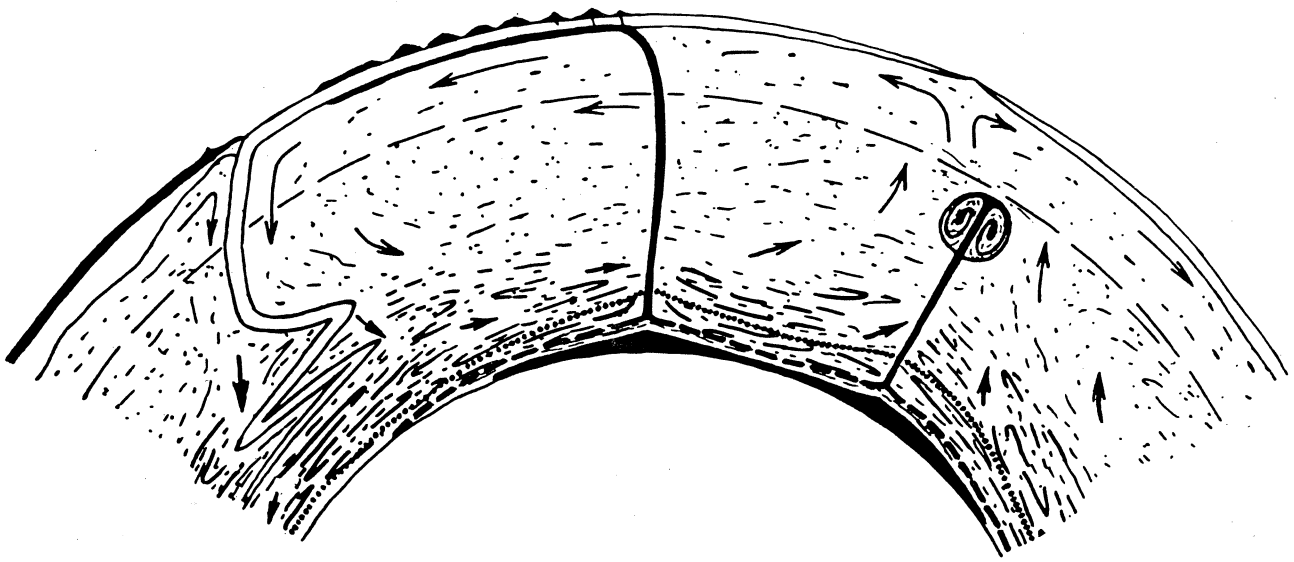
F. E. M. (Ted) Lilley
Research School of Earth Sciences
Australian National University

GEOLOGICAL SOCIETY OF AUSTRALIA

GEOPHYSICS DOWN UNDER

NEWSLETTER OF THE SPECIALIST GROUP ON SOLID-EARTH GEOPHYSICS



MANTLE PLUMES AND CONVECTION - THE LATEST IDEAS

ISSN 1035-0853

NEWSLETTER Nos 15/16 JUNE/DECEMBER 1992

THE D'ENTRECASTEAUX BICENTENARY MEETING, TASMANIA, 9–11 MAY, 1992

F.E.M. (TED) LILLEY Research School of Earth Sciences Australian National University

INTRODUCTION

The D'Entrecasteaux Bicentenary Meeting was held by the Specialist Group on Solid-Earth Geophysics in Tasmania on 9, 10 and 11 May 1992. Its purpose was to celebrate the measurement of magnetic intensity made by De Rossel, of the D'Entrecasteaux Expedition, at Recherche Bay, Tasmania on 11 May 1792. Articles in the December 1991 issue of "Geophysics Down Under" by Day and Lilley describe the setting of the 1792 De Rossel measurement, and its place in geophysics as part of the earliest surviving survey of global magnetic intensity. As pointed out by Day, the De Rossel 1792 measurement can be regarded as the first geophysical measurement made in Australia as part of a deliberate scientific enquiry. The 1992 anniversary thus formed a significant bicentenary, celebrated by the meeting.

