GEOLOGICAL SOCIETY OF NEW ZEALAND

NEWSLETTER

No. 8 May, 1960

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AIMS OF SOCIETY

The Geological Society of New Zealand was founded in May, 1955. Its objects include fostering investigations into the varying fields of earth science and serving as a medium for the expression of the views of New Zealand geologists. Membership is open to all those interested in the various branches of geology, geophysics, oceanography, mining, and the utilization of minerals and rock products.

THE NEWSLETTER

The Society publishes a Newsletter twice a year. Contributions such as personal notes, reports of meetings or conferences, descriptions of field trips, reviews or criticisms of recent publications, and similar items, will be welcomed by the Editors, c/o N.Z. Geological Survey, P.O. Box 368, Lower Hutt, New Zealand.

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

AUCKLAND SECTION, GEOLOGICAL SOCIETY OF NEW ZEALAND

A full programme of meetings has been arranged for 1960 for the Auckland section of the Society. The first talk was given in April by Mr Duncan Dow, formerly of the University of Auckland and now with the Australian Bureau of Mineral Resources, who spoke on "The Goldfields of New Guinea." Meetings are normally held on the last Friday of each month in the Geology Department of the University at 8pm. Any member who does not receive notices of individual meetings, but who would like to do so, should contact D. Kear, Geological Survey Otara Road, Otahuhu.

Subjects for forthcoming talks include the dating of Pleistocene and Holocene basalts in Northland and the formation of bauxite, descriptions of interesting outcrops near Auckland City, the engineering geology of North Island electrical generating stations, geological aspects of the Auckland ceramics industry, and a symposium on some controversial topic yet to be decided.

A striking feature of the 1960 Auckland Easter Show was a joint display by the "Auckland Star" and Whites Aviation Limited on the destruction of local scoria cones. Some excellent photographs, showed the results of quarrying, and many were published in the "Star" itself. Perhaps the most revealing, on a "before" and "after" basis, were for Mount Smart, because they showed that the cones can be quarried away entirely. Scoria is used extensively around Auckland, and it is certainly preferable from the scenic point of view, that the demand for scoria should be met by the total removal of cones (to form a sports arena in the case of Mount Smart) rather than that a large number of cones should be mutilated by large quarries. Ample opportunity exists in present day quarries for geological examination.

Since the last Newsletter, Dr R.N. Brothers, who is now on leave at Imperial College, London, has been appointed Associate Professor in Geology at the University of Auckland. A lecturer, new to Auckland has also been appointed - Dr Peter F. Ballance of Queen Mary College, University of London.

Mr R.F. Hay has moved from Wellington to the Otahuhu office of the Geological Survey.

- D.K.

GEOLOGICAL NEWS FROM CHRISTCHURCH

Staff changes in the Department of Geology at the University of Canterbury have had a considerable effect on the Christchurch geological community. DR MAXWELL GAGE left Christchurch in November 1959 and will spend a year at the University of Birmingham. DR MICHAEL J. FROST joined the staff in January 1960 after having held a Research Fellowship at the University of Birmingham. He is Lecturer in Mineralogy and Petrology. MISS DAWN RODLEY, from Victoria University of Wellington, has been appointed Assistant Lecturer and will lecture on historical geology. Mr P.B. ANDREWS is another new Assistant Lecturer and is giving a course in Engineering Geology.

DR A.L. WASHBURN has been appointed to a chair in geology at Yale University, a position which he will take up in September. He left Christchurch in February and will spend our winter in Greenland.

Student theses at present being prepared are:

"The Sedimentational History of the Lowermost Otaian in North Canterbury" by P.B. Andrews.

"The Palaeoecology of the Waiauan Stage of North Canterbury" by I.B. Campbell.

"A Geomorphic Study of the Pukaki Moraines and the Outwash of the Upper Waitaki Basin" by J.G. Speight.

