GEOLOGICAL SOCIETY OF NEW ZEALAND

N E W S L E T T E R

No. 2 November 1956

CONTENTS

NEXT GENERAL MEETING

University of Otago, Dunedin, at 2.00 p.m. on Wednesday, January 16, 1956.

(First day of the 32nd Meeting of A.N.Z.A.A.S.)

YOUR SUBSCRIPTION FOR 1956 IS ~~PAID~~ DUE

THE SOCIETY

The Geological Society of New Zealand was founded in May 1955. Its objects include fostering investigations in the various fields of earth science and serving as a channel for the expression of the views of New Zealand geologists. Membership is open to all those interested in the earth sciences, including all branches of geology, paleontology, mineralogy, glaciology, geophysics, seismology, oceanography, pedology, and hydrology; and there is only one class of membership. The annual subscription is at present 2/6d.

OFFICERS

	1955-6	1956-7
President:	Mr R.W. Willett	Mr H.E. Fyfe
Vice-President:	-	Dr J.T. Kingma
Secretary:	Mr B.W. Collins	Mr B.W. Collins
Treasurer:	-	Mr B.W. Collins
Committee:	Dr R.N. Brothers	Mr J.W. Brodie
	Prof. R.H. Clark	Dr R.N. Brothers
	Mr D. Kear	Prof. R.H.Clark
	Mr G.C. Shaw	Dr. J. Irving
	Mr B.L. Wood	Mr D. Kear

The Secretary's address is:

c/o N.Z. Geological Survey,
P.O. Box 2110,
CHRISTCHURCH, C.1.

(Note the change in Box No. from 374)

THE NEWSLETTER

The Society publishes a NEWSLETTER at irregular intervals. It is hoped to bring this out about twice a year. Copies of the first number (March 1956) are still available on application to the Secretary.

The NEWSLETTER is edited by the Secretary, who will be pleased to receive contributions. Personal notes, short items of geological and geophysical interest, news of the mineral and rock products industries, suggestions as to Society activities, reviews or criticisms of recently published work, letters on any relevant topic, and similar items will all be welcomed.

Unless specifically indicated, opinions expressed in the NEWSLETTER are not to be regarded as the official views of the Society.

ANNUAL REPORT FOR 1955-6

At the Annual General Meeting, held in Gisborne, May 12, 1956, the Secretary presented an annual report, which may be summarized as follows:

Membership. The 120 members of the Society are classified as:

N.Z. Geological Survey	34
University and Museums	25
Amateurs	22
Mining and Petroleum	13
Other DSIR (Geophysics, Soil, Oceanography)	14
Retired professionals	6
Clerical and Administrative	5

Activities. Steps towards the realization of the objects of the Society include: (1) the issue of a newsletter, including a list of members with addresses and notes of their special interests; and (2) the invitation extended to all members to attend the annual staff conference of the N.Z. Geological Survey.

Antarctic Research. Mr R.W. Willett was appointed the Society's representative on the Royal Society's Antarctic Scientific Research Committee, and a sub-committee on Antarctic Geology, consisting of Mr Willett (convener), Dr C.A. Flemming, Dr H.J. Harrington, and Prof. R.H. Clark, was set up. The Society was unsuccessful in its request that a geologist be appointed to the Ross Sea Committee.

Finances. Subscription receipts to the end of March totalled £14 4 6d. Expenses (mainly postages and stationery) amounted to £3 8 2d. There was thus a credit balance of £10 16 4d.

NEXT GENERAL MEETING.

Notice is hereby given that the next general meeting of the Society will be held at 2.00 p.m. at the University of Otago, Dunedin, on Wednesday, January 16, 1957. Mr H.E. Fyfe will deliver a Presidential Address.

Agenda:

- Apologies
- Minutes of First General Meeting
- Business arising from the Minutes
- Annual Report
- Financial Statement
- Alterations to the Constitution
- Report of Sub-committee on Antarctic Geology
- Election of Officers
- General Business
- Next General Meeting

ANNUAL GENERAL MEETING 1956

The First Annual General Meeting was held in conjunction with the N.Z. Geological Survey Staff Conference in Gisborne, on May 12, 1956. There was an attendance of about 50.

Minutes of the preliminary meeting held in Auckland, May 21, 1954, and of the foundation meeting of the Society in Kaikoura, May 14, 1955, were read and confirmed.

The Secretary's Annual Report was received (see above).

The matter of the distribution of New Zealand geological publications, especially overseas, was raised, and the committee was instructed to make tactful enquiries.

The committee was also instructed to approach the editors of the N.Z. Journal of Science and Technology and the Transactions of the Royal Society of N.Z. on their attitude to the publication of comment and criticism on papers published in those journals. The meeting agreed that such publication was desirable.

The report of the sub-committee on Antarctic Geology was received and the sub-committee reappointed with power to co-opt.

The N.Z. Fossil Record System and the suggestion that an award to be known as the "McKay Hammer" be made for outstanding field-work were referred to the committee.

It was decided that the Society should sponsor a sherry party for members of Section C (Geology) at the forthcoming Dunedin Meeting of the Australian and New Zealand Association for the Advancement of Science. The committee was empowered to invite members to contribute towards the cost of this entertainment, as it was thought fitting that at least the overseas members of Section C should be the guests of the New Zealanders. (See details elsewhere in this NEWSLETTER).

Dr A.R. Lillie raised the question of the impending destruction of important outcrops and other geological features (e.g. Auckland volcanoes, special fossil localities, recent fault scarps, etc.), and the meeting passed a resolution empowering the committee to act immediately when necessary to try to prevent such loss. (See note elsewhere in this NEWSLETTER).

The Constitution was amended to provide for the election of a Vice-President, and a Treasurer in addition to or combined with the office of Secretary.

The subscription for the coming year was fixed at 2/6d.

Officers were elected as set out at the beginning of this NEWSLETTER.

It was decided to hold the next general meeting in Dunedin at the time of the A.N.Z.A.A.S. conference, details to be left to the committee.

After a vote of thanks to the chairman (the retiring President, Mr R.W. Willett), Mr H.E. Fyfe took the chair and closed the meeting.

A.N.Z.A.A.S. MEETING, DUNEDIN

Most members will no doubt be aware of the forthcoming 32nd Meeting of the Australian and New Zealand Association for the Advancement of Science to be held in Dunedin, January 16-23, 1957. For the benefit of those who have not received full details, the following brief summary is given.

The Association meets about every two years in the main centres of Australia and in New Zealand in rotation. The last meeting in New Zealand was in Auckland in 1937. The Association has 16 sections (A to P), which meet concurrently. There are also a number of general functions (Presidential address, public meetings, receptions, etc.)

Membership is open to all, and enrolment should be made through the Hon. Local Secretary for New Zealand, Prof. G.J. Williams, School of Mines, Univ. of Otago, P.O. Box 56, Dunedin. There are three types of membership:

Annual members	£2 2. -.
Ordinary members (for each meeting only)	£2
Associate members (wives of members, students)	£1

The officers of Section C (Geology) this year are:

President:	Dr Dorothy Hill (Univ. of Queensland)
Vice-Presidents:	Prof. R.S. Allan (Christchurch)
	Prof. W.N. Benson (Dunedin)
	Dr W.R. Browne (Sydney)
	Mr S.B. Dickinson (Adelaide)
	Dr C.A. Fleming (Wellington)
	Prof. C.E. Marshall (Sydney)
	Dr F.L. Stillwell (Melbourne)
Joint Secretaries:	Prof. D.S. Coombs
	Mr D. Hamilton
	(both of Otago University)

The programme for Section C includes Pre- and Post-Sessional tours, short tours during the meeting, and the following Symposia:

Stratigraphic Correlations in Australasia (1) Pre-Tertiary (2) Tertiary
Inorganic Raw Materials of Australia and New Zealand (with Section B.)
Paleontological Discussions
Pleistocene Geology (with Section P)
Petroleum Geology
Reactions at High Temperatures and Pressures (with Sections A and B)
Geothermal Problems, North Island, New Zealand (with Sections A and H)
Tectonics of the South-West Pacific (with Sections D and P)
Structural Geophysics of the South-West Pacific (with Sections A and P)
Geochemistry (with Section B)
Late Tertiary and Recent Deformation (with Section P)
The New Zealand Upper-Palaeozoic - Lower-Mesozoic Geosyncline
Physical Properties of Rocks (with Section A)
Marine Microbiology (with Sections D, I and P)
The Role of Museums in Science (with Sections D, E, F and M)
Palaeomagnetism and Polar Wandering (with Section A).

Metamorphism: Fabric and Facies
Coal Studies and Utilization
Upper Cainozoic Volcanism
Sedimentation

Some of these symposia are to be held jointly with other sections as indicated (A, Physics, etc.; B, Chemistry; D, Zoology; E, History; F. Anthropology; H. Engineering; I, Medicine, etc.; M, Botany; P, Geography). The number of papers to be given in each Symposium varies from two to seven. There are also a number of unrelated papers and the Report of the Committee on Quaternary Strand-line changes. With such a full programme it is understandable that for much of the time there will be two sessions running concurrently.

Sessions organized by other Sections that may be of interest to geologists and other earth scientists include:

Symposia.

