

To Antarctica Aboard HMNZS Endeavour

Randall McMullan



This is a personal account of a voyage in February 1967 between New Zealand and McMurdo Sound, Antarctica aboard the New Zealand Navy supply ship HMNZS Endeavour. The author was one of three physicists from Victoria University of Wellington who towed a magnetometer behind the ship to gather early information about the mid-ocean ridge which continues to drive New Zealand apart from Antarctica.

The book contains photos and memories of the ship's voyage, of the US McMurdo Station and of the NZ Scott Base.

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To Antarctica
Aboard
HMNZS Endeavour

**A collection of facts, photos and
memories of a geomagnetic
research voyage in 1967**

Randall McMullan



Published by Piano Beach

Auckland, New Zealand

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Cover photo: *HMNZS Endeavour* sails into the Southern Ocean and to Antarctica.

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HMNZS Endeavour

Antarctic support vessel from 1962 to 1971. Seen here berthed at Lyttelton harbour just before sailing for The Antarctic in February 1967. Just visible on the hill at left is the historic Timeball Tower used for relaying accurate time to shipping. Captain Cook needed accurate time in his Endeavour voyage, and we also needed it aboard Endeavour II.

Introduction

Places and names

The *Antarctic* is the name of the region. *Antarctica* is the name of the continent. *Ross Island* is a large island of four volcanoes situated in the Ross Sea, off the coast of Antarctica in McMurdo Sound. McMurdo Station (US) and Scott Base (NZ) are located on the slopes of Ross Island and joined to mainland Antarctica by the Ross Ice Shelf.

In February 1967 I sailed from Lyttelton, New Zealand to McMurdo Sound, Antarctica aboard the New Zealand Navy supply ship *HMNZS Endeavour*. I was one of three research students from the Physics Department at Victoria University of Wellington, part of wider team that accompanied many of the twice-yearly supply trips in the 1960s. Between New Zealand and Antarctica we towed magnetic-sensing equipment on a cable behind the ship.

The *Endeavour* berthed near the US McMurdo Station to unload supplies for Scott Base and to discharge the aviation fuel carried in the oil-tanker section of the ship. In the course of two days, with no sunset, we explored the area around the US base, which in those days had a nuclear power station. We shopped duty-free at the PX store which incongruously offered the same items you could buy at a well-stocked airport.

From Observation Hill we looked down over McMurdo Station, the helicopter pad, the harbour, and Captain Scott's 'Discovery' hut on the promontory just behind the *Endeavour's* berth. As one of my photos shows, at that time the historic hut was perilously close to fuel storage tanks



Above: Ross Island landscape – from near Scott Base

From the rocky barrenness of the McMurdo area we walked to the New Zealand Scott Base which, although only a few kilometres away, gave a greater sense of Antarctic white vastness when you looked out over the Ross Ice Shelf. At Scott Base we posted letters, made radio-telephone calls to home and attended a party given for the Endeavour people.

One reason for publishing this book is to make the photos more widely available. Not for their technical or aesthetic qualities, but because they may have captured some aspects of the Antarctic operations of that particular era that will be useful in the future. Sections of the book include my recollections of operational matters so apologies if these seem inexpert or faulty but fortunately they are better documented elsewhere. For example, *Antarctic*, the publication of the New Zealand Antarctic Society has been published since 1956 and is available online at www.antarctic.org.nz

The book is also a memoir that I publish as a record for myself and friends, and so I take the liberty of including some more whimsical memories and reflections.

Acknowledgements

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Randall McMullan, May 2016



Above: *Endeavour* at sea. Looking aft as a 'greeny' wave breaks across the 'catwalk' over the storage tanks that divided the ship. We worked and ate in the aft of the ship but slept in a bunkroom right forward in the bow. The technique was to start running as one wave was breaking so as to catch the gap between waves.



Above: Geoff Barnes - on the aft deck with 'the fish' ready for towing. From Geoff's clothing we can assume that we were still in New Zealand summer waters

David A Christoffel

Associate Professor Christoffel, known to everyone as 'Chris', supervised my thesis. Chris had a quiet pleasant personality and was obviously a kind man as he approved my short MSc thesis when he would much rather that I extended it to be a PhD thesis. He was the instigator and director of the magnetic survey research work at Victoria University and perhaps can be considered the 'father' of New Zealand plate tectonics.

Chris had obviously been on several previous voyages of the Endeavour. He sailed with us when the Endeavour positioned itself from Wellington to Lyttelton but didn't join us on the full trip to the Antarctica. I believe that we also had a practice run of equipment on another positioning trip between Lyttelton and Wellington in December 1966.

The Research

At 8 am on Wednesday 8 February 1967 *HMNZS Endeavour* sailed from Lyttelton harbour on the second Antarctic supply journey of the 1966/67 summer. It was one of many supply trips, from about 1958, that had carried scientists from the Physics Department of Victoria University of Wellington. Our research task was to gather a profile of the variations in the Earth's magnetic field along the track sailed by the Endeavour, along with the bathymetry (ocean floor depth).

Our interest was the in the rocks hidden under the seafloor, especially while passing over the over the mid-ocean ridge which is pushing the New Zealand continental plate apart from Antarctica. Each trip of the *Endeavour* was sailed along a track that differed in longitude to others and therefore allowed the ship's depth recorder to gather a new profile of the ocean depth.

Research Colleagues

Geoff Barnes

Geoff was one of the team of three aboard the Endeavour in February. We were classmates for 5 years at Napier Boys High School, and then for a further 5 years doing physics at Victoria. We made contact again in the 1990s and also met up at a school reunion in the 2000s.

Malcolm Grant

Malcolm was the third member of the team and was also our nominated leader. I recall that it was only Malcolm that went to the ship's bridge to negotiate any necessary changes in speed when we were trying to haul in our equipment. Malcolm went to MIT for his doctorate and, from traces on websites, I believe that he returned to live and work in NZ

David Christoffel's accumulation of research data and analysis was an early indication that the New Zealand Alpine Fault had shifted, one side to other, by hundreds of kilometres.

My Thesis

My personal research career in geophysics was short and of minor significance. At Victoria University of Wellington, the first year of an MSc degree in physics was a post-graduate BSc (hons) programme of papers in various branches of physics such as nuclear physics, electronics, biophysics, and geophysics. This intermediate degree was followed by a thesis for an MSc or PhD.

My thesis - 'A Magnetic Survey of the Campbell Plateau' – was an analysis of magnetic profiles and bathymetry (sea-depth) from our voyage, and other voyages since 1961. It concentrated on the Campbell Plateau, the large and unique area of drowned 'continental New Zealand' which extends south and west from Stewart Island.

The thesis, though good enough to gain my MSc degree, was a relatively modest contribution to a very big picture that was being built up. I published the thesis in December 1967, and sailed for the UK on 1 January 1968.