Four-mile mapping has been the main occupation of the Christchurch office of the N.Z. Geological Survey. In the 1958-59 field-season work was concentrated on Four-mile Sheet 15 (Buller) and geologists from the Christchurch office mapped that part east of the Alpine Fault. The Awatere Fault was traced south-west to its junction with the Alpine Fault near the Clear Grey River. The Awatere Fault displaces metamorphic boundaries in a dextral sense by about 4 miles, but does not displace the Alpine Fault. In the 1959-60 field season work has moved south to Sheet 18 (Hurunui) and large areas of Alpine greywacke, previously virtually unexplored, have been mapped.

The Christchurch Colloquium of Geology first met in September 1958. During 1959 three talks were given:

MR H.S. GAIR discussed the geology of Northern Rhodesia and compared it with New Zealand.

DR W.A. WATTERS described some aspects of the geology of Southern Chile.

DR DONALD F. SQUIRES spoke on "Ecologic Interpretations of Coral Reefs with some reference to New Zealand's Fossil Reefs".

Average attendance has been 24 and the Colloquium appear to be serving a useful function.

- D.R.G.

SOME RECENT GEOLOGICAL SURVEY PUBLICATIONS

Biological Type Specimens in the New Zealand Geological Survey.

1. Recent Mollusca. N.Z. geol. Surv. Pal. Bull. 30. 1959. Anne Boreham.

Geology of Tongariro Subdivision. N.Z.geol.Surv.Bull.n.s.40.1959. D.R.Gregg.

The Geological Map of New Zealand 1:2,000,000. N.Z. geol.Surv. Bull. n.s. 66. 1959. G.W.Grindley, H.J.Harrington and B.L. Wood.

The Geology and Hydrology of Western Samoa. N.Z. geol.Surv. Bull. n.s. 63. 1959. D. Kear and B.L. Wood.

Early Tertiary Mollusca from Otaio Gorge, South Canterbury. N.Z. geol. Surv. Pal. Bull. 33. 1960. J. Marwick.

Geological Map of New Zealand 1:250,000. Sheet 27 Fiord (1st Ed.) 1960. B.L. Wood.

From the classroom — "There is no evidence that the area has been vulcanized."

- Geotimes.

BIOGRAPHICAL NOTES

S. HERBERT COX

S. Herbert Cox, a pioneer in New Zealand geology, arrived in this country on December 3rd, 1874, and worked as Assistant Geologist with the N.Z. Geological Survey until 1884. Not a lot is generally known in New Zealand about his subsequent career. The Geological Survey will be displaying shortly a photographic portrait of Cox in his later years, which has kindly been sent on request to the Survey by the Dean of the Royal School of Mines, London. The following short account of Cox's career, taken from the "Transactions of the Institution of Mining and Metallurgy" vol. XXX, 1921, p.470, may interest Society members.

> "Samuel Herbert Cox died on April 11th, 1920, at the age of 68 years, having experienced failing health for a number of years. He entered the Royal School of Mines London, in 1872, and obtained the Associateship in 1874. In the latter year he went to New Zealand to take up a position with the Geological Survey, and he was appointed Chief Inspector of Mines and Assistant Geologist. From 1884 to 1890, he was engaged as lecturer on geology, mineralogy and mining at the Technical College, Sydney N.S.W., and also practised there as a consulting mining engineer. In 1901 he became a partner in the firm of Bainbridge, Seymour & Co., of London, and remained thus associated until 1907, but two years prior to the latter date, he was appointed Professor of Mining at the Royal School of Mines, London, a position which he felt compelled to resign in 1912 on account of failing health. He was the author of 'Prospecting for Minerals', which afforded much help to students, and at various time he contributed to the Transactions of the Institution. He occupied the Presidential Chair of the Institution in 1899-1900, and from 1906 to the date of his death he was one of the honorary technical editors of the publications of the institution. Professor Cox was an original Member of the Institution (1892), and wa s elected to Honorary Membership in 1912."
>
> - G.C.S.