Meteorology and Climatology (Sections A and P)
Submarine Geology and the Fauna and Flora of Outlying Islands (Section D)
Oceanography - Waves and Currents (Sections D and P)
Archeology in Australia and New Zealand (Section F)
C.14 Studies (Section F)
Minor Elements in Soils (Section K, Agriculture and Forestry).
Cartography (Section P).

Papers.

Continental Drift and Collembola (J.T.Salmon, Section D)
Recent Excavations in Otago (L. Lockerbie, Section F)
Oil Field Engineering (D.J. Skinner, Section H).
Foundation Engineering (F.W. Taylor, Section H).
Soil Processes in New Zealand (N.H. Taylor, Section K).
New Zealand Watershed Forests (J.T. Holloway, Section K)
The Energy-producing Regions of New Zealand (B. Farrell, Section P).

Special functions included in the Section C Programme are:

Wed., Jan. 16, 2.00 p.m. - General Meeting of the Geological Society of New Zealand, with Presidential Address by Mr H.E. Fyfe.
Thurs., Jan. 17, 5.15 p.m. - Sherry Party for Members of Section C.
Wed. Jan. 23, 11.30 p.m. - Formal Business Session.

V.U.C. GEOLOGICAL SOCIETY

News has reached us of the existence of a Geological Society formed by the students at Victoria University College. The President for 1956 was Mr Ting and the Secretary Miss Le Fort. This society promises to be an active and stimulating organization and we wish it every success.

SHERRY PARTY FOR SECTION C, A.N.Z.A.A.S.

As mentioned in the account of the May 1956 General Meeting, it was decided that the Society should sponsor a sherry party at which the visiting Australian geologists could be entertained during the Dunedin meeting of the Australian and New Zealand Association for the Advancement of Science. With the kind co-operation of the Section C Secretaries (Prof. D.S. Coombs and Mr D. Hamilton) this has been arranged for 5.15 p.m. on Thursday, January 17, 1957, the first day of technical sessions. A very successful similar function was held during the Melbourne A.N.Z.A.A.S. Meeting in August 1955. It provides an excellent opportunity for the Australian and New Zealand geologists and their wives to meet informally early in the Meeting.

Contributions towards the cost of this function are now invited from members of the Society (and any others). Please send immediately to the Secretary-Treasurer, P.O. Box 2110, Christchurch. Let us entertain our Australian friends with typical New Zealand hospitality. The amount and variety of food and drink available at this function depend on the response to this appeal. We hope to cater for all tastes and appetites.

"GEOMORPHOLOGICAL ASPECTS OF THE CONTINENTAL FLEXURE" by C.A. Cotton

A recent publication that should interest many New Zealand geologists is "Aspects geomorphologiques de la flexure continentale", by Prof. C.A.Cotton, and published last year in Ann. Soc. Geol. Belg., 78: B403-18 (in French).

Duplicated copies of the original English text (without figures) of this paper are available on application to the Secretary.

"NOTE ON THE NEW CALEDONIAN LIAS AND ON THE PALEOGEOGRAPHY OF THE LIAS OF THE INDOPACIFIC REGION" by J. Avias

A short paper of some interest to New Zealand geologists is that entitled "Note sur le Lias Neo-Caledonien et la Paleogeographie du Lias dans la Region Indo-pacifique", by Jacques Avias, and published in 1954 in C.R. 19th Int. Geol. Congr., Sect. XII, pp. 89-91 (in French). In this contribution the author records the presence of Maitaia trechmanni in New Caledonia in rocks formerly regarded as Lower Triassic, and discusses a Late Mesozoic - Mesozoic Melanesian geosyncline extending from New Guinea to New Zealand.

A translation has been made into English by Dr E.W. Bennett, D.S.I.R., Christchurch, and a limited number of duplicated copies are available on application to the Secretary.

PUBLICATIONS WANTED TO BUY, SELL, OR EXCHANGE

Copies of Dr H.J. Finlay's papers on New Zealand foraminifera are in very short supply or actually out of stock at the N.Z. Geological Survey. There is a continuing demand for copies of those papers by workers in micropaleontology both in New Zealand and overseas. If any members have copies they do not need, Mr N. de B. Hornibrook, (N.Z. Geol. Surv., P.O. Box 8002, Wellington) will be pleased to accept them for issue to those with the best claims.

Canterbury University College Library wishes to buy a copy of N.Z. Geol. Surv. Bull. 23 (Geology of Western Southland, by J. Park). Contact Mr J.D. Campbell, Geology Department, C.U.C.

The Secretary has received enquiries for the following publications, which are urgently required at reasonable prices:

N.Z. Geol. Surv. Rep. Geol. Explor. Nos. 1, 2, 3, 4, 5, 18.

N.Z. Geol. Surv. Bulls. 13, 15, 20, 21, 23, 25, 27, 38, 39.

N.Z. Geol. Surv. Paleont. Bull. 11.

N.Z. Colon. Laboratory Annu. Rep. 1, 4, 23, 24, 27, 28, 29, 40.

Rep. Aust. N.Z. Ass. Adv. Sci., 24-30.

N.Z. J. Sci. Tech., 15 (1), 17 (1), 18 (2, 5), 19 (1, 2, 5, 12).

Proc. N.Z. Instn. Engrs., 30 (2), 1944.

N.Z. Mines Dep. Rep., of the following dates of publication:- 1886, 1889, 1891, 1895, 1920, 1922, 1924, 1926, 1926, 1929, 1930, 1932, 1933, 1935, 1936, 1937, 1939, 1940, 1945.

N.Z. J. Sci. Tech., Section A, 20 (1, 2), 21 (2, 3, 5, 6), 24 (1), 25 (2), 27 (1-5), 28 (5), 29 (1).

Would any members having any of these publications for sale or exchange please communicate with the Secretary, indicating if possible the price etc., desired.

Mr B.W. Collins (P.O. Box 2110, Christchurch) has for sale or exchange (or might be induced to give away):

Rep. Aust. N.Z. Ass. Adv. Sci., 23 (Auckland), 1937.

Proc. N.Z. Inst. Engrs. 32 (1946) and 34 (1948).

N.Z. Engng., 1 (3, 4), 2 (10), 3 (2-12), 4 (1-12), 5 (1-12), 6 (1-12).

N.Z. Geol. Surv. Rep. Geol. Explor. 5.

Please don't forget your sub (if due - see bottom of page 1), and the contribution towards the A.N.Z.A.A.S. Sherry Party (see page 7). All subscriptions and donations will be acknowledged.

PETROLEUM GEOLOGY IN TARANAKI

Exploration of the petroleum prospecting licenses held by the Shell Company of New Zealand and Todd Brothers in the Taranaki - Rangitikei area has been undertaken on behalf of the concession holders by Shell-D'Arcy and Todd Oil Services Ltd. Field work was begun in November 1955, and is now being carried out by two geological parties and one seismic party, as well as one magnetic party and one gravity party in charge of D.S.I.R. technicians.

The geologists have so far been working in the older formations of the northern framework of the Taranaki basin, and will gradually carry their mainly stratigraphical studies into the younger Tertiary formations of the basin proper.

The magnetic work covers the area of the Taranaki Peninsula which is overlain by the ash and other ejectements of Mount Egmont. The gravity survey is of an infilling nature to cover the blanks not surveyed by the earlier oil seekers in the region, mainly the New Zealand Petroleum Company.

So far the seismic party has surveyed one continuous line from New Plymouth to Uruti, with occasional short cross lines at intervals. Reflections have been fair. Experimental use of both multiple shotholes and multiple seismometers is being continued in an effort to obtain improved reflections.

It is not expected to be able to select a location or locations for test drilling before the second half of 1957.

June 22, 1956 J. Irving.

What about a contribution to the next NEWSLETTER? A letter, a description of a recent geological trip, reports of local activities, a controversial suggestion, a new theory, or comments on recently published work - these are a few suggestions.

NEW MEMBERS

The following have joined the Society since the issue of the last NEWSLETTER (March, 1956):

Arnold, M.C., Shell D'Arcy and Todd Oil Services Ltd.
Bakker, G., Shell D'Arcy and Todd Oil Services Ltd.
Barron, R.M., A.U.C. Geology Department.
Boreham, Miss A.E., Geological Survey, Wellington.
Bradley, J., V.U.C. Geology Department.
Cotton, Dr C.A., 3 Manuka Avenue, Lower Hutt.
Dibble, R.R., Geophysical Survey, D.S.I.R. Wellington.
Firth, C.W., Waterworks Engineer, Auckland City Council.
Fyfe, H.E., Geological Survey, Wellington.
Glennie, K.W., Shell D'Arcy and Todd Oil Services Ltd.
Graham, J.J., Stanford Univ., California.
Grange, Dr L.I., 21 Colway Street, Wellington.
Grant-Mackie, J.A., A.U.C. Geology Department.
Gutierrez, F.I., Univ. of the Philippines, Quezon City.
Hamilton, Dr W.M., Secretary, D.S.I.R., Wellington.
Hay, R.F., Geological Survey, Wellington.
Hopgood, A.M., A.U.C. Geology Department.
Irving, Dr J., Shell D'Arcy and Todd Oil Services Ltd.
Jaeckli, Dr. J., Shell D'Arcy and Todd Oil Services.
Keyes, I.W., Geological Survey, Wellington.
Leopard, A.E., Geological Survey, Wellington.
Lloyd, M.H., A.U.C. Geology Department.
Maasland, P., 1a Tiri Road, Milford, Auckland, N.2.
Mead, A.D., 133 Owairaka Avenue, Auckland, S.W.2.
Moore, W.R., V.U.C. Geology Department.
Nash, J.A.D., D.S.I.R., Wellington.
Nicholson, Mrs H.M., Northcote College, Auckland, N.4.
Paltridge, I.M., A.U.C. Geology Department.
Pantin, Dr H., Oceanographic Inst., Wellington.
Pick, M., Todd Bros. Oil Exploration Div., Gisborne.
Player, R.A., Takapuna Grammer School, Auckland.
Rich, C.C., V.U.C. Geology Department.
Scott, Miss F.C., No. 4 R.D., Springston, Christchurch.
Selkirk, R.C., 32 Victoria Road, Papatoetoe, Auckland.
Taylor, S.R., Geology Dept., Oxford, England.
Todd, B., Todd Bros. Ltd., Wellington.
Turner, Prof. F.J., Univ. of California, Berkeley 4, California.
Vella, P., British Petroleum Co., Wellington.
Ward, W.T., Soil Bureau, Christchurch.
Watters, Dr. W.A., Geological Survey, Wellington.