A Magnetic Survey of the Campbell Plateau.

by Randall McMullan

The main conclusion of my thesis was: *The anomaly contour map indicates that the magnetic anomalies associated with the Southland Syncline extend at least 150 miles out to sea, with no indication of a coastal displacement.*

(The Southland Syncline is a massive downward fold in crustal rocks which runs out to sea from The Catlins area of Otago.)

Diary of the Voyage

From Scott Base I posted a letter to my parents with a detailed account of shipboard life which entwined with our difficulties of keeping the equipment working. Extracts from this diary-letter are given in the following sections. The spelling and abbreviations are more or less in their raw state.

I didn't keep an account of the return voyage which sailed from McMurdo direct to Wellington.

Below: Envelope postmarked on 18 Feb 1967 from Scott Base, Ross Dependency



The cinema

Our bunk room in the very bow of the ship was accessed by walking through the hold. The hold held some stacks of goods together with a Volkswagen Beetle car for some sort of promotion. There was enough floor space left for folding chairs, a screen and movie projector, presumably 16mm. Clothing for this cinema needed to be warm as the hold was unheated. While the ship rolled we braced ourselves on the seats and the projectionist braced the projector on its stand. However, I remember one sea roll which caused a reel to fall off the projector!



Above: Our bunks in the forward bunkroom. We slept right next to the hull which would clang as ice slide alongside. Once under the blankets we had to strap ourselves in.

At Sea, Wed 8 February 1967

It is 9pm and I am lying on my bunk up forward whilst next door there is a film showing ("633 Squadron") of which I can hear every word and burst of gunfire. The sea is calm at the moment and the weather is foggy - we left Lyttelton at 8 A.M. this morning. This ship rolls and heaves in any sea (it has a flat bottom) and I lost my breakfast. I couldn't face lunch but during the afternoon I came right, ate tea and think I will be OK.

We had a very smooth crossing on the Wahine on Mon. night. Prof. Christofell accompanied us, so there were 4 in all. We lugged our baggage to the Endeavour and installed ourselves before going into CHC at 11am. At this time it was probable that we were delayed until next Sunday because the tanker bringing our fuel from Aust. was running late - we carry high octane aviation fuel to McMurdo. However NAC let us fill up with theirs and from being a ship of 2000 tons when empty we are now a ship of 5000 tons wallowing along at top speed of 14 knots - tomorrow we slow down to 10 knots which is the usual speed.

We assembled the equipment yesterday and to date haven't succeeded in 'de-bugging' it. Chris sailed back on the Wahine last night thinking that it was OK but more faults have developed and we have been really hard at it up till now. We have streamed our fish out behind the ship 3 times and had to haul it in each time. Normally it stays in the sea continuously and is recorded in our lab on a chart recorder. When it is going the 3 of us will be on watch 24. hours a day in shifts. The equipment is automatic except for calculating navigational data, and when it goes wrong of course.

The meals are reasonable and last night we had a large feed of steak, chips and veges. which we received very well as we had not had much lunch. We are dining or eating in the petty officers mess, which is really better than the Officers mess as it requires a tie - not to mention the fact that they dine at 8pm compared to 5.30 - 6.15pm.

Thursday 9 Feb, 2nd Day at Sea, 11pm

Well, I was a little premature about my sea-legs last night. The seas got bigger during the night and upon getting up, the 3 of us felt terrible. I could only face a slice of toast (that line was the biggest roll yet) and a cup of tea which I quickly lost. I ate lunch (which I kept) but couldn't face tea. However at the moment I am feeling OK having eaten chocolate and I am feeling all optimistic again

Below: Randall tending the Lab equipment which is processing and recording the readings being sent in from the magnetometer 'fish' being towed at two ship-lengths behind the *Endeavour*.



I am on watch by myself in the lab until midnight when I wake up Malcolm who goes on until 8 am. During the day we have 2 short watches of 8 - 12 and 12 - 4. We finally got the equipment going properly this afternoon after a partially satisfactory run this morning. We eventually traced the main fault to the pre-amplifier inside the fish, which was supposed to have been repaired at Vic, but had in fact been mis-wired. None of us are very strong electronic repairers but our collective knowledge just made out

Today started out grey and remained so until late afternoon when the sun appeared. We are really in deep water now and the waves are huge- at the moment the ship is doing some magnificent rolls and I can hear crockery flying around somewhere. We have absolutely everything tied down - including myself.... However they say there is worse to come.

This afternoon we were given instruction about lifejackets and life-rafts. The ship carries 5 inflatable rubber life-rafts which each carry 25-40 persons. They are contained in canisters about the size of a oil drum: and they inflate on hitting the water - all mod cons such as food, water, cigarettes, cars are contained in them and they are warm inside being completely enclosed by a cover (with door). So we can look forward to sinking as it might be more comfortable.

Friday 10th, 3rd Day At Sea, 6.30pm

It is a very nice evening on the high seas - sunny but not warm outside. We passed 50° south at about 4 pm and are now on extra rations - midnight snacks for those who want it, soup all the time. The heating is also going full blast and inside everyone is wearing next to nothing, but the wind is cold on deck.



Above: The Petty Officers' Wardroom of the Endeavour. Geoff is perhaps waiting for a meal. We are getting plenty of salt on the table and the Zip water heater is a homely feature on the wall.

Our fish is behaving itself thank goodness and we haven't had to haul it in at all since we streamed it yesterday. I am on watch until 7.30 pm tonight and on again at 7am in the morning. Actually we have changed the times of watches to fit with our meal times better - unlike the Navy we are adaptable.

We had a very tossed night last night, but my stomach has completely settled and I am quite enjoying the motion as well as the meals. Had a roast meal at lunch time and sausages and chips for tea.

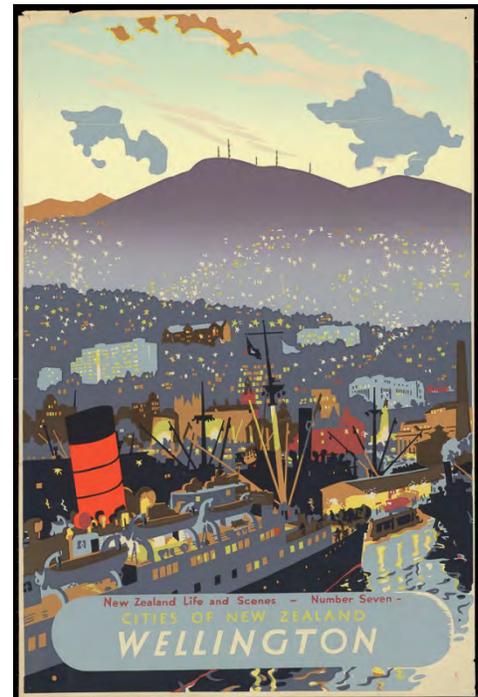
Everyone is supposed to be cutting down on showers etc. because the American icebreaker Staten Island's evaporators have broken down and we have to re-stock her as well as clean out our fuel tanks with freshwater. If we can keep our consumption below 3-thousand gallons a day we will not have to have it rationed and so far we are doing OK without stopping showers altogether.