A. DIESELDORFF

A little known writer on New Zealand geology was the German petrographer, Arthur Dieseldorff (1866- ?). In 1901 he published a long paper describing rock and fossil specimens collected in

1896/97 by Professor H.H. Schauinsland, a zoologist who visited New Zealand on an expedition organized by the Bremen Museum. Most of the specimens came from the Chatham Islands and from several of the islands in Cook Strait, particularly Stephens and D'Urville Islands. Later, in 1902, Dieseldorff also described the petrography of some stone artefacts from the Chathams.

Details of the early part of his life are given in a short biography accompanying his 1901 paper. He was the son of a Hamburg merchant, and on leaving school he commenced a business apprenticeship in London. After a period of military service in 1883/84 he worked in Germany, Central America, and South Africa, and in 1896 visited Australia and New Zealand on business. On his return home he studied at the universities of Freiberg in Saxony, Freiburg in Baden, and finally Marburg, where his work on the rocks collected by Schauinsland in New Zealand was carried out.

Unfortunately, despite enquiries from the Geology Department at the University of Marburg, and from the German Geological Society, little could be found about the later part of his life. He continued to write for several years, and his papers include one, of 1906, describing manganese ores from British North Borneo. The last definite mention of his name was in the German-published International Calendar of Geologists for 1925/26, when he was living in Wiesbaden.

- W.A.W.

NOTES FROM GEOLOGY DEPARTMENT, VICTORIA UNIVERSITY

by Paul Vella.

1. STAFF Mr J. Bradley, after eight months' leave in Britain, returned in April this year. While away, he carried out research on basalts and dolerites at the University of Durham, and visited other British Universities studying methods of teaching, mapping and structural geology.

Almost immediately Professor Clark takes well earned leave, embarking for England on May 23rd. He will visit Geology Departments of British Universities and Institutions, and will represent Victoria University at the Tercentenary of

the Royal Society of London. After this he will take part in a presessional tour of Iceland and the 21st International Geological Congress at Copenhagen. At the end of August he will attend the SCAR conference at Cambridge. Immediately after he will travel to the U.S. to study geological teaching and research techniques in American universities, and finally settle at Berkeley, California, for a few months to undertake some petrological and geochemical research. He is due to return to New Zealand in March 1961.

During the absence of Mr. Bradley we have been fortunate to have the assistance of Dr. H.M.Pantin of the Oceanographic Institute as a part-time lecturer.

2. NEW APPOINTMENTS Your correspondent, Paul Vella, was appointed lecturer in paleontology in February 1959. Mr E.F. (Ted) Hardy, formerly draughtsman for Todd Motors and Todd Bros. Oil Exploration Division, joined the Geology Department as technician in April this year.

3. PEDOLOGY COURSE This year a pedology course was started, a course of ten lectures being presented by members of the Soil Bureau. Four of the lectures were by Mr. Taylor; others were by Dr. Swindale, Dr. Northey, Mr. Wells, Dr. Lee, Mr. Gibbs and Dr. Fieldes. Two excursions and three two hour practical classes were held. We are greatly indebted to the staff of the Soil Bureau, and especially to Mr. Taylor, for an intensely interesting introduction to soil science, which, it is hoped, will mark the beginning of a regular university course.

4. STUDENTS, PAST AND PRESENT We extend best wishes to Miss Dawn Rodley who is now a junior lecturer at Canterbury University. Dawn's interest is paleontology.

Bert Moore, who has been working for BP in Gisborne on a temporary appointment for the past year, has taken a post with the Colonial Geological Survey in Tanganyika for three years.

Hank van den Heuvel completed his M.Sc. thesis titled "Cretaceous and Tertiary rocks of Flat Point District, Wairarapa" early last year. This is the first detailed account of Cretaceous stratigraphy and structure in the Wairarapa. It will appear in the next issue of the Journal of Geology and Geophysics. Hank is now working for the Mount Isa Mining Company, Queensland.

John Bruce has completed an M.Sc. thesis on the Geology of Nelson City. Arrow Rock was proved to be Tertiary.