This brings our total membership to 140. There are, however, still a number of persons who are either workers in geology and related sciences or interested in the earth sciences who should be members.

It is hoped to issue a full list of members with their addresses and special interests in the near future. Would all members who have not already done so please notify the Secretary of these details, including any alterations or additions desired in the list distributed with NEWSLETTER No.1.

N. Z. ARCHAEOLOGICAL ASSOCIATION

The First Annual Conference of this Association was held in Auckland May 14-16, 1956. Several geologists attended, and of the 13 papers presented the following were of particular interest to geologists:

Brothers, R.N.:	Petrological Analysis of Maori Stone Tools.
Harris, W.F.:	Pollen Analysis and Archaeology.
Kear, D.:	Geological Techniques in Dating New Zealand's Prehistory.
Powell, A.W.B.:	Shells and Shell Fish in New Zealand Prehistory.
Rafter, T.H.:	Radio-Carbon Ageing in New Zealand.
Taylor, N.H.:	Soil Science and New Zealand Prehistory.

Mr Kear, in his paper, emphasized that the archaeologist must possess a sound knowledge of later Holocene deposits. A useful base for his time-scale would be the Climatic Optimum, which can be recognized by several methods. After discussing various methods of dating deposits, he went on to describe the necessity for the accurate location both in space and in time of material collected. A critical attitude was needed in the collection of samples and in assessing the results obtained by the radiocarbon method.

The conference appears to have been a great success, and we wish this sister society all the best for the future.

GOOD WISHES FROM THE GEOLOGICAL SOCIETY OF LONDON

The following letter has been received from Professor L. Hawkes, President of the Geological Society of London:

"Dear Sir,

The Council of this Society has learned through the medium of the first issue of your News Letter, of the recent formation of the Geological Society of New Zealand.

On behalf of the Council and Fellows of the Geological Society of London, I extend our greetings to your Society and our good wishes for its growth and prosperity.

We observe that a number of your founder-members are also Fellows of this Society and we regard this as a promise of close and happy relations between the two societies. We shall receive with interest and pleasure news of the activities of your members and shall welcome at our Rooms any of them who may be visiting this country."

AUCKLAND BRANCH

At a meeting of geologists at Auckland on May 29, 1956, an Auckland Branch of the Geological Society of N.Z. was founded. Twenty-four persons attended an interesting symposium on "The Trias-Jura Rocks of the West Coast, North Island". Dr C.A.Fleming opened the discussion by outlining the recent discoveries by himself, Mr Kear, and Mr Stevens in the Kawhia district. The results of Mr B.H. Purser's research at Port Waikato were summarized briefly by Professor Lillie. Mr Kear added a considerable amount of new data on the area between Port Waikato and Raglan Harbour. Mr R.A. Player reported on the progress of his research in the area between Raglan and Kawhia. The discussion following became very general, with Mr A.P. Mason, Dr R.N. Brothers, Mr J.G. Mackie, and Mr C.W. Firth contributing.

The next meeting was to be held on June 29, when "The Waitemata Group" was to be the subject for discussion. Further subjects for future meetings were: "Pleistocene Sea-levels in the Auckland District", "Auckland Greywackes", "Volcanics of the Auckland Isthmus", "Distribution of Pliocene Beds in the Auckland Province", and "Ignimbrites".

It was intended to meet monthly in the Geology Department of Auckland University College, on the last Friday of the month at 7.15 p.m. An open invitation was extended to visitors. Papers to be read were expected to be of such local interest as to arouse discussion amongst most members of the branch, the main object at present being to stimulate geological research within the Auckland district. Occasionally a speaker may be invited to talk on topics of more general or purely theoretical interest. Meetings were to be informal, and refreshments were to be offered.

It is understood that Professor A.R. Lillie was elected Chairman of the branch (unwillingly) and Dr R.N. Brothers accepted the position of Secretary (rebelliously). Twelve new members of the Geological Society have been enrolled as a result of this Auckland activity.

We would like to congratulate Auckland on forming the first branch of the Geological Society, and express the hope that their 1956 programme has been as interesting and successful as the plans gave promise.

Further news of the branch (and any other local activities in other parts of New Zealand) will be included in the next NEWSLETTER if reports are sent to the Secretary.

In the next NEWSLETTER (which with any luck may be out in time for the A.N.Z.A.A.S. Meeting) we hope to have besides a full list of members and a list of Geological Survey "Open File" Reports, notes on uranium, radiocarbon dating, the Geological Survey's four-mile mapping project, and contributions from members (this means <u>you</u>! - so get cracking!)

GEOLOGY AND THE ANTARCTIC

The Society's best wishes for the success of the Trans-Antarctic Expedition have been sent to Sir Edmund Hillary and the geologists in his party. The members of New Zealand's International Geophysical Year team have also been congratulated and have received the Society's good wishes. Several members of these parties are members of the Society.

The personnel concerned is:

Trans-Antarctic Expedition

Mr.J. Holmes Miller, deputy leader, navigator, surveyor, assistant geologist, and stores officer.
Mr. B.M. Gunn (Geology Department, Otago University), geologist and photographer.
Mr. Guyon Warren (Geological Survey, Christchurch), assistant geologist.

I.G.Y. Party (Scott Base)

Dr T.R. Hatherton (Geophysical Survey, D.S.I.R., Wellington)
Mr V.E.Gerard (Magnetic Observatory, D.S.I.R.,Christchurch)
Mr W.J.P. Macdonald
Mr R.H. Orr (Geophysics Division, D.S.I.R., Wellington)
Mr H.N. Sandford.

I.G.Y. Party (Adare Station)

Mr J.G. Humphries
Mr C.E. Ingham (Geophysics Division, Wellington)
Mr W. Langevad.

The Society will follow their activities with great interest, and trusts that their efforts, together with those of the second year I.G.Y. party which will occupy the bases during 1957-8, will be crowned with success.

The Society's Sub-committee on Antarctic Geology has been active during the last few months in co-operating with the Antarctic Research Committee of the Royal Society of New Zealand. It has requested reports from various specialists on certain outstanding problems of Antarctic geology (especially concerning the Ross Dependency), and intends to issue them to members of the expedition and others interested. The sub-committee consists of Mr R.W.Willett (convener), Prof. R.H.Clark, Dr. C.A.Fleming, and Dr. H.J. Harrington.

Reports issued so far include:

Geological Report No. 1. Preliminary Bibliography of the Geology of Ross Dependency.
Geological Report No. 2. Ditto Supplement No. 1.
Geological Report No. 3. Suggestions for Glaciological and Glaciation Studies by Geologist Members of the N.Z. Antarctic Expedition, by M. Gage and R.P. Suggate.
Geological Report No. 4. Pleistocene Geology with Special Reference to Raised Beaches, by C.A. Fleming.
Geological Report No. 5. The Beacon Sandstone - Summary of Published Work, by G. Warren.

PRESERVATION OF IMPORTANT GEOLOGICAL FEATURES

At the May General Meeting Professor A.R. Lillie raised the question of the impending destruction of interesting outcrops by the activities of industry, mining, and public works. Dr R.N. Brothers stated that only two of the many volcanoes in the Auckland district were not now being quarried: some had been almost entirely removed from the landscape. These speakers were supported by others including Drs. H.W. Wellman and C.A. Fleming, and the Committee was instructed to take such action as it thought necessary.

Geological features that have been suggested as worth preserving include: the fossil forest at Curio Bay, Waikawa; the Moeraki "boulders"; certain fossil localities; recent fault scarps; and type sections of formations or stages.

Members are urgently requested to write to the Secretary or inform any member of the Committee about:

1. Any geological feature they consider worthy of special effort to preserve for posterity.

2. Means of so doing, i.e., what action can be taken by the Society.

3. Any geological feature of special interest that is threatened with destruction - by quarrying, flooding, burial, destruction by vandals, etc.