At about 5 this afternoon we had 'Exercise hands to life-raft stations', which we carried out. Malcolm and Geoff were forward in the bunkroom sleeping, so had their snoozes cut short.

Another passenger on board is an artist by the name of Mallitte who is at present commissioned by the Navy and D.S.I.R. to paintings and sketches of ships featuring in some of the work done here. Scientists at work etc. We are featuring in some of the work he is doing but haven't as yet seen the finished products.

Sunday 12th Feb, 5th Day at Sea, 1pm

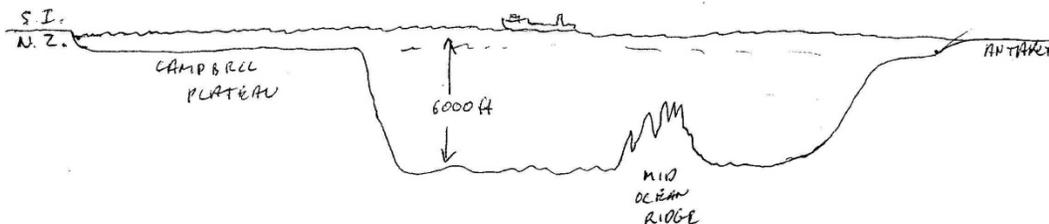
The three of us are sitting in the lab trying to stop ourselves and the equipment from being thrown about too much. The ship is still battling its way south at about 10 knots and covering about 250 - 300 nautical miles a day. The wind is whistling outside, the seas are very big and the catwalk is being lashed with spray, not to mention the odd complete wave. Today is Sunday although you wouldn't believe it - we did however have roast pork for lunch with pineapple dessert.



Above: Poster of Wellington by the artist aboard *Endeavour* - Howard Mallitte

The artist

Howard Mallitte (1910 - 1979) was a New Zealand designer. After navy service in WW2 he was employed by the NZ Tourist and Publicity Department, and produced some striking posters. He also documented a 1963 trip to Antarctica with the Governor General Sir Bernard Fergusson



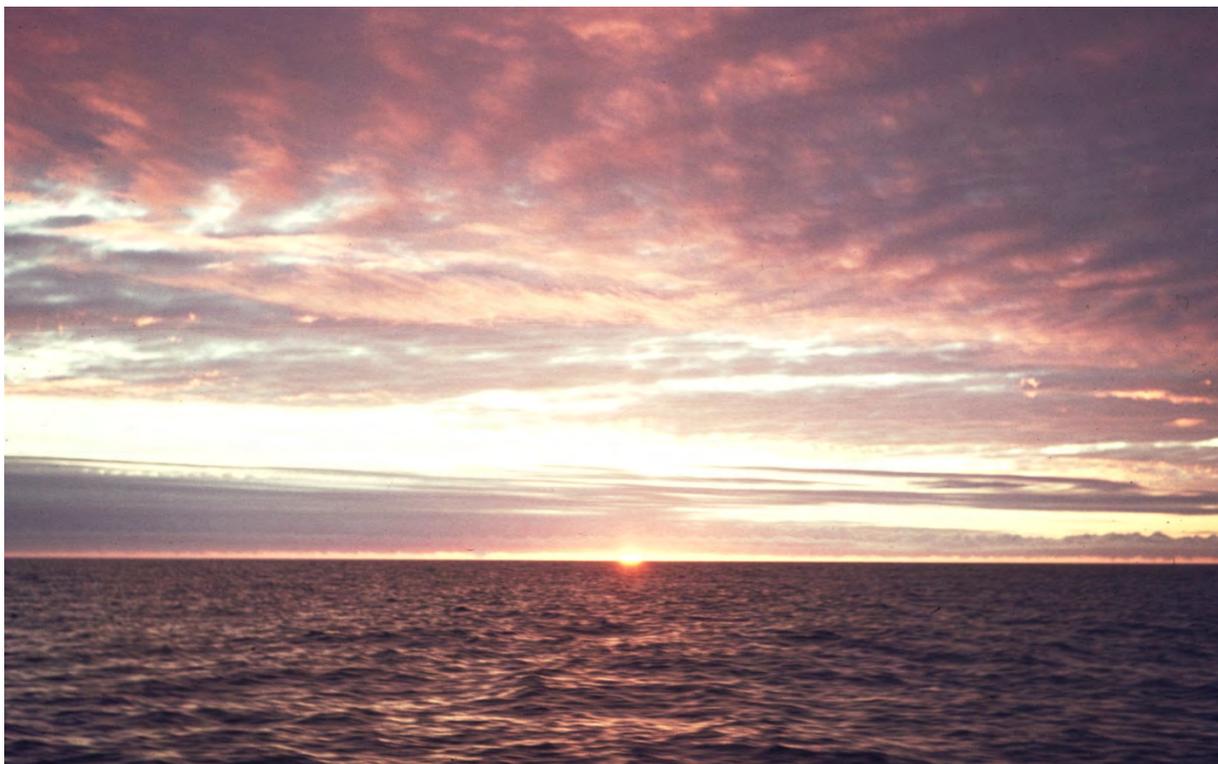
Above: An instructional sketch of the seafloor profile between New Zealand and Antarctica. Sketched in my letter around this point.

Below: a sunset in the Antarctic Ocean. A valuable sighting for our navigational accuracy. Without satellite equipment, our knowledge of where we were on the Earth's surface depended upon the officers on the bridge taking old-fashioned 'fixes' at sunrise, noon, and sunset – if we they could be seen.

I was on night watch last night and had a hectic time when the equipment stopped completely. I eventually traced it to a solder joint shaken loose in one of the amplifiers - we lost 3 hours of recording though. Hope that doesn't happen tonight as we will be passing over the mid-ocean ridge which we particularly want to get recordings of.

I had about 5 hours sleep this morning and I will have another read/nap this afternoon. Getting plenty of reading done - finished 'Martin Chuzzlewit' last night. I suppose you are all economising on butter and not wasting bread these times - I can't say that we are. The bread is baked on board and is quite good.