McKay's Maitaia (Atomodesma) locality in the Brook Street volcanics was rediscovered and a gastropod Peruvispira was found. The Tertiary sequence extends from Eocene to lower Miocene and possibly to the Pliocene.

John Lewis has completed a mainly petrographic study of several dacite domes of Tauhara, near Taupo.

P. Webb and B. McKelvey, for their M.Sc's, have in the press several papers on results of the 1957/58 and 1958/59 Victoria University Antarctic Expeditions in the Dry Valley area of South Victoria Land.

S. Skwarko, from the University of Melbourne, has presented a thesis on graptolites of North-west Nelson. Observations of tectonic deformation of graptolites led to a revision of Keble and Benson's determinations and a reassessment of New Zealand correlations with European and Australian Ordovician zones. Skwarko is now employed by the Bureau of Mineral Resources in Canberra.

5. VICTORIA UNIVERSITY ANTARCTIC EXPEDITION 1959/60. Continuing the annual summer programme, Victoria University placed a five-man team in the Wright-Victoria dry valley area, South Victoria Land:

Leader, biologist and meteorologist: Dr R. W. Balham (lecturer in Zoology)
Surveyor: R.H. Wheeler (lecturer in Geography)
Geologists: G. Gibson and A. Allen (students, Geology Department)
Geophysicist: I. Willis (student, Physics and Geology Departments).

Graham Gibson and Tony Allen completed the geological mapping of the dry valleys, covering about 800 square miles of the northern part of the area. Additional observations were made on glaciology, soils, permafrost and evaporites. Some 150 oriented samples for paleomagnetic studies were collected from dolerite sills and dykes.

6. POST-GRADUATE RESEARCH Richard Blank, University of Washington, U.S. National Science Foundation post-doctoral research fellow, arrived at the end of 1959 to study N.Z. ignimbrites.

Roger Martin, B.A., University of California, Los Angeles, M.S. University of Idaho, arrived in July 1957 and is studying ignimbrites for a Ph. D.

Gerrit Neef, B.Sc., London, arrived from Canada in March 1959, and is mapping the Eketahuna Sheet (N.153), north Wairarapa, for a Ph.D.

The main work of Dr Wellman during the last year has

been on Holocene Stratigraphy. Holocene sections around the northern coasts were examined at Christmas 1958-59, and those at D'Urville Island at Christmas 1959-60. An account will appear in the Trans. Roy. Soc. N.Z.

The writer has prepared papers on the Molluscan subfamily Typhinae and the Foraminiferal family Uvigerinidae, both to be submitted for publication shortly.

7. SOME RECENT DISCOVERIES In the upper Awatere Valley, Miss Alva Challis, Dr Wellman and Professor Clark discovered a new fossil locality in tuffs of Ngaterian age, similar to the fossiliferous tuffs at Limestone Creek, but with ammonites and a variety of gastropods. The ammonites are almost certainly Cenomanian. Another ammonite, Ptychoceras is associated with Aucellina euglypha in underlying Motuan beds, and this has a world-wide range from Aptian to upper Albian. Ammonites from Cover Creek, collected by Hall, Gibson and Wellman, show that the Coverian is a correlative or near correlative of the Ngaterian. Hall will propose the suppression of the Coverian stage in a paper at the Science Congress in May.

In Wairarapa the Pareora, Landon and Arnold Series are usually absent. S. Kustanowich has discovered in the Tinui Valley (N.159) a structurally complex but apparently complete lower Tertiary sequence lithologically similar to that of Hawkes Bay. The Pareora microfaunas are similar to those of Gisborne district, and have also been identified near Flat Point.

VICTORIA UNIVERSITY GEOLOGICAL SOCIETY

by G.A.Challis Secretary.

The Society has been very active in the last year, holding two field trips, four general meetings and several film evenings. The long field trip last year was held in the Tinui district of the N.E. Wairarapa and the results of this trip have been incorporated in a paper for publication by three of the members. A one-day trip visited the Otaihanga Tertiary Outlier near Wellington and was the first of several short trips planned for the Wellington District.