It is only with the co-operation of members that the Committee can hope to cover New Zealand in this matter. We would like to be able to compile a list of proposed "Geological Monuments", or features of national (and international) importance. Besides those mentioned, there may be geomorphological features, glacial features (striations, moraines, erratics), special types of rare rocks and minerals, and localities of stratigraphic interest (contacts, unconformities, folds, etc.) that ought to be considered. Even if they cannot be preserved (because of the requirements of industry, public works, etc.), it may be possible to ensure their adequate examination and study, and obtain a permanent record (photographic or otherwise) for the future, before it is too late.

In the next NEWSLETTER it is hoped to include, by kind permission of Mr R.W.Willett, Director of the N.Z. Geological Survey, a list of recent unpublished Geological Survey reports (type-written and duplicated) that are open for perusal by members of the Society. Some of these reports may be seen at the Head Office of the Survey, 156, The Terrace, Wellington, or at District Offices in Rotorua, Ngaruawahia, Christchurch, Greymouth, and Invercargill. Others may be borrowed on application to the Head Office. This listing of "Open File" reports will be initially of an experimental nature. We are very grateful to the Director of the Geological Survey for making them available, and hope that this service will be useful to members.

PERSONAL NOTES AND NEWS

Mr R.W. Willett has replaced Dr L.I. Grange (retired) as Director of the N.Z. Geological Survey. At the farewell function to Dr Grange on March 28, 1956, four Directors of the Geological Survey were present - Dr J. Henderson and Mr M. Ongley in addition to Dr Grange and Mr Willett.

Messrs B.L. Wood and D. Kear (N.Z.G.S.) recently visited Samoa to investigate the occurrence of phosphate.

Mr J. Healy (N.Z.G.S.) spent some time in Fiji recently studying the volcanic and thermal activity.

Dr C.B. Campbell, Mining Geologist, U.K. Atomic Energy Authority, will visit New Zealand in the near future. He will spend about a fortnight in this country investigating the occurrence of fissionable materials, especially in the Buller district.

Mr H.E. Fyfe and Dr L.I. Grange represented New Zealand at the 20th International Geological Congress held in Mexico last September. Dr H.W. Wellman also attended.

Congratulations to Mr G.R. Stevens, Mr J.B. Waterhouse, Dr F.F. Evison, and any others, who have been awarded scholarships for study overseas.

Mr D.D. Wilson, formerly of the Geological Survey, Christchurch, has resigned to take up sheep farming at Ashley Downs, near Clinton, South Otago.

Mr J.P. Fox recently resigned from the Soil Bureau, Christchurch, to go farming at Waihaorunga, South Canterbury.

Prof. F.J. Turner, University of California (formerly of Otago University), will be attending the A.N.Z.A.A.S. Meeting in Dunedin next January.

Mr T.J. McKee, Mapua, Nelson, has been taking an active part in the exploration for uranium deposits in the Buller Gorge.

Recent additions to the staff of the Geological Survey are Miss A.E. Boreham, Dr. W.A. Watters, and Messrs G.R. Stevens and G. Warren.

Through the courtesy of Mr R.W. Willett, Director of the N.Z. Geological Survey, there is issued as a supplement to this NEWSLETTER a "Report of the Twelfth Annual Staff Conference, Gisborne, May 8 - 14, 1956", compiled by B.W. Collins. It includes summaries of the papers presented at the conference, which, for the first time, was open to members of the Geological Society.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

NEW ZEALAND GEOLOGICAL SURVEY

REPORT OF THE TWELFTH ANNUAL STAFF CONFERENCE GISBORNE, MAY 8-14, 1956.

Compiled by B. W. Collins, N.Z. Geological Survey, Christchurch.

(issued as a supplement to the Geological Society of New Zealand NEWSLETTER, No. 2, November 1956).

Introduction

The Twelfth Annual Staff Conference of the New Zealand Geological Survey was held in Gisborne in May 1956 at the Gisborne Central School. An innovation this year was the general invitation extended to all members of the Geological Society of New Zealand to attend the open sessions of the Conference and the excursions. As a result, besides 35 members of the Geological Survey, there were present for at least part of the time representatives of the following groups:

Auckland University College (4)
Otago University (1)
Victoria University College (1)
Dominion Museum (1)
Petroleum Company geologists (4)
D.S.I.R. Geophysics Division (5)
N.Z. Oceanographic Institute (2)
N.Z. Soil Bureau (1)
D.S.I.R. Head Office (3)
Amateur geologists (1)
Overseas geologists visiting N.Z. (Profs. J. J. Graham of Stanford Univ. and F. I. Gutierrez of Univ. of the Phillippines)

Arrangements for the Conference were in the hands of Dr J. T. Kingma (N.Z.G.S., Wellington), assisted ably by Mr W. A. Pullar (N.Z. Soil Bureau, Gisborne). To these, and others who helped (especially Mrs W. A. Pullar, who arranged morning and afternoon tea during the indoor sessions; the Gisborne Central School authorities; and the people of Gisborne), we owe a debt of gratitude for the success of the Conference. Special mention should also be made of Mr H. W. Wellman (at that time N.Z. Geol. Surv., Wellington; now British Petroleum Co.), who arranged and led the excursions, which were a special feature of this year's Conference.

Previous N.Z. Geological Survey Conferences

First	Wellington	1945	May 30 - June 1
Second	Greymouth	1946	Aug. 23 - Sept. 2
Third	Wellington	1947	May 6 - May 19
Fourth	Rotorua	1948	May 11 - May 20
Fifth	Auckland	1949	Jan. 31 (with 7th Pacific Science Congress)
Sixth	Invercargill	1950	April 27 - May 8
Seventh	Christchurch	1951	May 22 and 23 (with 7th N.Z. Science Congress)
Eighth	Wellington	1952	April 30 - May 7
Ninth	Nelson	1953	May 17 - May 23
Tenth	Auckland	1954	May 22 - May 24 (with 8th N.Z. Science Congress)
Eleventh	Kaikoura	1955	May 11 - May 16

Duplicated reports have been issued of the 2nd, 4th, 6th, 7th, 8th, 9th, and 10th Conferences.

Programme

Wednesday, May 9

Opening by Mr R. W. Willett, Director, N.Z. Geological Survey, and welcome by the Mayor of Gisborne (Mr H. H. Barker). Papers by Hay, Harrington, Kear, Thompson, Hornibrook, Hamilton, Eiby, Robertson, Kingma, Reed, Wood, McKellar, Stevens, Mutch, Suggate, Bowen, Fyfe, and Collins.

Thursday, May 10

Excursion to Mata Valley (Raukumara section).

Friday, May 11

Excursion to Tapuwaeroa Valley (Taitai - Mokoiwi section).

Saturday, May 12

Excursion to Motu River (type Clarence section).

Sunday, May 13

Morning, 9.00 - 10.30: Papers by Brodie and Fleming; addresses by Fleming (stratigraphic lexikon), Hamilton (A.N.Z.A.A.S., 1957), and Pullar (Gisborne Plain).

11.15 - 1.00: N.Z. Geological Survey administration and policy discussions.

Afternoon: Excursion on Gisborne Plain led by Messrs W. A. Pullar (Soil Survey) and A. D. Todd (Poverty Bay Catchment Board).

On Wednesday evening a meeting of the recently-formed Gisborne Philosophical Society was addressed by Messrs Willett, Shaw, Hornibrook, Collins, and Dr Harrington.

The local radio station recorded a round-table discussion by Messrs Willett, Kear, Hornibrook, Collins, and Dr Harrington, which was broadcast on Sunday evening.

Abstracts of Papers and Discussions

The following abstracts, arranged in alphabetical order of authors, have been supplied by authors (except where indicated) and are reproduced with a minimum of editing. Brief notes on the discussions have been supplied by B. W. Collins. Notes on the excursions, by W. A. Pullar and H. W. Wellman, are included. Unless otherwise stated, authors are (or were) officers of the N.Z. Geological Survey.

1. Early Pleistocene Glaciation in Westland, by F. E. Bowen.

Glacial silts and boulder clays at Humphreys Gully and Blue Spur, Arahura; Sunday Creek, Chesterfield; and Findlay Creek, a tributary of Nelson Creek, north Westland, are both stratigraphically too low and too indurated to be correlated with any known late Pleistocene glaciation. The beds at Humphreys Gully in particular closely resemble the early Pleistocene section with glacial beds at Ross described by Gage (1945, The Tertiary and Quaternary Geology of Ross, Westland. Trans. R.S.N.Z. 75 (2): 138-159). Silts with lenses of rounded pebbles at Ballarat Hill, although not certainly glacial, are also believed to be of early Pleistocene age. Early Pleistocene glacial beds are thus found from Ross in south Westland to Nelson Creek in north Westland but neither the full extent nor the number of glaciations represented are known.

The stratigraphy is complicated as a result of movements

initiated in late Tertiary times, culminating in the Kaikoura Orogeny. Some evidence suggests a conformable relationship between Pleistocene and Tertiary beds near synclinal axes and an unconformable relationship near the anticlinal axes.

Owing to confusion of nomenclature and incorrect correlations, descriptions of sections by the early geologists cannot be relied on, and many sections will have to be re-examined before the extent and nature of early Pleistocene glaciation can be worked out.