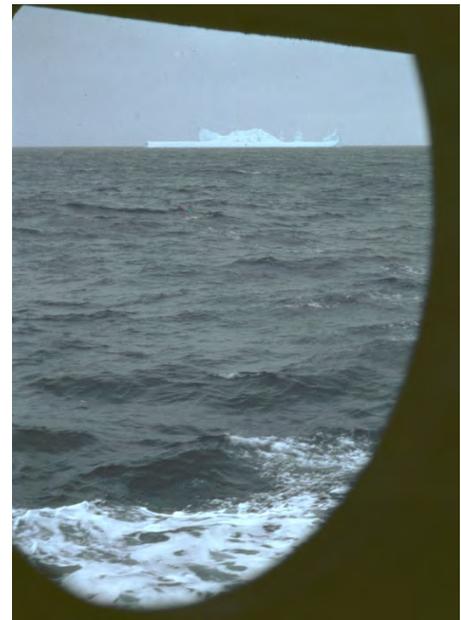
All going well, we are scheduled to arrive at McMurdo on Friday and leave on Sunday. They hope to arrive back in Wgton about March 3rd.



Tues 14th Feb, 7th Day at Sea, 1pm

We are now in the land of the icebergs and killer whales. The first iceberg was sighted at about 9pm last night, it being still fairly light and today there are always about half a dozen in view, some large, some almost melted away. We have passed close to a couple of them and they are quite eerie as they silently glide by, occasionally with birds sitting on their leeward slopes.

The weather today is overcast with occasional flurries of snow and comparatively calm seas. We had a nice sunny afternoon yesterday. Inside the ship it is warm and I am working in shirtsleeves most of the time and sleeping in my shortee pyjamas with 2 blankets (on a Dunlopillow mattress). The weather on Sunday developed into a fierce storm and early yesterday morning the ship did a 45 degree roll. I felt awful Sunday evening and eventually lost the pork dinner I told you about.



The ice was here

The ice was there

The ice was all around



I started eating again yesterday afternoon. I hope that I don't seem too pre-occupied with food and the state of my stomach but it does make all the difference. Today for lunch we had Hamburgers, chips, corncobs and tomatoes followed by raw apples (cool stored). At the moment my idea of a feast would be a bag of Omega plums and a pint of fresh milk.

The storm flooded the fish the other night and the 3 of us had to get up at 5.30 AM and haul on a freezing wet cable while balancing on a pitching wet deck - the 3 of us can only just get it in. On the Dec. trip, when the other 2 weren't as big as us, they couldn't get it in alone. We replaced the amplifier in the fish and are recording again although we have had the odd bit of trouble at this end in the electronics. Some of the equipment has been going without a hitch for years and the continual tossing is beginning to take a toll on it. It is however

all due to be replaced.

The ship's radio system can't pick up the N.Z. broadcast stations now and they play taped music. The ship receives cable news bulletins but I haven't seen one today yet - someone said that the Drivers Union etc. are on strike and people are joking by talking of doing the same.

We have rigged our own aerial and listen to short-wave but during the day we can only seem to get Moscow or Radio Peking. On Sunday night I tuned into a Radio NZ transmission to Antarctica and caught the last bit of the N.Z. Women's Bowling in the Sports round up - didn't hear Win's name though.

Saw 'A New Kind of Love' last night starring Paul Newman - wasn't bad, romantic comedy type of thing .

Below Randall on desk wearing his Antarctic gear.



At 8am this morning we were doing 12 knots and were 65 deg south - we are due to cross the Atlantic circle at about 8pm tonight - look it up on your globe. Malcolm has not long washed his 'smalls' and has them pegged out in here making the lab look like a Chinese laundry. We have our Antarctic kits out - windproof trouser covers and windproof jacket complete with fur edged hood - I look just like Captain Scott in mine.

Wednesday 15th, 8th Day at Sea, 4.30pm

Have not long sighted the coastline of Antarctica near Cape Adare - my first continent. It is a very sunny day and we can see mountains and hills snowed-covered to the sea. We are due at McMurdo at mid-day. Friday, probably leave again Saturday

and should be back in Wgton. March 1st now. We will be busy while we are there, but at least it will be daylight all the time

Thursday 16th, 9th Day at Sea, 4pm

The weather has been bad since last night with poor visibility and large waves that have cut our speed down to about 4 knots. A lead inside the fish was shaken loose this morning and we had to haul it in amidst snow and ice. However it is easier to haul in at slow speeds and we braced ourselves, so to speak, with paper cups of hot soup and we have it out again. We are in the Ross sea and the sea temp. is several degrees below freezing point (it can do that being salted)

We are entitled to 2 cans of beer a day at 1/- a can- but for me it is not the weather.



Above: The Antarctic Coastline



Above: View of McMurdo Base February 1967. Taken from Observation Hill looking over the Base to the *Endeavour* berthed in front of the fuel tanks. The white ship entering the port is the US ice breaker *The Glacier*.

Saturday 18th Feb, 8am

Have just tied up alongside ice at McMurdo - good to see civilisation again. The last few days have been murder with heavy swell & driving snow cutting our speed right down and running us late. The weather here is trying to be sunny thank goodness.

Will sign off now and get this posted when I can - probably from Scott Base which is about 2 miles away, where I will try & phone you. We are going to visit the PX as soon as possible.

Love to All - Randall

Right: Back of envelope posted on 18 Feb 1967 from Scott Base, Ross Dependency



McMurdo Station

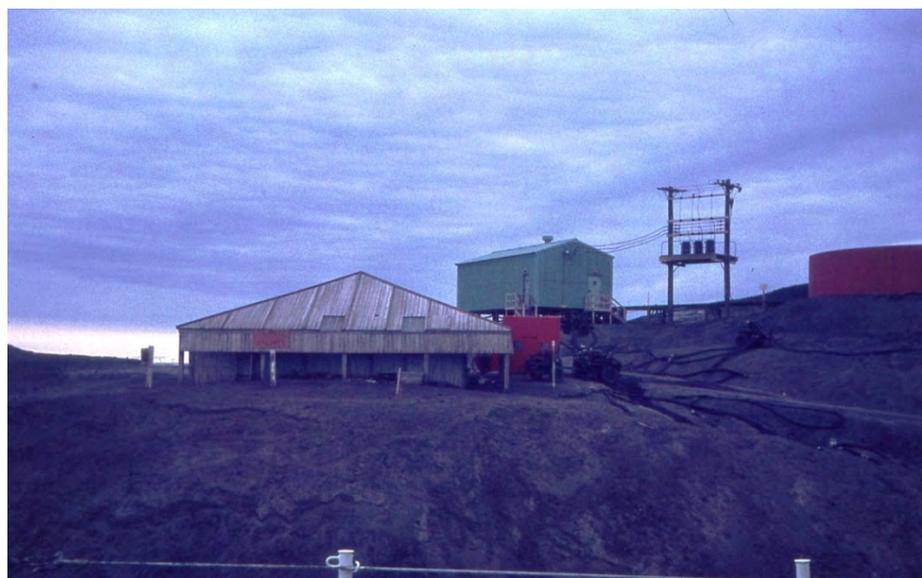
The Endeavour berthed alongside an ice platform at Hut Point in McMurdo Station harbour and unloaded its cargo from the hold and pumped its aviation fuel from the tanks. We three scientists walked around to McMurdo Station and visited the well-stocked PX store to buy items like transistor radios and Super 8 movie cameras.