General meetings were addressed by Mr T. Grant-Taylor,

when the subject was "Pleistocene Geology", and Dr W.A.Watters who spoke on "The Geology of Chile". The Annual General Meeting, held in April last year, was addressed by Mr N.H. Taylor, Director of the Soil Bureau, the subject being "Soil Zones of Russia" - a taste of things which have since come, in the form of a course on Pedology at this University.

An innovation last year was the holding of a final meeting followed by a social evening. Visitors included guest speakers for the year and other friends from the Geological Survey and the oil companies. We were very glad of this opportunity to express our thanks to those who have helped the Society.

The final meeting took the form of a discussion on Geological Education. Professor Clark and Dr Wellman spoke for the Defence, against an attack of students and visitors. After outlining the present course in Geology at this University, Professor Clark suggested improvements to the degree structure which might benefit Geology. Among his suggestions were:-

1). Splitting of Geology III into two units, so that the degree would include four units of Geology instead of three as at present, and allowing more time for practical courses and special courses in Engineering or Economic Geology.

2). Introduction of prerequisites for Geology. The suggestion was that Chemistry, Physics and Maths to at least one stage should be compulsory for students majoring in Geology.

This second point was met with groans and general consternation from the students.

Dr Wellman concentrated on the practical side of things. His chief concern was the lack of contact between "academic" and "real" geologists ("real" = field geologists), and he feared the production of graduates stuffed full of theory and lacking practise "More field work! " is the cry; and how to get the field work on the limited funds provided by the University is Professor Clark's and Dr Wellman's problem. The Society came in for some praise here, as it provides a one-week field trip which is partly subsidised by a grant from the Students Association.

After Dr Wellman and Professor Clark had had their say, the meeting was thrown open to discussion and the following points were raised. Dr Irving of Shell Co. stressed the importance of knowing the geology of your own country first, before concentrating on outside. He was replying to a charge of insularity among N.Z. geologists.

Dr Watters raised the point of N.Z. post graduate

students going to overseas universities and being unable to comply with language prerequisites etc. This aroused some discussion on the inclusion of a foreign language unit in the degree.

Geology as a secondary school subject was suggested by Mr Bruce. There was general agreement on the suitability of Geology as a school subject but lack of teachers and equipment is a limiting factor.

This concludes the account of last year's activities but may I make a final request --: we are tired of seeing each others faces in the Society and would like to see some new ones from outside the University.

A NOTE ON VOLCANOLOGY IN RABAUL

By F.D. Studt.

(Editors' note: Mr Studt of the Geophysics Division of D.S.I.R. visited Rabaul in late November, 1959, with Mr Fooks, project engineer at Wairakei, to make a preliminary survey of the possible use of geothermal steam.)

During my recent trip to Rabaul, in New Britain, I was fortunate enough to meet again Mr G.A. Taylor, Volcanologist of the Geological Survey branch of the Commonwealth Bureau of Mineral Resources, Australia. He was on one of his infrequent respites from active volcanology, at home with his wife and small son. They live right alongside the volcano observatory, perched up on the rim of the Rabaul caldera.

Mr Taylor was just back from the Paris conference on active volcanoes; he attended a session at which a New Zealand paper on Wairakei was presented by Dr H. Tazieff, but understood very little of it since it was presented in French. He speaks of a move to limit the number of languages in use at future conferences. While in Europe, Mr Taylor visited Pompeii, and was perplexed by the apparent charring of much of the exhumed woodwork, which he does not consider consistent with the lapilli type shower which is supposed to have overwhelmed the town. Carbonisation may, of course, take place with prolonged

burial, and according to officers of the Forest Research Institute, Rotorua, the distinction between charred and cold-carbonised wood is quite easy to make.