Discussion: Suggate mentioned that beds at the Gowan R. mapped by Fyfe as "Glenhope Beds", at the base of the Moutere Gravels, may be the equivalents of the Ross glacial beds.

2. Bathymetric Maps of Hawkes Bay, by J. W. Brodie (N.Z. Oceanographic Institute).

Notable features were (1) the extension of Mahia Peninsula a third of the way across the bay; (2) an offshore bank at 180 fathoms, 25 miles to the east; (3) a sub marine canyon with its head off Porangahau, 300 fathoms deep and flat-floored, leading down into the Kermadec-Tonga trench; (4) an interface 30 ft below the sea-floor in Hawkes Bay giving pronounced reflections - probably a result of recent sedimentation; and (5) shoreward-facing scarps near Mahia Peninsula and in southern Hawkes Bay - probably due to recent faulting. (B.W.C.)

Discussion: Grant-Taylor, Schofield, Fleming, Wellman.

3. Ground-Water Hydrology and the Pleistocene in Canterbury, by B. W. Collins.

By far the greater part of the ground water used or potentially available in New Zealand occurs in unconsolidated alluvium of Pleistocene and Recent age. The gravels immediately underlying the Canterbury Plains are generally regarded as outwash deposits of the last main glacial advance, but alluvia of both older and younger ages occur. Discrimination of the various sets of gravels on lithological grounds alone is difficult because of the lack of distinguishing criteria - all are greywacke gravels without distinctive characteristics. Degree of weathering may be of assistance, but where gravels have been below the water table for long periods they may still be less oxidised than younger gravels that have been above the water table and in the zone of oxidation and weathering for some time. Degree of leaching depends on intensity of rainfall as well as age. Yields of wells show that younger gravels in general are more permeable, and hence more desirable aquifers, than older beds. Yet permeability depends greatly also on original lithological differences. Much of the Pleistocene outwash contains a high proportion of silt or clay, which greatly reduces the permeability of even coarse gravels.

In the river valleys traversing the Canterbury Plains occur suites of terraces, due to intermittent down-cutting alternating with periods of aggradation. The thickness of the gravels deposited during the aggradational phases is important, and may in some places be deduced from the evidence of wells. Remnants of horizontal gravels occurring at elevations higher than the surface of the Canterbury Plains (as at Waipara Mound, Cust and Mairaki Downs, Woolshed Hill, Methven, etc.) could be either younger or older than the deposits immediately below the surface in other parts of the Plains. Whether the Plains surface is an erosional one more or less thinly veneered with young gravels or due to deep aggradation is also a debateable question. In the Christchurch area, and other coastal regions at the northern and southern ends of the plain, the surface is

underlain by alluvium younger than that of the main plains and flooding over the Canterbury Plains surface (restricted sense). Some of these deposits are highly permeable, but their thickness has not yet been accurately determined. If they are due to the Flandrian transgression, radio-carbon datings may greatly assist in the solution of this and related problems.

Discussion: Contributors included Wellman, Grant-Taylor, Schofield, Fleming, and McKellar.

4. New Zealand Crustal Structure - The Seismic Evidence, by G. A. Eiby, Seismological Observatory, Wellington.

The seismological definition of the word "crust" applies to all that part of the solid earth lying above the Mohorovicic discontinuity. This boundary is recognised by the speed of longitudinal waves just beneath it, which is about 8.1 km/sec with only minor regional differences.

The crust of continental regions is classically considered as a two-layered structure, averaging 40 km thick, the upper layer being conventionally described as "Granitic", and the lower as "Basaltic". In oceanic regions the granitic layer is missing, and the basaltic layer only a few kilometers thick.

New Zealand studies have been based both on natural earthquakes and on explosions. The following cross section was obtained from a refraction profile extending 170 km from Wellington along the main ranges:-

Depth	Velocity	Interpretation	
0 to 3km	3.5 to 5.5 km/sec	Greywacke	Metamorphic Complex
3 to 10	6.0	Granitic	
10 to 18	6.2	Basaltic	'Intermediate' layer
	Mohorovicic Discontinuity		
18 +	8.0	Dunite	The Mantle

It is not possible to identify a rock uniquely from a knowledge of the velocity. Both depth and position in the stratigraphic column must also be considered. The top layer is known to be greywacke by direct observation, and the description of the mantle as dunite is conventionally accepted. In Europe and America, a 6.0 km/sec layer is called "granitic". In New Zealand this could limit the thickness of greywacke to an extent unacceptable to the geologist. If the greywacke thickness is to be increased, there must be a major change in the degree of metamorphism at 3km.

Reflection studies west of the Firth of Thames indicate that the Mohorovicic discontinuity may be a few km deeper there than in Wellington. Surface wave dispersion along the flank of the Lord Howe Rise also gives a crustal thickness of this order.

Discussion: During a lively discussion on the interpretation of the geophysical evidence, Harrington stated that "dunite" was an unfortunate term - "gabbro" or "ultrabasic rocks" should be used. Wellman and Robertson also made comments.

5. Note on Structure and Sequence in the Kawhia Jurassic, by C. A. Fleming.

Work by D. Kear and C. A. Fleming on the type N.Z. Jurassic section at Kawhia was undertaken to establish litho-

logic units, determine sequence of ammonite faunas, clarify stage boundaries and establish correlations overseas by ammonites determined by Dr Arkell.

An outstanding problem has been correlation of the type south-side section (Temaiken to Puaroan) with the north side sections at Puti Point and Motutara (containing faunas determined as Lower Tithonian by Spath and classed as Ohauan by Marwick) across a broad belt of Tertiary sediments and volcanics.

STRUCTURE

Henderson and Grange (Bull. 28) interpreted the undermass as a series of fault blocks. They interpreted irregularities in the base of the overlying Tertiary as due to faults and projected them into the Jurassic, to define more or less independent blocks. They recognized a generalized major synclinal structure (Kawhia Syncline) and defined its axis not from dips but from their ideas on the age of the beds. Because they classed the Waiharakeke Conglomerates as Neocomian and the Puti Pt beds as Tithonian, they described the main synclinal axis as passing through the Moerangi Upland, although their dips show an anticline there, and they neglected evidence of folding in the SE part of Kawhia North S.D. Their field sheets contain all the evidence to map two belts of conglomerate dipping E. and W. respectively from an anticlinal axis passing through Kawaroa Stream, the western belt dipping below the supposedly lower Tithonian Puti Pt beds. Had they tried to map formations, and used the evidence of superposition it is hard to see how they could have avoided the conclusions we have now reached.

The continuous South-shore type section from Te Maika to Waikarakeke Bridge is the west limb of a syncline ("Tuapu Syncline", axis about Aweawaroa Creek Mouth), defined by dips and by Waiharakeke Conglomerate on both limbs, flanked by an anticline (defined by dips only) further east ("Ngahinga Anticline", axis ½ m. W. of Hauturu).

The North shore structure is dominated by an anticline ("Kawaroa Anticline", axis W. of Kawaroa Stream), defined by dips and by conglomerate belts on both flanks.

The conglomerates defining the above structures and the fine-grained beds above and below on both shores are similar and are correlated. The Kawaroa Anticline on the north is continuous with the Ngahinga Anticline on the south.

SEQUENCE

In 1954 we mapped formations from Totara Pt to Waiharakeke but found no satisfactory way of fitting in the Puti Point beds (lower Tithonian by ammonites, Uhlig in Boehm; Spath) between the beds at Heteri (upper Kimmeridgian ammonites, Arkell) and the beds from Kowhai Pt to Paparoa Creek (upper Tithonian to ? lower Neocomian ammonites), though we toyed with several hypotheses to fault them out, or lap them out by unconformity at the base of the Kiwi Sandstone.

This year we worked first on the north shore and established the following sequence chiefly on the west limb of Kawaroa Anticline:

Puti Siltstone		Motutara Zone (Belemnopsis apathi m.s., small short)
		Upper Puti Zone (Belemnopsis marwicki m.s. (= Trechmann pl. 16, f. 13)
		Lower Puti Zone (Belemnopsis brownei)
Waiharakeke Conglomerate		
Kinohaku Mudstone		(with Belemnopsis minor)

The lower mudstone is correlated with the Kinohaku Mudstone

from its position and lithology and because it contains Belemnopsis minor (N73/634) and rare "Berriasellid" ammonite impressions (N73/633). As its outcrop is entirely inland, fossils are hard to find and entirely casts.

The conglomerate correlated with the Waiharakeke Conglomerate resembles it in lithology and position. It contains Belemnites but more work is required to show their affinity. Fossils from the top of the conglomerate on the east limb (N73/641) include Belemnopsis cf. brownei.

The Puti Siltstone is dominantly fine-grained with concretions which, at Puti Point and Motutara, have yielded many ammonites, since the Hon. Mr Rolleston brought back the first - a giant Perisphinctid which Hector named Ammonites sisyphi after his friend, whom he nicknamed Sisyphus (the Greek legendary figure condemned to roll a stone). Henderson and Grange's dips showed Puti and Motutara to be on a strike line but we found a sequence (tabulated above) which rationalises the fact that different ammonite species occur at the 2 places. We found Belemnopsis to be zonally distributed. All are shallow and narrow-grooved, short-grooved, laterally-compressed guards, not like the aucklandicus-minor group of the south side. The brownei zone just reaches Puti Pt but strikes seaward to W. and E., swinging to regain the coast a mile E. of Puti and then striking North to Sutherland's Stream (grid ref. 403169, N73/637).