We climbed to the top of Observation Hill which rises beside McMurdo Station and took photos alongside the wooden cross erected in 1913 as a memorial to Robert Scott and party who died on the Ross Ice Shelf in 1912



Above: Endeavour berthed at McMurdo. Unloading cargo and aviation fuel.

Right: Scott's 1902 Discovery Hut. A prefabricated building mainly used for stores. Photo taken from the deck of the Endeavour with 1967 fuel installations sited rather too close.

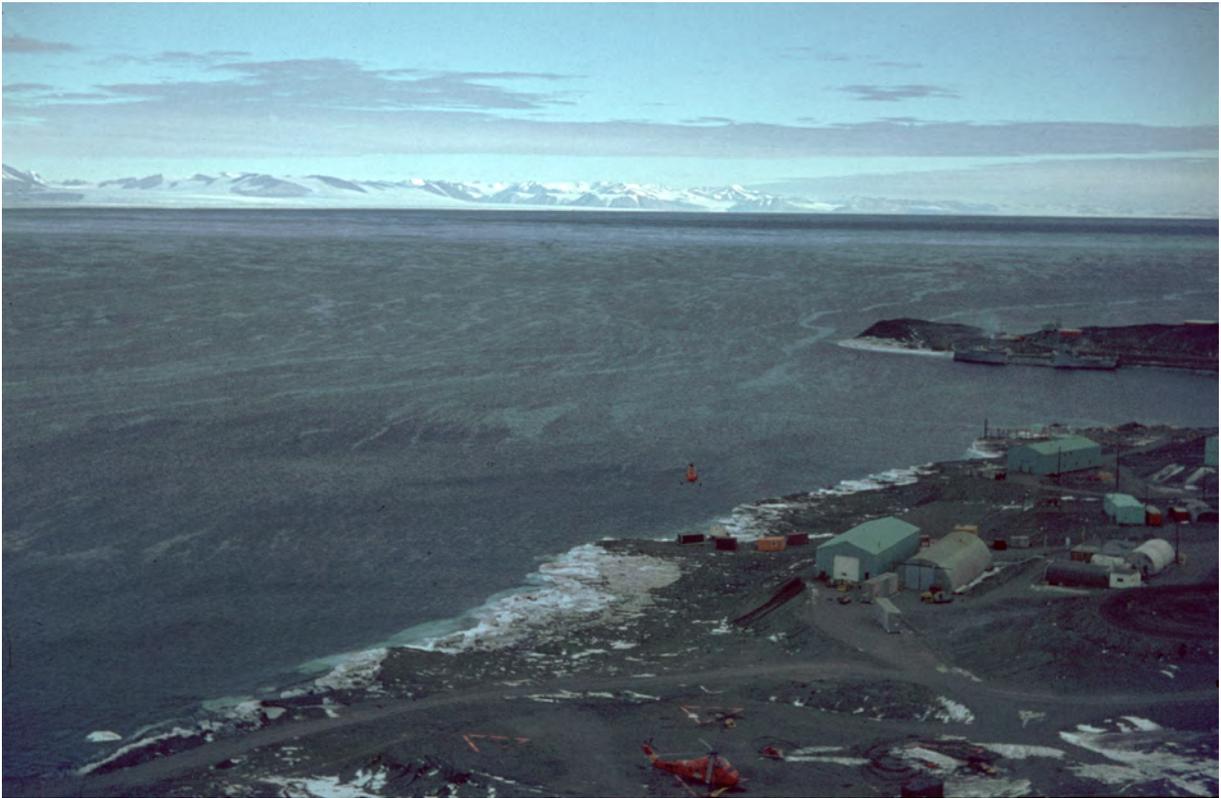




Above: Chapel of the Snows at McMurdo, with memorial to Admiral Byrd on plinth

Below: 'Atoms for Peace'. The 1.8 MW power plant ran, unreliably, from 1962 to 1972





Above: McMurdo helicopter operations – taken from Observation Hill

Below: Nuclear power plant site in 2012.
Photo by Sergey Tarasenko, from Wiki Commons

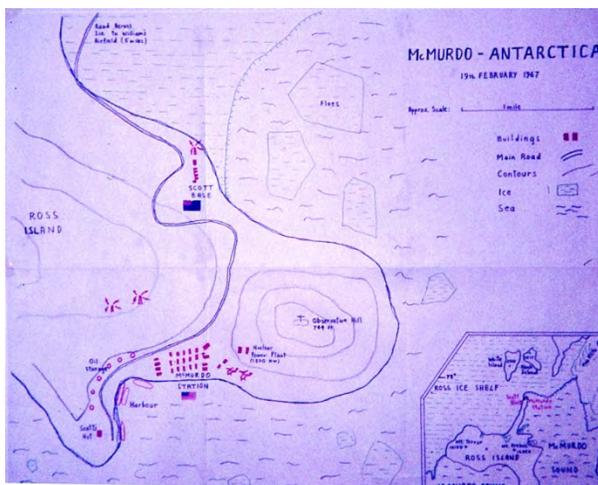


Scott Base

From the noisy activities and rocky barrenness of the McMurdo Station area we walked to the New Zealand Scott Base. Although only a few kilometres away, the area gave a much greater sense of Antarctic white vastness when you looked out over the Ross Ice Shelf.

The Scott Base people hosted a party for the Endeavour people. The sunny afternoon temperatures outside had 'warmed' to just above freezing so there were some plaid shirtsleeves rolled up, and I recall a window being open!

I presume that we made phone calls home from Scott Base, as mentioned in the letter-diary. The letter was certainly posted, received, and still exists.



Above: Sketch map of the McMurdo area. Drawn by myself on the return voyage and pasted on the lab door.

Taking photos inside Scott Base strained the capabilities of the camera and the Agfachrome film. However the slightly unfocused photos of the party are included nearby in case faces and profiles can be recognised and remembered by a few readers.





Above: Scott Base buildings February 1967.

Below: Mount Erebus from Scott Base





Above: Scott Base huskies – with seals behind.

Below: Mount Erebus from Scott Base at 11pm.