Mr Taylor and his assistant John Barry recently worked on Bam, a small active volcanic island off the north coast of New Guinea; where they attempted to measure high fumarole temperatures; they were interested in the details of high temperature thermo-couples recently used on White Island by Mr G.E.K. Thompson. They are, however, devoting increasing attention to volcanic seismology, especially in the buildup in amplitude and duration of volcanic tremor prior to major explosions; they consider this useful for short-range prediction, but they find little correlation of tremor with visible activity after such an explosion. Portable willmore equipment is used for this work.

Rabaul itself is equipped with Benioff and Omori seismographs; at the time of my visit, the latter were being reinstalled in an old Jap ammunition tunnel, since a Chinese company had begun quarrying the caldera wall beneath the observatory, using jaw crushers. Mr Taylor operates an extensive system of reports from lay observers rather similar to that operated by our seismologists, but covering hot springs, volcanic activity, etc. in addition to felt shocks; he believes that regional seismicity in his area is increasing at the present time, whereas in New Zealand, if anything, recent seismicity seems to have been below normal.

Many will know that Mr Taylor's respite in Rabaul was shortlived. In March of this year he left for Manam Island, also off the north coast of New Guinea, and arranged for the evacuation of the population just prior to an eruption.

ANOTHER FOSSIL WHALE-BARNACLE FROM NEW ZEALAND

by S. Kustanowich

The recent description by Dr C. A. Fleming (N.Z.J. Geol. Geophys. 2: 242-7, 1959) of a Waitotaran whale-barnacle from Hawke's Bay has drawn our attention to this rare group of animal fossils. It is the first record from New Zealand and altogether only 13 occurrences of fossil Coronulas, belonging to six different species, have been recorded. Seven of them have come from countries bordering the Pacific, five from the Mediterranean region, and one from England - all of them Pliocene to Pleistocene in age.

In January 1959 the writer found a well-preserved barnacle also belonging to the CORONULINAE in the basal Nukumaruan limestone at Castlepoint, Wairarapa. The shell was complete with all the compartments and still retained most of its original ornamentation. On preliminary examination, it appears that the present specimen is most closely related to the living Coronula diadema (Linnaeus) and the fossil Coronula aotea Fleming, but differs markedly from both of them in several characters which could be of specific value.

A fuller description, completing yet another record of a Plio-Pleistocene occurrence of this interesting fossil from New Zealand, is being prepared.

GEOLOGICAL NOTES FROM DUNEDIN

The Dunedin office of the Geological Survey has just completed a very busy summer field period. Mr B.L. Wood and Mr L. McConnell explored the whole of the shoreline of Lake Te Anau by dinghy, and with Mr G. W. Grindley examined the Milford area on foot and by fishing boat and dinghy. This involved some very laborious and difficult travelling along the coast near Poison Bay. Fairly simple structures were found similar to those already mapped to the south, though there was a complexly folded zone on the east side of the Alpine Fault.

In December Mr A. R. Mutch, Dr J. B. Waterhouse and Mr I. C. McKellar made further traverses across the belt of Te Anau and Maitai rocks east of the Hollyford, and measured great thicknesses of Atomodesma beds and basal Maitai limestone on Mt Bassington near the south end of Lake Alabaster. Early in the New Year, Mr Mutch, Mr McConnell and Mr McKellar continued these traverses further north by flying in to Lake Wilmot with Amphibian Airways. The party explored the north end of the Skippers Range as far west as the Alpine Fault, an interesting section never before examined geologically. A trip was also made up the Red Pyke Gorge to Red Mountain, and access to the "Mineral Belt" was easier than expected this way. One highlight was the discovery of one or two fragments of what may be a late Jurassic Belemnite at the lower end of the Barrier River Gorge in rocks fallen from a cliff face. This raises the possibility of fossiliferous Lower Mesozoic beds in the rugged country to the north of the Barrier.

With the Haast Road almost completed to the west coast, the high grade metamorphic rocks of the Haast Valley and the coastline south to Jacksons Bay are becoming accessible to Otago geologists. This has already greatly helped the Geological Survey's 4-mile mapping programme in this region.