The fauna of the Puti Siltstone is rich and distinctive, the 3 belemnites and Aulacosphinctoid ammonites being so different from those of the S. side sections West of Waiharakeke that it seems impossible to have overlooked it there, and improbable that it could break into a comparatively uniform faunal sequence (in which the Belemnopsis are of strongly canaliculate hochstetteri-minor type, like small aucklandica and the ammonites dominantly Berriasellids like Kossmatia).

The N-S structural and formational correlations need more checking than we have yet given them. The siltstone above the Waiharakeke Conglomerate in the Tuapu Syncline (Puti Siltstone by our correlation) has yielded a few fossils (N73/635), including a weakly canaliculate Belemnopsis or Hibolites like those from the upper Puti Zone. On our next visit we will search for fossils in what steeply-eroded creeks there are in the Tuapu Syncline. Another problem is the absence (judged by bulletin field sheets and our own observations) of a further limb of Waiharakeke Conglomerate on the east flank of the Ngahinga Anticline.

CONCLUSIONS

(1) The Upper Jurassic in the core of the Kawhia Syncline is disposed in open folds that can be mapped by altitude of the beds and tentatively correlated across the Kawhia Harbour depression.

(2) The Puti Siltstone and its cephalopod faunas overlie the Waiharakeke Conglomerate and underlying beds of the South Shore sections and are the youngest Mesozoic beds at Kawhia.

(3) The alleged Upper Tithonian "Berriasella" neozelanica comes from beds underlying the Lower Tithonian of Puti Pt. It cannot be found, and Zittel's figures may be misleading. Probably the beds it came from are Upper Kummeridgian.

(4) There is no longer any evidence that the Kawhia section reaches the base of the Cretaceous.

Discussion by Wellman, Brothers, Kear, and W. M. Hamilton.

6. Geology of Mangaia by H. E. Fyfe

Mangaia, an island of the Cook Group, is the remnant of an early Tertiary basaltic volcano completely surrounded by a massive raised reef of an average width of 50 chains and possibly as much as 120 chains in one area. The central volcanic core and the raised reef, in the lower part of which P. Marshall recognized Lepidocyclines of probably Miocene age, is truncated by a gently domed post-Miocene surface of marine erosion, 554 ft high at the centre of the island. The raised reef, brown as the Makatea, stands as a roughly circular rampart surrounding the volcanic core; its upper surface is 110 ft and 230 ft high at its outer and inner margins respectively.

Landwards, the Makatea is bounded by precipitous walls, at the base of which are alluvial flats, little above sea-level, or gently rolling hillocks between the flats. These flats and hillocks occupy a wide moat-like depression between the Makatea and the central core. Rarely does the Makatea abut upon spurs of the central volcanic mass, and there are few outcrops of lagoonal limestone within the moat, all at inconsiderable elevation.

Seawards, the Makatea is bounded by precipitous slopes that descend from a wave-cut platform at 100-110 ft elevation, to the inner margin of a lower platform at a height of 45-50 ft. Still-stands of sea level at elevations of 30 ft, 25 ft, and 10-15 ft are indicated by somewhat obscure, discontinuous benches. There is a well-developed solution nick in the limestone at sea level, and one 6 ft higher.

Landwards from the Makatea a few small lagoons, discharging by subterranean passages through the raised reef and as yet incompletely infilled by the aggrading streams, indicate a former sea level below the present.

To the north of Oneroa and within the lagoon enclosed by the present fringing reef is a truncated platform that stands about 10 inches above low tide, composed of limestone that is apparently part of the ancient reef-mass.

At a guess, about 20% of the mass of the raised reef is composed of coral in position of growth, the remainder being recemented fragmental limestone.

Terrace remnants and shoulders on spurs developed by radial drainage on the volcanics, mark four partial erosion cycles above present base level. These may ultimately be correlated with caves which penetrate the reef at different heights and through which the interior drainage passed at the various stages of uplift.

The reef commenced as a fringing reef and apparently with subsidence became a barrier reef. Whether the moat is a product of stream erosion on fresh basalt and ash since marine planation of the island, or on fine detritus that filled the lagoon within a barrier reef at the period of planation is uncertain, but the latter hypothesis is favoured. The amount of lateritic earth required to fill solution cavities in the raised reef would suggest that during planation considerable quantities of volcanic detritus were swept over it, and that such filling was not bird-transported as suggested by P. Marshall.

The above is an alternative explanation to that offered by P. Marshall for the history of the island; but much more field work is required by a team consisting of at least a palaeontologist, a petrologist, and a surveying technician to elucidate the island's history. No two islands seen during the trip have similar histories.

The above was incidental to an assessment of the value of the manganese on Mangaia. The volcanic core of the Island is

deeply weathered to lateritic clays and earths, and the manganese occurs as residual and replacement deposits occupying veinlets, cracks, or crevices of the parent basalt within 15-20 ft of the surface of the deeply-weathered zone, or as discontinuous concretionary masses, and slope placers. The manganese "ore" is psilomelane of 90% MnO_2 content down to low-grade ferro-manganese "ore" of little MnO_2 content, and nowhere on the island is there any economically workable deposit.

One specimen disclosed complete replacement of reef limestone by iron-manganese oxide.

Discussion and questions by Beck, Harrington, Collins, and Fleming. Laterization of the basalt extends to a depth of 18 ft.

7. Cretaceous Age of an Undermans Conglomerate in North Canterbury, by D. Hamilton.

The older rocks outcropping in the Hurunui Gorge from the Culverden Plain to Ethelton, are predominantly medium- to fine-grained clastic and tuffaceous greywackes, and micaceous argillites, in which lenses of more or less calcareous sandstones and argillites occur. Pillow lavas, with associated marbles which have yielded rhynchonellids, are interbedded in the sequence.

At the site of the suspension bridge over the Hurunui River (towards the top of the section) two conglomerate horizons occur. The associated felspathic sandstones contain profuse but poorly-preserved plant remains. The younger beds, lying to the south-east of the conglomerates are comparable lithologically with those occurring below the conglomerates. These younger beds also have pillow lavas and imperfect impressions of rhynchonellids in the associated calcareous sediments. Graded bedding occurs below and above the conglomerate bands and the conglomerates, too, show repeated graded bedding. This would suggest redeposition of sediments under geosynclinal conditions. Geosynclinal conditions are also suggested by the presence of pillow lavas in the youngest part of the sequence. The whole sequence is moderately indurated and deeply involved in the post-Hokonui orogenic movements.

The following fossils have been collected from the conglomerate:

1. An ammonite collected from a boulder in the Hurunui River bed by Dr Jobberns and recently redescribed as Idoceras speighti (Marshall), of Kimmeridgian age. The matrix was compared with that of the conglomerate, but similar rocks occur in the gorge sequence.

2. Belemnites from an angular block of calcareous siltstone in the conglomerate. Though precise determination was not possible they are
   either Aulacoteuthis, which is more characteristic of the Lower Cretaceous, but also occurs in the Upper Jurassic.
   or Cylindroteuthis, which is well-known from the Upper-Jurassic, but also occurs in the Middle Jurassic and Lower Cretaceous.

3. A rhynchonellid from an angular block of calcareous sandstone from the conglomerate. Tentatively this is described as a "rhynchonellid with ribbing like that of Peregrinella - a Cretaceous genus of Europe".

4. Small ammonites from an angular block from the base of the conglomerate. These have been tentatively identified as the inner whorls of Anapachydiscus of Campanian age.

This is the first record of Cretaceous fossils to be collected in situ from the undermass in North Canterbury.

Boulders in the conglomerate consist of angular sedimentary rocks and well-rounded igneous and metamorphic rocks (microgranites, quartz porphyries, hornfels, and green greywacke).

Discussion: Fyfe remarked that in the Hossack area, at the head of the Hanmer River, a conglomerate occurred that might also be Cretaceous. The greywacke underlying the Hanmer "Marble" might be of similar age. Wellman stated that a similar conglomerate of Late Cretaceous age was found in the Awatere Valley. Apparently geosynclinal conditions had persisted into the Cretaceous Period, and the conglomerate had been redeposited by turbidity currents. Kear said there was a similar sequence at the top of the Ohauan of the Kawhia area. In answer to a question by Warren on the source of the igneous rocks in the conglomerate, Fyfe mentioned that these rocks, together with the fine gold, magnetite, and radioactive zircon and hyacinth in the conglomerate, indicated derivation from the West Coast.