The Return Voyage

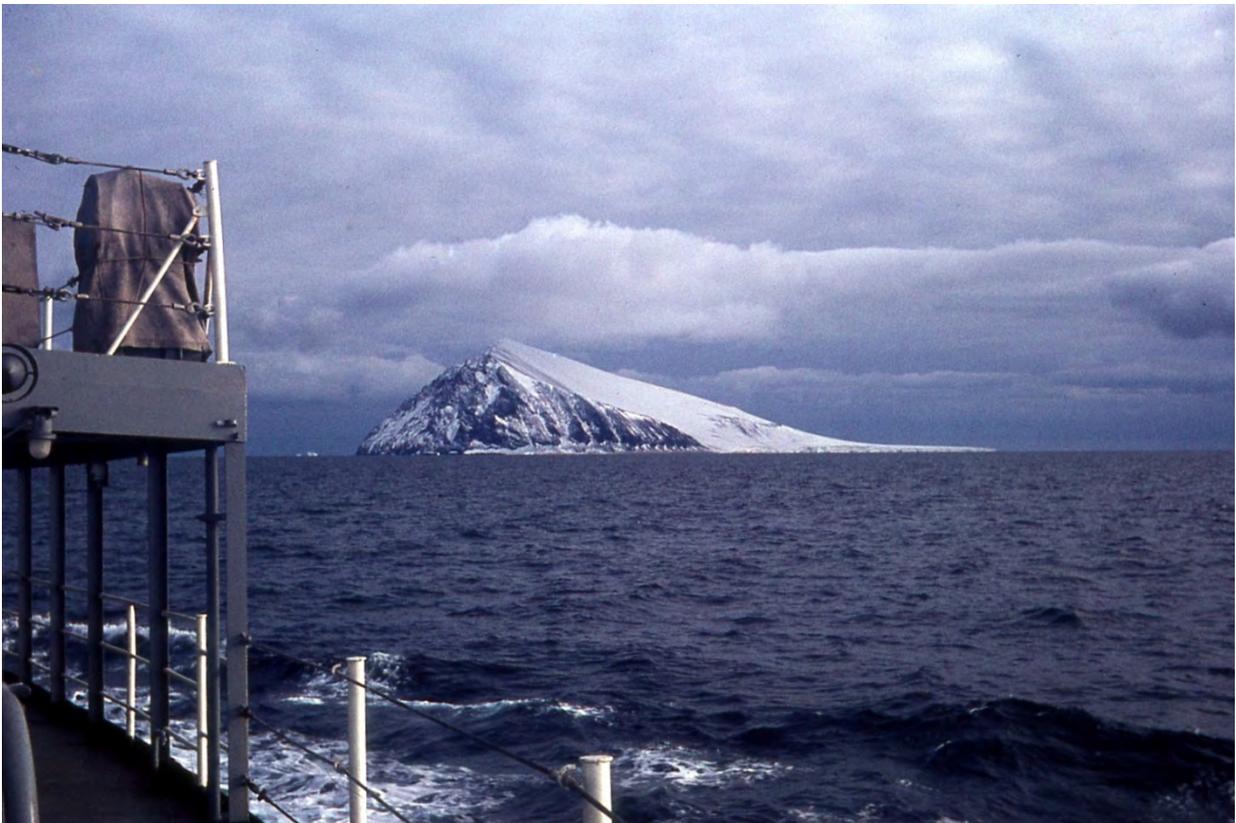


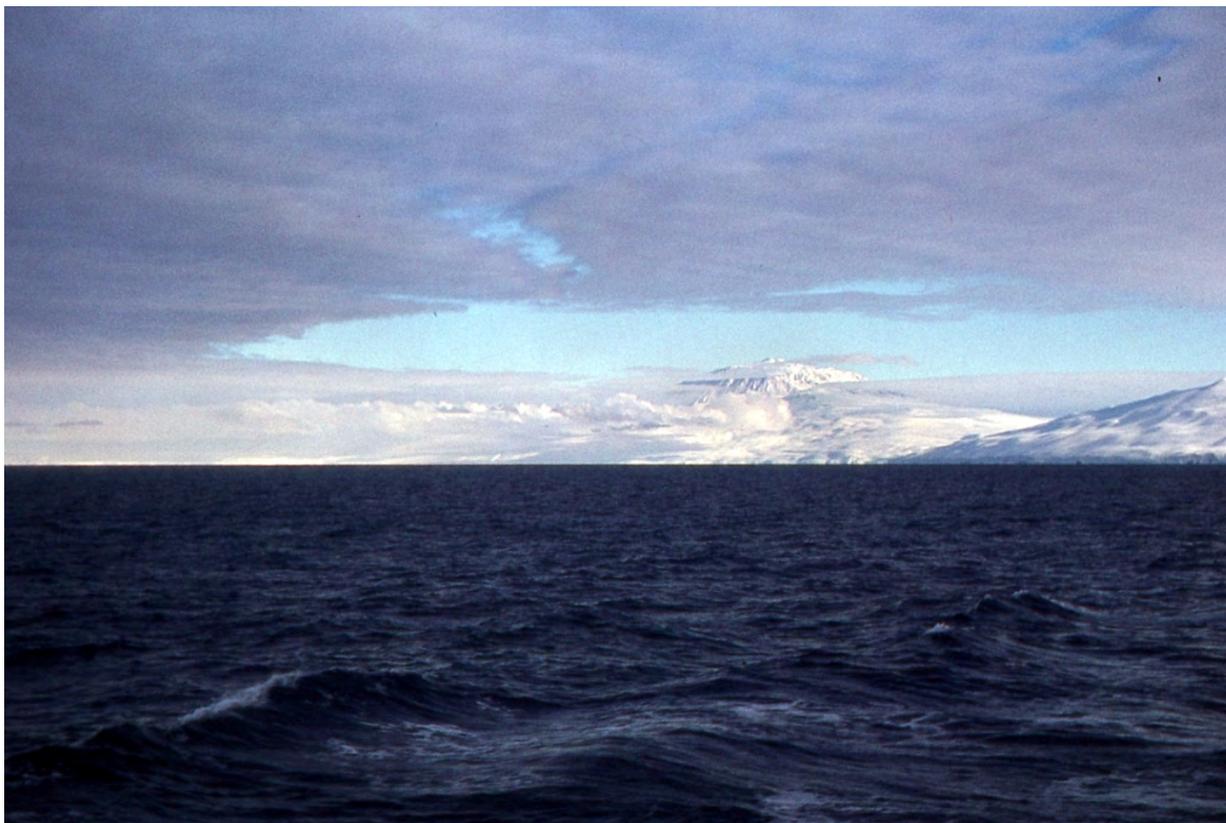
Left: Men from Scott Base farewelling *Endeavour* from Hut Point where we had been berthed. They are at the cross erected in memory of George Vince who died in an accident nearby in 1904.

I didn't keep a diary for the return voyage from McMurdo Sound to Wellington. I don't recall any violent storms but do remember almost finishing reading *Lord of The Rings*, and suddenly not caring what happened.

We towed the magnetometer along the agreed track but eventually the equipment failed beyond our abilities to repair it. The ship was then able to take a more direct and faster track to Wellington.

Below: Beaufort Island, which is sited 20 km north of Cape Byrd on Ross Island..