A glaciological party (G. Warren, B. Skinner, I.McKellar) once more tackled the problem of measurement of net end-of-summer snow accumulation on the upper Tasman Glacier between 7,000ft and 8,000ft, this time fitting measurements neatly in between two nor'westers. Techniques are improving with experience, and a recently imported coring auger proved a great success. Mt Cook air services have now more powerful ski-equipped aircraft and can provide faster transport for man and equipment. We were glad to have Mr Arnold Heine with the party for some of the time. He has just returned from his fourth consecutive summer in the Antarctic.

Mr Bruce Skinner, an experienced draughtsman from Lands and Survey Department, has recently joined the Dunedin staff of Geological Survey, where his duties include field work as well as draughting. He replaces Peter Chandler, who resigned from the staff last year.

DR A. J. R. WHITE, lecturer in Geology at the University of Otago since 1957 has been appointed Senior Lecturer in Geology at University College, Canberra. He leaves to take up his new post in June. During his three years in New Zealand he has been co-author of papers on the Shag Valley ignimbrite and on the age relations of the Dunedin Volcanics. Perhaps his greatest contribution has been towards a strong revival of interest in structural studies in metamorphic rocks. It is to be hoped that he will soon publish the results of the detailed structural work he has done in the Roxburgh district. Together with Mr B. L. Wood he has done much to establish an overall structural pattern of the Otago Schist. New Zealand Geology gains much by having the attention of people of Dr White's calibre even for periods as short as three years. It is greatly to be regretted, however, that conditions here do not encourage outstanding people from overseas to stay longer.

MR WINTHROP D. MEANS of the University of California has been appointed Lecturer in Geology at the University of Otago and will take up his duties in September.

- I.C.M. & J.D.C.

NOTES ON THE GEOPHYSICS CONFERENCE, TAUPO, 1960.

by R. R. Dibble.

The Geophysics Conference held at Taupo from March 28th to April 1st this year was an eagerly awaited event. This was the first Geophysics Conference in New Zealand since 1953 and the I.G.Y. had boosted Geophysics enormously in the meantime. It was a sign that the Geophysics Division was returning to normal after the overload the I.G.Y. had caused, and it was a symbol for the future - The accent of the conference was firmly on new ideas and projects. Discussion was all important. Representatives of every institution in New Zealand concerned with geophysics were invited and nearly all responded. About 74 people attended and all agreed that the conference was a complete success.

The meetings were held in the lounge of the Spa Hotel which was just the right size, and gave the right atmosphere.

The Conference was opened by Dr Hamilton, who stayed for the whole conference, and by Dr Robertson. DR J. ELDER opened the Volcanology session with a paper on Hydrothermal Systems and the Earth's temperature. He postulated that the earth formed from a hot diffuse cloud which cooled by radiation to form countless cold planetismoids. These accreted with heating by compression and collision to form an initially molten earth. This solidified from the outside inwards, the shells of different composition being formed by differentiation, and the solidification boundary being the core boundary. From considerations of the rate of solidification and the volume now solid, Dr Elder calculated the age of the solid earth as 10^{10}. He also showed that the age is increasing at a very rapid rate. According to Adam it was 7 days old. Lord Kelvin said it was 50 million years and now Elder says it is 10^{10} years!

His model for the Taupo depression is a graben 40 Kms wide and 5 Kms deep filled with material of bulk permeability 5 times that of the surrounding rock, and with water. The permeability is almost entirely due to cracks and fissures in the rocks but these are individually unimportant.

This 'Pot' is being heated by conduction from a magma chamber about 1 Km below the bottom of the depression. Within the pot a free convective system operates, with large convecting masses and very small recharge and discharge masses. The convective systems which would be set up by particular models are found by a Hele - Shaw cell and scale models used as analogue computers. During morning tea Dr Elder gave a convincing demonstration of the circulation patters from a hot spot in the Taupo graben by means of the Hele - Shaw cell.