SATURDAY MORNING, AT GOVERNMENT HOUSE

The meeting convened at 11 a.m. at Government House, Hobart, where the Governor of Tasmania, General Sir Phillip Bennett, welcomed delegates, opened the meeting, and showed participants through the formal entertaining rooms of Government House. Then, outside, a tour of buildings which remain from the Rossbank Magnetic Observatory (1840-1854) was conducted by Hobart historian, Mrs Gillian Winter. The tour concluded near the Botanic Gardens, where lunch was enjoyed at the kiosk.

SATURDAY AFTERNOON, AT THE CSIRO MARINE LABORATORIES

On Saturday afternoon, from 1.30 to 5.30 p.m., a symposium was held at the CSIRO Marine Laboratories on the topic "Progress in Geomagnetism in Australia, 1792-1992: A Bicentennial Review". Members of the public were invited, and there was an attendance of some 80 to 100, at this excellent venue. Eight speakers gave talks covering the range of modern geomagnetism, and its remarkable developments. The speakers, and their topics, are given on the accompanying programme as Appendix 1. Afternoon tea was served in the canteen of the Marine Laboratories with the compliments of Geophysical Technology Pty Ltd (Director, John Stanley), and with a superb view out over the Derwent Estuary.

SATURDAY EVENING, AT MURES SEAFOOD RESTAURANT

Following drinks at the Customs House Hotel, the conference dinner was held at Mures Seafood Restaurant, Victoria Dock. Some thirty diners enjoyed a menu of dishes which commemorated the D'Entrecasteaux Expedition, with a special label De Rossel Chardonnay, in a room decorated to the period. After the main course, Alan Day gave an interesting and entertaining account of the circumstances of the expedition two hundred years ago, and proposed a toast to "D'Entrecasteaux and the Early Scientists". Then, after dessert, an abrupt knock at the door announced the arrival of the figure of an eighteenth century Frenchman (alias Pat Quilty), who responded to the toast, with much applause.

SUNDAY, ON THE M.V. *CARTELA* TO RECHERCHE BAY

The Sunday cruise to Recherche Bay left Hobart wharves at 7.30 am in still, calm conditions. The M.V. *Cartela* had a full complement on board for a day cruise, with 170 members of the Hobart public augmenting some 30 participants from the D'Entrecasteaux Meeting. The *Cartela* is also celebrating an anniversary this year, having been built in 1912 for commerce in the D'Entrecasteaux Channel.

The cruise proceeded down the Derwent Estuary, and entered the D'Entrecasteaux Channel at the northern end. Features of interest were pointed out by a number of commentators, especially Hobart geologist Max Banks, as the Channel was traversed, from north to south. Then, with a mild headwind and waves from the south, it was into the open sea, with southern Tasmania to starboard. As the entrance to Recherche Bay was reached the ferry turned to head in, to a reading (in translation) of La Billardière's account of the D'Entrecasteaux arrival in the bay in 1792.

Inside the bay, the ferry went first to the Port du Nord, past Bennetts Point (the 1792 observatory site), and to the mooring sites of the D'Entrecasteaux ships *La Recherche* and *L'Esperance* in 1792. Then heading south, the ferry toured the Port du Sud (and past D'Entrecasteaux's 1793 observatory site), before heading out of the bay and north again. Lunch was served with a slight following sea, and then, upon entering the Channel, a stop was made at Partridge Island (so named by the D'Entrecasteaux expedition who saw quail there).

Afternoon tea was served heading north up the Channel, and then as it got dark a spectacular Aurora Australis became evident, against the black sky to the stern of the ferry. The ferry deck lights were switched off; and the auroral activity, as if to illustrate the talk by Gary Burns just the day before, kept the ferry party entranced.

Hobart, with city lights reflected in the water, was reached at 7 p.m. The ferry berthed to the sound of three cheers for the captain, Michael Roche, and crew.

