, shows a stagnant glacier in the upper reaches and the now empty main valley beyond is occupied by a proglacial lake, ponded by overdeeping by ice and recessional moraine. This 'lake' is solid ice, but some, as in the Wright Valley, are still liquid due to a high degree of salinity and are a subject of much scientific speculation. The stationary Upper Victoria glacier, like many other retreating or stationary tributary glaciers of the Dry Valleys, is spectacularly cliff-sided from radiation melting caused by reflection of the sun from the bare rock valley sides. The three New Zealanders are passing through penitentes, melt sculptured litter from huge slabs of ice that have 'calved' from the glacier's lateral wall. The lamination, top right, in the top of the glacier is the ice of a 'perched' tributary glacier which joined the main glacier some four kilometres further up the valley.
 The photograph, top right, of Mt Erebus, higher than Mt Cook by thirty metres, shows another unusual feature of Antarctica—its only active volcano. In this photograph, the slopes of Erebus are unusually heavily clad in snow, and the normal contrast of black volcanic rock and snow slopes is masked. The almost constant, gentle, white plume of smoke and ash is also temporarily absent. The photograph shows the life style of the New Zealand field parties in Antarctica. Here is the traditional double-skinned pyramid tent of Scott's day still in use, albeit now of more durable synthetic materials. Sleds too are still used but are pulled by a motor toboggan, the mechanical if less reliable substitute for the husky dog. These toboggan tracks make a contrast to the dog-sled trails in the foreground of the Axel Heiberg photograph of only a few years earlier.

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