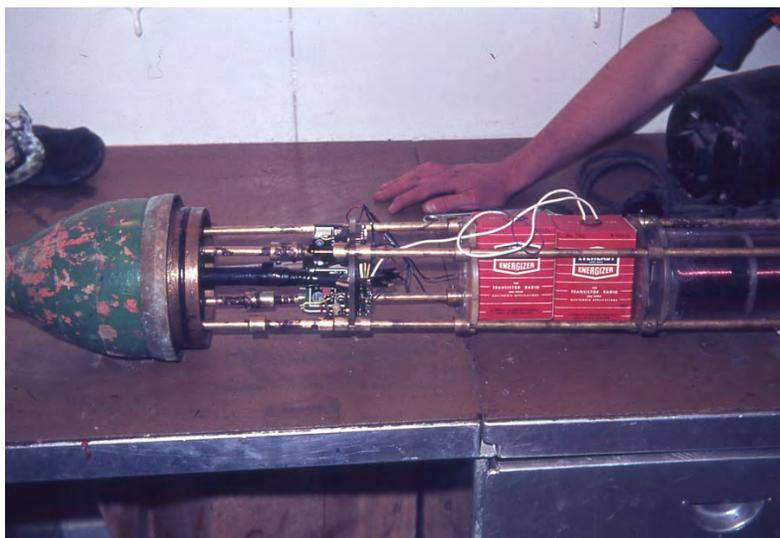




Above: Sailing away from Antarctica - Mount Erebus from the Ross Sea.

The Equipment

The strength of the Earth's magnetic field is measured by an instrument called a magnetometer, of which there are various forms. For most purposes, the general magnetic field of the Earth can be assumed to smoothly change from area to area. Our instrument needed to be sensitive enough to detect small variations in this apparently 'constant' magnetic field and the technique used was that of proton-precession (see explanation in separate box).



Right: Inside 'the fish'. When it was first pulled in from the near freezing sea water the brass couplings were 'cold-welded' together and it was hard to open.

The proton magnetometer we used had to be designed and built at the University. To minimise the effect of the ship's metal our detection unit was enclosed in a torpedo-shaped case, called 'the fish', which was towed behind the ship. The tow cable also carried electrical measurements back to the equipment in our laboratory on the ship. A modern smartphone can contain several magnetometers that are now reduced to a tiny component on a small circuit board.

The photograph on the previous page shows the 'hand-crafted' nature of our equipment which, by 1967, had been during several seasons of constant movement. My diary-letter records the faults we experienced in the equipment – both in the fish and in the lab. The dreaded faults were ones requiring the retrieval of the fish by three of us on the aft deck hauling on the cable, amidst snow and ice, preferably with the ship at reduced speed.

At the time, the New Zealand Air Force was acquiring Orion aircraft whose long tail book contained a magnetometer to detect submarines. Our magnetometer was tuned to the much fainter magnetic signature of distant rock and if we had passed over a submarine we would have certainly known about it!

From the thesis

The principle of the proton precession magnetometer depends on the interaction between the magnetic moment of protons and an external magnetic field. When a magnetic field of about 100 gauss is applied to a sample of water, it causes protons in the water to become oriented in the direction of the applied field. If the applied field is removed, the protons precess about the Earth's magnetic field direction at a frequency equal to the Larmor precession frequency .. (the formula is given). The precessing magnetic vector of the protons induces an e.m.f. in a coil surrounding the water sample, and the frequency of this e.m.f. provides a measure of the Earth's field.

Below: The *Endeavour* heading back to New Zealand.



Specifications of the Endeavour

Displacement: 1850 tons (4335 tons full load)

Length: overall 311ft (95m)

Beam: 48ft 8in (15m)

Mean draught: 15ft 8in (4.7m)

Performance: 14 knots

Machinery: GM diesel electric, 3300bhp, 2 shafts

Complement: (US Navy):
Officers – 8, Enlisted – 115

HMNZS Endeavour II

The New Zealand Navy has had 3 Antarctic support ships named *HMNZS Endeavour*, including one still in service at the time of writing. They share the wonderful name of HMS Endeavour used by Captain Cook on his first voyage of discovery in 1768 to 1771. Captain Cook had chosen a collier from his old home port of Whitby, North Yorkshire as having suitable qualities for his expedition.

HMNZS Endeavour II was also a 'repurposed' vessel that started life as a US Navy petrol tanker launched in 1944 as the *USS Namakagon*. In 1962 she was loaned to NZ, refitted and strengthened for ice, and became *HMNZS Endeavour*. She returned to the US Navy in 1971 and was transferred to the Taiwan Navy as *Lung Chuan*

Photo No. 19-N-126272 USS Namakagon (AOG-53) on 5 June 1947



Right: The ship as the *USS Namakagon* in 1947.

Source: US National Archives

Right:

The NZ Antarctic Veterans website (www.antarctic.homestead.com) has contributions by Jim Dell, a retired Warrant Officer (Communications) Royal New Zealand Navy. His account of the Endeavour's season following my voyage gives an idea of the number of people aboard.

The 1967/68 season started later – *Endeavour* departed Auckland 23 December 1967 after having loaded the bulk of the cargo for Scott Base. We arrived in Lyttelton 29 December to take on aviation fuel and the remainder of the Scott Base cargo. From this point on, we have a much detailed diary of events as four of us decided to start up a paper – "The Endeavour Times". For the first trip, we put out a daily edition, but due to the lack of stationery, the paper was only done every second day on the second trip. We had a crew of about 60, plus scientists, sea cadets and reservists – approximately 85 in all. All contributed to the paper and we have been able to keep a historic document, detailing the events of the 1967/68 season.



Looking back

I did not continue with geophysics research: life took me elsewhere. Looking back after 50 years, I am struck by just how close in time my 1967 research and thesis is to the 1963 landmark paper of Vine and Matthews which made the convincing case that seafloor spreading from mid-ocean ridges was the mechanism that had driven, and was continually driving, the continents into new arrangements; what is now termed plate tectonics. Just 5 or 10 years before that time it had been still contentious to propose that continents had moved position.

Forty years on, this mechanism for continental drift is still accepted. German meteorologist Wegener did his reputation no good by suggesting, in 1912, that continents may have once been joined. His evidence included visual clues such as the apparent 'fit' between the shapes of the South America coastline near Brazil and the Africa coastline near Nigeria.

These clues were not to enough to overcome our collective ignorance of what was hidden in the oceans; it was easier to be distracted by continental features such as Mount Everest. We also failed to appreciate that the material of the Earth's mantle, forming about 80 per cent of the Earth's volume, is viscous enough to act as a

Above: Endeavour returning to Wellington, Within sight of the harbour heads.

Photography

The photos in this book are scanned from Agfachrome 35mm slides (transparencies) taken on a Voigtlander 35mm camera (non-SLR) given to me as a cast-off by my Uncle Monty Organ. I had also used Agfachrome for my Milford Track walk as there was an opinion around that the Agfa film was more 'true' to natural colours than Kodak film. Fortunately modern photographic software can rescue any colour deficiencies of the original slides.