MONDAY AT THE 1792 OBSERVATORY SITE, RECHERCHE BAY

The aurora heralded in the actual bicentenary day in clear weather, with sun and blue sky. A party of some twenty-one drove south by car, to rendezvous at Moss Glen, Recherche Bay, at noon. Here two Zodiac craft of the Australian Antarctic Division, each with helmsman and handler, ferried the party across the bay to land at Bennetts Point, the site of the 1792 Observatory. Members of the party are listed in Appendix 2.

Various magnetic measurements were made. A dip needle was oscillated, to re-enact ceremonially De Rossel's determination of relative field intensity: the period of oscillation observed was 3.014 ± 0.009 s. With the needle steady, many of the party took readings of the static dip, with a mean result of 73°21' ± 04' (to the south). This value, compared to De Rossel's 1792 result of 70°50', indicated a movement of the magnetic pole towards Australia by c430 km over 200 years.

Also, a modern total-field proton-precession magnetometer was read to measure magnetic field intensity. The initial reading obtained was 62781.7 nT, and subsequent readings showed some magnetic activity still continuing from that associated with the aurora of the night before.

A plaque was affixed to a sturdy outcrop of dolerite nearby, above the water, and unveiled with a speech (in French) by David Branagan, Chairman of the Specialist Group on Earth Sciences History of the Geological Society of Australia. The speech concluded with a toast (with fine French brandy) to the next 200 years of Australian geophysics, and was made to complete the occasion, and the meeting.

ACKNOWLEDGEMENTS

Thanks are extended to the people and institutions mentioned in the description above, for making the meeting so successful. In addition, thanks are especially due to Dr George Cresswell of the CSIRO Marine Laboratories for the success of the Saturday afternoon symposium, and to Dr Gary Burns and Dr Dudley Parkinson for acting as a local committee in Hobart.

APPENDIX 1. SYMPOSIUM PROGRAMME — PROGRESS IN GEOMAGNETISM IN AUSTRALIA, 1792–1992: A BICENTENNIAL REVIEW (9/5/92)

1330. First Session, chaired by Dr Tony Brown (Royal Society of Tasmania).

W. D. Parkinson (University of Tasmania):. *Description of Earth's magnetic field and its measurement.*

The magnetic field of Earth is sensed by its effects, such as causing a compass to point north. A dip needle is like a compass in a vertical plane, showing whether the magnetic forces are inclined.

Photographs (opposite), by Ian McDougall and Alex McLaren of the D'Entrecasteaux Bicentenary Meeting.

Top left shows a group outside Government House, Hobart, on 9 May 1992.

The remaining photos were taken at Recherche Bay on 11 May 1992 and are, clockwise from top right:

Boarding Zodiac craft to cross Port du Nord to Bennetts Point.

Timing an oscillating dip needle at the 1792 site (l. to r. Ted Lilley, Peter Stevenson, Jim Dooley, Dudley Parkinson).

The plaque emplaced at Bennetts Point.

Measuring the magnetic field with a proton-precession magnetometer (l. to r. Charles Barton, Jim Dooley, Alex McLaren).

Looking back across Port du Nord from Bennetts Point.

The D'Entrecasteaux expedition carried out the earliest surviving survey of global magnetic intensity by measuring the oscillation time of a dip needle, disturbed from rest. Two hundred years have seen remarkable developments in the instruments used to measure Earth's magnetic field.

F. E. M. Lilley (Australian National University, Canberra). *Creation of magnetic fields by fluid motion.*

A reversing Earth's magnetic field asks anew the question, what is its cause? The magnetization of the surface rocks, which is such a help to geological mapping and palaeomagnetism, and causes the magnetic stripes of the sea-floor, is not sufficient for the main magnetic field of Earth and does not explain the reversals. Deeper in the Earth it is too hot for such magnetization, and instead it is now accepted that a dynamo process, occurring in the fluid core of Earth, creates and sustains the main magnetic field. Electric currents are generated and when these change direction a magnetic reversal occurs.

David E. Leaman (Consultant Geophysicist, Hobart): *Geological information from magnetic maps.*

Some rocks contain magnetic minerals and thus distort Earth's magnetic field. These distortions can be used to extract geological information of use in research, exploration, archaeology or building foundation studies. Magnetic surveys are low-cost, safe and free of risk of environmental damage.