8. The Tangihua Problem, by H. J. Harrington and R. F. Hay.

The problem concerns the age, stratigraphic position and structural relations of Tangihua Formation which consists of basic lavas and dolenitic intrusives occurring in 20 steep-sided irregularly-embayed massifs in Northland. Sediments interbedded with the lavas contain Inoceramus at several localities, and an Upper Jurassic Meleagrinella at Pandora Bay. Tangihua Formation, together with overlying sediments of Clarentian to Otaian age was deformed on north-west axes in upper Porcora time, the folds having a short wave-length, and large amplitude. Subsequent deposition of Altonian sediments and volcanics was followed by a second folding on west-north-west axes, in Southland time, the folds having a long wave-length and variable amplitude. The Tangihua massifs have been exposed by erosion where the crests of anticlines of the second folding cross the crests of anticlines of the first folding. A plasticine model showing the effect of the two fold-systems crossing at 20 to 30° was handed round for inspection. It provided a three-dimensional picture of the way in which the second folding warped the axes of the first folds into S-shaped forms with rapid changes in direction and amount of plunge. This solution of the structural part of the Tangihua Problem can be applied to the East Coast of the North Island, where maps of Cretaceous and Tertiary sediments show clearly that folds on north-east axes have been deformed by later folding on north-west axes.

Discussion: Brothers asked a question about the Tokatoka Range.

9. Foraminiferal Zones in the Upper Oligocene of the Waikato, by N. de B. Hornibrook.

In the Port Waikato - Kaawa area, good sections at Waikawau, Kaawa, Waiwiri Beach and Limestone Downs have provided a sequence of Foraminiferal faunas that can be correlated with the microfaunas of the sandstones and siltstones inland at Mercer and Kopuku.

The (composite) coastal sequence has been zoned as follows:

			Zone	Stage
PLEISTOCENE	sands			
	disconformity			
	siltstone	Valvulineria saulcii Staffia sinalata	E	Ph
WAIKAWAU BEDS 200 ft	siltstone & sandstone	Textularia? n.sp. (Poor faunas)	D	Po-Ph
	sandstone & phosph. bands & limestone	Gaudryina reussi Ehrenbergina Spiroloculina novo-zealandica, Cytheridea	C	Po
	minor bored zone			
"CARDITA" BEDS circa 4 ft	Dark gritty sands	Gyroidinoides allani Elphidium aff. rotatum	B-2	Lw
	marked bored zone			
"MAHOENUI" 180 ft +	Massive grey siltstone-sandstone	Rectobolivina maoriella Gyroid. allani Lenticulina mamilligera	B-1	Lw
		Cibicides thiara Gaudryina reussi	A	Lw
TE KUITI	limestone			

The "Cardita" Beds are still a problem but I prefer to group them faunally with the underlying beds as they are evidently still Waitakian.

D zone was very poorly fossiliferous and the faunal sequence in the Koheroa Siltstone at Mercer where E and D zone forms occur together suggests that the calcareous E zone species may be absent from D zone through leaching in the Bullring section in the coastal district.

Suggested correlation with inland beds:

Kopuku sandstone: C zone
Kopuku siltstone: D & E zones
Koheroa siltstone: D & E zones

Auckland District. An attempt to apply this zonation to the Waitemata Beds is as follows:

Lower Waitemata Beds at Whitford and Maraetai (Papakura Limestone), Motutapu Island, Orakei Bay: C zone.

Some evidence for the existence of E Zone can be found in Searle's paper on the geology of the Waitakere Hills, in which Finlay records V. saulcii from below the "Parnell Grit" at Blockhouse Bay.

The Manakau Breccias are, in part at least, Lower Southland in age. (Cycloclypeus is first known in New Zealand in the Altonian, from these beds).

Discussion: Contributions by Kear, Suggate, D. Hamilton, and Brothers.

10. Onerahi Group, by D. Kear.

Ferrar gave the name Onerahi Formation to argillaceous rocks near Whangarei. From the points of view of induration and structure they appear intermediate in age between the Eocene-Oligocene Whangarei Formation (coal, sandstone, limestone), and the basement Waipapa greywackes. They also contain upper Cretaceous to Eocene fossils. Hence Ferrar mapped the Northland Coalfields on the assumption that they occurred only below the Whangarei Formation. In actual fact they have never been found there in the field, and only twice in drillholes.

Almost all the Onerahi rocks of the immediate coalfield area were emplaced in the upper Tertiary, and lie in space between the Whangarei Formation and the Pleistocene basalts. They reached their present position by slumping, presumably from the nose of a thrust or nappe.

It is proposed that the name Onerahi Group be applied to those few rocks in their correct stratigraphical position that have been struck in coalfield drillholes. They can probably be subdivided into smaller units elsewhere. The name "Onerahi Chaos" will be used for those rocks in the immediate coalfield area that were emplaced by slumping in the Late Tertiary, and which cannot be subdivided in our present state of knowledge. It may well be possible to map their equivalents to the west, where the nappe or thrust is unslumped.

Discussion: Comments by Wellman, Harrington, Grant-Taylor, and Bowen.

11. Gravimetric Pattern and Geological Structure of the South Island, by J. T. Kingma.

Gravimetric anomalies of -40 to -105 milligals in the South Island are all situated in a zone occupying a narrow strip of country between Lake Wakatipu and the Spenser Mountains. These anomalies suggest a mass-defect in the crust. The topography over the negative zone is not high enough to explain the anomaly. The Southern Alps lies to the west of the negative zone, suggesting that the South Island Main Range, or crest of the South Island Geanticline, bypassed its root to form a large nappe. The various stages of the advancing geanticlinal crest are comparable with Island Arcs of the East and West Indian, and Swiss Alpine types.

The stress has been in a ENE - WSW direction. The Alpine Fault is the surface expression of the overfold plane, and the transcurrent movement along it is a natural result of the overfolding movement.

The Chatham - Mernoo Bank Rise may be considered the tail end of the overfold. The Kermadec Trough peters out against this Rise and shows a westward drag after passing Cook Strait.

Towards the northern part of the Southern Alps the nappe-structure dies out and the South Island Main Range is centred over the zone of negative anomaly. This area shows quite clearly - by the dextral transcurrent faults in Marlborough - how the South Island Nappe was torn from the North Island Main Range. The formation of Cook Strait was a natural result of the movement.

The South Island East Coast volcanism and the Cretaceo - Tertiary idiogeosynclinal sediments there are correctly placed in relations to the Island Arc.

Discussion: There were many contributors to an interesting discussion, in which the author stated that he thought that the overthrusting began in the Oligocene and that the extent

of lateral movement on the Alpine Fault was probably about eight miles.

12. Mesozoic Stratigraphy and Structure, Hokonui Subdivision, by I. C. McKellar.

The paper was a progress report of recent mapping in the classical area of the Hokonui Hills. A map and column were presented showing modern Triassic and Jurassic stage boundaries and thicknesses and distribution of early and recent fossil-collecting points. Warepan, Otapirian, and Arataurian beds not previously recorded have been mapped as a thin sequence crossing the Dunsdale Valley Road along the south margin of the Hokonui syncline.

The total thickness of beds in the Eastern Hokonui Hills is 42000 ft, the lowest 3000 ft exposed probably belong to the Maitai group. The richly fossiliferous part of the section ranging in age from basal Kaihikuan to highest Ururoan is 12000 ft thick.

A large sparsely-fossiliferous area in the central Hokonui Hills can at present only be grouped in the Temaikan, as even though there is a thickness of over 12000 ft there is as yet no fossil evidence for higher stages.

The Hokonui syncline is very unsymmetrical, steeply-dipping beds being confined to the north limb, and to the small area of upper Triassic and lower Jurassic rocks in the Dunsdale Valley. Beds on the southern limb dip at about 10^{0} and in places have been warped into minor folds. A large number of small clockwise-transcurrent faults have been plotted from aerial photographs all striking close to N.N.E. One or two small anticlockwise transcurrent faults striking N.W. combined with these suggest East-West compression.

Two much larger faults with downthrow to the west and striking N.N.E. are inferred from the faunal succession. These are the Bastion Fault originally mapped by Cox in 1878 and the Otapiri Fault along the Otapiri Valley, which probably causes repetition of the highly-fossiliferous Arataurian beds on the north face of Flag Hill.

Discussion: See Paper 17.

13. The Nature of the Upper Palaeozoic-Mesozoic Landmass to the West of New Zealand, by A. R. Mutch.

A landmass, now submerged in the Tasman sea, beyond the western margin of New Zealand, has long been postulated by New Zealand geologists, from their study of the Upper Paleozoic-Mesozoic geosynclinal sequence. The facies, recognised in the rocks of the marginal syncline in Southland, Nelson and Auckland, indicate the Otago-Marlborough schist belt as the axial region of the New Zealand geosyncline and the submerged landmass to the west of it as an orogenic belt.

The changes in the foreland facies of the New Zealand geosyncline with time best illustrate the nature of the landmass. The andesitic nature of the volcanogenic sediments in the Takitimu and Brook Street groups suggests that in Carboniferous time the landmass was a volcanic archipelago (for criteria see Eardley, 1947). The Lower Permian conglomerates with copious andesitic and minor granitic components (associated with marginal unconformity) indicate that the Carboniferous ? landmass was elevated to form a larger volcanic island or islands, e.g. modern Japan, (see Eardley; only the larger islands of a volcanic archipelago with a long geological history have granites and metamorphosed sediments exposed in them). The Upper Permian rocks of the North Island, the Waipapa and Tokatea Hill groups, point to a landmass similar to that in the Carboniferous. The Triassic

conglomerates, similar to those of the Lower Permian and again associated with marginal unconformities, in Southland, Nelson and Auckland, suggest further uplift. In the Jurassic the arkosic marine sediments and Coal-measures indicate a landmass of high relief and predominantly granitic rocks.