Ironically, within 15 months of the voyage I was an employee of Kodak's UK Harrow factory as part of a technical team making Kodachrome and Ektachrome films.

From the Thesis:

The most spectacular evidence for spreading ocean floors has come from magnetic anomaly studies over the ocean ridges and basins. Vine and Matthews (1963) have suggested that the history of a spreading ocean floor may be recorded in the permanent or remnant magnetism of the ocean bed. As new oceanic crust forms at the centre of the mid-ocean ridge and cools through the Curie temperature, the remnant component of its magnetism will take the direction of the earth's magnetic field at that time. This remnant magnetism, which is strong, remains with the ocean floor as it spreads away from the ridge and is reflected in the magnetic anomalies measured over the ridge and ocean basins.

fluid when measured over planetary rather than mortal spans of time. The impressive granite masses of continents are actually dead rocks that are passively floating on the mantle and being driven apart by the sea floor.

I had no reputation to lose when, almost 60 years after Wegener's publications, I technically explained the seafloor spreading mechanism and how it 'accidentally' left a record of ancient magnetism. (See box at left)

By a happy chance in the properties of ocean bed rocks, a record of the Earth's past magnetic field is captured as molten rocks emerge at the mid-ocean ridge and cool through a temperature where their magnetism is preserved in relative strength and direction. The records in the rocks were particularly arresting when they indicated that, at regular intervals, the Earth's magnetic field had rapidly 'flipped' in the opposite direction. The record showed the north magnetic pole had become the south, and the south magnetic pole had become the north

Early Satellite Navigation

It was less than 10 years since Sputnik the first artificial Earth satellite had been launched. As we laboured with our traditional navigation we did understand how it would be possible to use satellites on known orbits to get better fixes. We heard that some US Navy ships had such equipment.

50 years on we all have satellite navigation equipment – in our cars and in our phones!

Navigation

Even in the 1960's ships didn't know, or need to know, exactly where they were upon the wide oceans. As long as they arrived near their destination they could then use their eyes, radio and radar to navigate locally and to avoid collisions. But we wanted to know exactly where we had been each day. In the absence of accurate satellite navigation we had to depend upon the traditional methods of master mariners, using sightings from the bridge of the sun even as the sun became more reclusive in the polar skies.

I think the commander of a previous *Endeavour* – Captain Cook – would have appreciated our new type of exploration. His skill at navigational observations would have been invaluable to us. Two hundred years after his voyages, we were using equipment and methods that he would have recognised and that were of comparable accuracy.

So, if James Cook had been on our particular voyage of the *Endeavour* his navigational observations and calculations could have bettered ours, and his map-making skills would have superbly exceeded ours.



Above: Abeam Beaufort Island.

Below: Tending the cable – probably Malcolm.
Note kitchen waste disposal chute direct to sea.

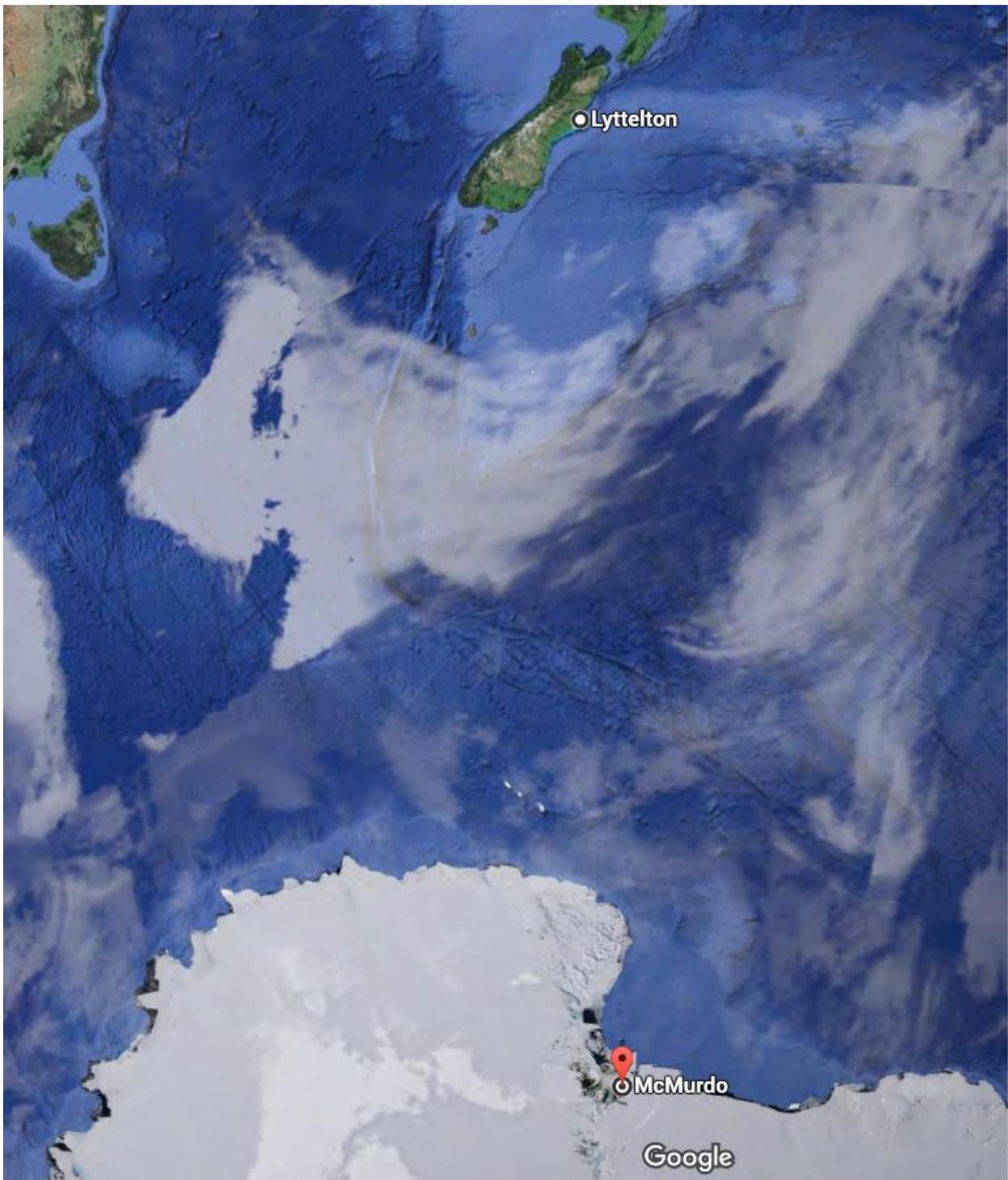


Maps



Above: Big picture map of Antarctica.

Source: NASA, USA



Above: Bigger picture map of the Southern Ocean between Antarctica and New Zealand. Shows mid-ocean ridge.

Source: Google maps