C. E. Barton (Bureau of Mineral Resources, Canberra): *Palaeomagnetism and continental drift.*

The magnetization present in rocks is, in many cases, acquired when the rock was formed. Thus rocks act like "frozen magnetic compasses" and "frozen dip needles" which tell us the variation (declination) and dip (inclination) of the ancient magnetic field. This is the science of palaeomagnetism.

Over geologic time, the magnetic poles can be taken to have been coincident with the geographic poles, on average. Thus palaeomagnetic measurements give the latitudes at which rocks were formed, and their original orientations. From palaeomagnetic measurements some remarkable (at the time incredible) facts emerged: that the continents had moved great distances across the surface of Earth.

1550. Second Session, chaired by Dr Mark Duldig (Australian Institute of Physics).

Ian McDougall, FAAS (Australian National University): *Reversals of Earth's magnetic field and sea-floor spreading.*

The measurement of the magnetization of rocks showed another result which at the time was incredible: many rocks had been formed when Earth's magnetic field was "reversed", that is, compasses would have pointed south. Determining the ages of these reversely magnetized rocks established a reversal sequence for Earth's magnetic field, and led to yet a third surprising and most important result: patterns of magnetic "stripes" measured over the oceans were caused by a seafloor-spreading process, the oceanic part of continental drift.

James C. Dooley (Retired, formerly with the Bureau of Mineral Resources): *Mapping the magnetic field of Australia and its change with time.*

Because of the importance of the magnetic field to surveying and navigation, and the fact that because the magnetic poles are not coincident with the geographic poles, a compass does not point true north, it is important to make magnetic maps of a continent like Australia. Also, the magnetic poles move slowly, so that the change of the field with time must be monitored. This change is called the "secular variation".

Denis E. Winch (University of Sydney): *Daily magnetic changes, and the history of observatories since 1840.*

Electric currents flow also in the upper atmosphere of Earth, driven especially by the Sun, and changing from day to night. The understanding of the accompanying daily changes in the magnetic field at Earth's surface has been an achievement of the international network of magnetic observatories which now exists over Earth's surface. The observatory network also monitors the slow movement of the magnetic poles, and the magnetic storms which occur when unusually intense electric currents flow in the atmosphere and space beyond Earth.

The Rossbank Observatory, which operated in Hobart from 1840 to 1854, was an important early member of the global observatory network.

Gary B. Burns (Australian Antarctic Division, Hobart): *Earth's magnetic field in space, and aurorae.*

Earth's magnetic field extends into space, occupying a region much larger than the volume of Earth itself. Magnetic field measurement is thus a basic part of space research. The shape of Earth's magnetic field in space is determined by its interaction with the "solar wind". A spectacular consequence is the occurrence of aurorae (Aurora Australis in the south and Aurora Borealis in the north). These aurorae are the result of Earth's magnetic field funnelling energetic particles into the parts of the sky which form the auroral regions. Aurorae are associated with strong magnetic storms. Data from the magnetic observatory network continue to make vital contributions to the study of the interactions of Sun and Earth.

APPENDIX 2.

ATTENDANCE ON MONDAY, 11 MAY 1992.

The people present at Bennetts Point on 11 May 1992 were:

Charles Barton	Ted Lilley
David Branagan	Penny Lilley
Gary Burns	Ian McDougall
Alan Day	Alex McLaren
James Dooley	Dudley Parkinson
John Goldsmith	Michael Roach
Fay Goldsmith	Janne Sprague
Pene Greet	Peter Stevenson
Roy Harden Jones	Geoffrey Stilwell
Clodagh Harden Jones	Ruth Wilson
James Lee	

and four Zodiac personnel from Antarctic Division.

Max Banks and Nanette Dooley were on the western shore at Moss Glen.

CORRECTION

On page 6 of the December 1991 issue (No. 14) of Geophysics Down Under, 9 May 1794 should replace 9 Feb. 1794 as the date given by De Rossel (1808) for the magnetic intensity measurement in Surabaya.