A volcanic arc is postulated to explain the distribution of the pre-Cretaceous rocks in the southern islands of New Zealand. The Otago Schist is considered to extend through the Chatham Islands to Campbell Island.

A. J. Bardley, 1947: Palaeozoic Cordilleran Geosyncline and Related Orogeny. Journ. Geol., Vol. IV, No. 4, pp. 309-42.

Discussion: Grant-Taylor, Harrington, Robertson, Grindley, Fleming, Wellman, and Reed contributed.

14. Gisborne Plain Excursion, by W. A. Pullar (N.Z. Soil Bureau).

A very thin pumice mantle on the raised beach at Darton Field was examined. Individual profiles are unsatisfactory because of disturbance, and the mantle had to be "sensed out" by literally hundreds of observations. The pumice is considered to be subaerial because

(a) the mantle conforms closely to the surface of beach ridges

(b) it is found as a thin layer all over the Plain; it is at the surface on the raised beach but is buried by alluvium to a depth of nearly 20 ft towards the middle of the Plain

(c) the layer is of uniform thickness of about 6 to 9 in. with evenly sized pumice grains of about 2 mm. There are also lapilli of up to 10 mm. ring.

The age of the ash is not certain, Grange (1931) gave it the name of Gisborne Ash, and Taylor (1953) considers it to be older than 3,000 years; Gibbs (paper being prepared, maps of which shown at conference) is of opinion that it is more likely to be one of the Taupo group of showers c. 250 A.D. As the ash would arrive here cold, there are no charred fragments of wood and so no use can be made of the radio-active carbon method of dating.

A recognisable topsoil has been found under the ash, which in turn is buried by 12 ft of alluvium, but dating of this soil would not give the age of the ash. Coarse sand grains and lapilli are being examined mineralogically from samples taken from Gisborne Plain, hills west of Gisborne, Matawai (axial range), Ruatahuna and Kaingaroa Plains, to see if the shower can be traced continuously from periphery to the vent. At the vent, charred fragments in the ash can be dated by the radio-active carbon method.

15. Application of Metamorphic Facies to the Otago, Marlborough, and Alpine Schists, by J. J. Reed.

One aspect - the relation of mineralogical and chemical composition - was discussed, using modified A-C-F diagrams. The close relationship revealed, when combined with a comparison of bulk chemical composition and with the available field data, provides an adequate basis for discussing metamorphic facies.

Discussion: The effect of original rock type on the petrology of schists was discussed by Wellman, who asked if a classification by type and rank, like that of coal, could be used. Other contributors were Suggate,

Harrington, Bowen, Lillie, Grindley, Schofield, and Collins (who quoted from a letter by Mason).

16. New Zealand Crustal Structure - the Gravimetric Evidence, by E. I. Robertson (Geophysics Division).

Bouguer anomalies are due to (1) deep-seated effects - regional anomalies, and (2) near-surface effects - residual anomalies. The mountains of the North Island appear to have no effect on the gravity picture. In the South Island, however, gravity lows occur in the area of the Spenser Mountains and in a belt to the south-east of the Southern Alps, especially near Lakes Pukaki and Wanaka. The displacement of this belt from 7 to 25 miles from the axis of the Alps may indicate the presence of an overthrust. Observations of gravity being made in a submarine around New Zealand and in the Tasman Sea later this year should provide much useful information on the major structure of the New Zealand Region. (B.W.C.)

17. Lower Liassic Ammonite Zones in the Arataurian of Flag Hill, by G. R. Stevens.

Study of the ammonite fauna of the Arataurian of Flag Hill has revealed the presence of the two upper zones of the Hettangian stage and the lowest zone of the Sinemurian stage.

The zones indicated by an asterisk have been recognized in the Flag Hill succession:

Stages	Zones	
	Echioceras	raricostatum
	Oxynoticeras	oxynotum
SINEMURIAN	Asteroceras	obtusum
	Arnioceras	semicostatum
	Coroniceras	bucklandi *
==========	Scamnoceras	(Schlotheimia) angulatum *
	Psiloceras	planorbis *
HETTANGIAN	Ostrea	liassica
	Pleuromya	tatei

(Triae/Jurassic Boundary)

Discussion (on papers 12 and 17): Brothers asked about the nature of the pebbles in the conglomerates. Mutch mentioned that the total thickness of Permian and Triassic sediments in the Southland syncline was 80,000 ft. Other contributions were made by Wellman, Graham, Kear, Robertson, Grindley, Fleming, Wood, Collins, and Hornibrook.

18. Late Pleistocene Glaciations and Fault Movements, by R. P. Suggate.

Improved knowledge of the sequences of Late Pleistocene glaciations in Canterbury and Westland is likely to lead to early agreement on correlation of events on the two sides of the Southern Alps. With increasing confidence in the correctness of the sequence, the relative dating of surfaces displaced by the Alpine and Wairau Faults, at the Wairau River, Lake Rotoiti, Maruia River, and Haupiri River is now possible. The amounts of horizontal displacement of surfaces of the same age appear to be substantially similar along the Alpine and Wairau Faults, at least as far south as Haupiri River. The amounts of vertical movement are dissimilar.

Discussion: by Robertson, Lensen, and Wellman.

19. Ignimbrites in the Rotorua-Taupo Area, by B. N. Thompson.

In the Rotorua-Taupo volcanic zone, the volcanic rocks are distributed symmetrically about a N.N.E.-trending central zone of rhyolitic volcanoes and soft pumice breccias. Andesitic and basaltic volcanoes lie along the outer edges of the central zone and these are flanked by ignimbrites. The outer edges of the ignimbrites abut against greywacke ranges, which converge towards the Tongariro National Park.

Examination of cores of volcanic rocks drilled at various hydro sites in the area suggests the following sequence of ignimbrite-like rocks.

100 ft	Pumice breccias
	Unconformity or disconformity
Up to 700 ft	Soft ignimbrite and pumice lenticles Harder ignimbrite and denser pumice lenticles Hard ignimbrite and flattened, owharoite-like glassy lenticles. Glassy base to some ignimbrites
	Unconformity
20 ft	Sediments - lacustrine or fluviatile
	Unconformity
40 ft	Soft ignimbrite Harder ignimbrite, some with glassy base
	Unconformity
	Sediments - lacustrine or fluviatile

Discussion: Suggate, Steiner, Studt, Robertson, and Bailey.

20. Excursions from Gisborne during May 1956, by H. W. Wellman

We were able to see representatives of all the Cretaceous beds during three excursions. Three important sections were visited. The Raukumara section in the lower Mata River was visited during the first day. It extends down from Piripauan beds with the key fossil Inoceramus pacificus, the three Raukumara stages being continuously exposed in one of the best sections known. At the top the Te Ratan contains I. apetius, in the middle the Mangaotanean contains I. bicorrugatus, and at the base at the west side of the anticline that terminates the section, the Arowhanan contains I. rangatira.

The second excursion was to the critical section at Wairongamai Stream where the Haumurian beds of Tapuwaeroa facies are in fault contact with Mokoiwian mudstone. The fault was missed by Ongley and Macpherson, and the lower Cretaceous Mokoiwi mudstone considered to overlie the Tapuwaeroa beds and to be upper Cretaceous in age. The Taitai Sandstone overlies the mudstone and was known to be older than the Tapuwaeroa beds by Ongley and Macpherson. The Taitai thrust was postulated in order to explain this apparent stratigraphic inversion.

The third day was spent in beautiful weather at the Motu Falls Section - the type section for three of the four Clarence Stages. The Clarence Series is overlain by the Arowhanan with I. rangatira and underlain by sandstone similar to that with

Aptian fossils at Koranga. In the upper Clarence stage - the Ngaterian - we were fortunate in finding specimens of I. fyfei - the key fossil for the top of the stage - much better preserved than any found before. Fossils were also found in the underlying stages, the most important discovery being a starfish in sandstone at the top of the Urutawan.

21. Fiordland Complex: Manapouri-Doubtful Sound, by B. L. Wood.

Recent work has extended mapping from the area of meta-quartzites, siliceous meta-greywackes and calc-silicate rocks of southern Fiordland northward to the area of hornblende and garnet-pyroxene gneiss mapped by Turner (Trans. Roy. Soc., vols. 67, 68) about Lake Manapouri and Doubtful Sound.

Folds in the southern area trend northward and north-northwest and the belt of siliceous rocks meets the coast about and south of Doubtful Sound. Hornblende-biotite schists and rarely calc-silicate rocks make up the eastern part of the southern region and extend into the Doubtful Sound region. They occupy a narrow strip along the east side of Smith Sound and Thompson Sound. The strip of schist is bordered on the west by the hornblende-pyroxene rocks mapped by Turner and on the east by a homogeneous hornblende-diorite. They appear to grade into the gneisses to the west, but have a very sharp contact which was traced for several miles with the diorite to the east. At the head of Smith Sound typical hornblende gneisses in marble have a gradational contact with the diorite.

The rocks of the two regions can be correlated on lithology and the structures can be followed from one area to the next. However, the problems of the relationships of the hornblende-diorite to the gneiss and of the schists to the gneiss in Doubtful Sound will require further work.

Discussion: Reed, Wellman, Brothers, Grindley, Harrington, Collins.