Next came MR J. HEALY'S paper on Heat Flow and Volcanism. The evidence suggests that the heat from the geothermal area comes from magma at shallow depth. How did it get there? The most likely place for melting to start is just below the crust. Convection in the magma then occurs, transporting heat to the top of the chamber and causing further melting there. This absorbs heat and increases the circulation. As the chamber eats through the granitic crust its composition gradually changes from Basalt to Andesite. He explains rhyolites as melted sediment which remain as a cap on top of the convection cell, probably due to the higher viscocity. Heat, water and other volatiles are concentrated in this cap from the convection cell. Volcanic eruptions from the cell can be compared with geyser activity. At a certain stage the

magma 'boils' and produces an ignimbrite eruption. The rhyolite cap thus exhausted, later eruptions are andesites.

Then MR C.J. BANWELL gave a paper on Effects of Exploitation of the Wairakei Thermal System. The total water discharge is now 3 times the original natural flow and this has been accompanied by an increase in natural heat flow from 350,000 to 400,000 Kg. cal./sec. The increase is especially observable at Karapiti and is attributed to steam rising from the additional hot water now discharged by the bores. Water pressures within the hot aquifer are falling by 70 to 100 ft of cold water head per year in most places, but rises appear to be occurring in some high producing bores in the Western part of the field. Falls in ground level up to 22cms since 1952 correspond generally with the falls in aquifer pressures. The deformation appears to be elastic. So far no definite ground uplift has been established anywhere.

Next we heard MR F.E. STUDT on Mass Transfer and Heat Output During Recent Eruptions of Ngauruhoe. The 1949 and 1954 eruptions produced 0.8 and 4.9 million cubic yards of lava respectively. If this were representative of 10 years life Ngauruhoe would have taken 10,000 years to grow, and National Park and Pihanga all of the Pleistocene. These lifetimes are probably too long and the lava output was probably much higher in the past. The heat output in the same ten years was about 1.3×10^{23} ergs for lava and the same for gases. This is 60 times the normal heat flux for an area the size of the mountain. Wairakei has an output 1000 times the normal heat flux, more like Mauna Loa than Ngauruhoe. The heat output from the whole volcanic belt is about 10^{17} ergs/sec. which is twelve times the normal heat flux and is equivalent in energy to a magnitude 7 earthquake every day.

After lunch MR G.W. GRINDLEY discussed the Stratigraphy and Structure of the Central Volcanic District. Stratigraphic correlation for four key areas across the district were given. They were based primarily on the Huka mudstone which was present in all four sections. He presented Six palaeogeographic maps ranging from Pliocene to Recent, and these showed a tendency for volcanic activity to migrate from West to East. He set the age of the activity as between 500,000 and 5 million years.

MR D. KEAR in his paper on Basaltic Volcanism and related structure in the Kerikeri - Kaikohe region, showed how volcanoes could be placed in order of increasing age by the weathering of volcanic boulders. These boulders are plentiful around a young volcano and farmers get rid of as many as possible by building stone fences. There are fewer boulders around older volcanoes because some have weathered away. Age criteria are:-

(a) Stone fences plus stones lying around

(b) stone fences

(c) stone and wire fences

(d) wire fences

Erosion of the cone gives a supporting scale. In this way he showed that volcanism migrated from North to South, and that Ngawha springs could be the next site. The four younger volcanoes are less than say 5,000 years old.

Next on the programme was MR R.R. DIBBLE on Volcanic Seismology. Because the average period of seismic warning for explosive eruptions is only 12 days, and such eruptions can occur over such a large area in New Zealand, the only practical method of detailed study is to have portable seismographs ready to be rushed to reported swarms of earthquakes. Instrument at present in use are a permanent line of seismometers between Ngauruhoe and the Chateau Observatory, and seismoscopes of low sensitivity at Wairakei, Waimangu and Rotorua. To complete the instrumentation he proposed a portable tape recording seismograph running at a tape speed of 0.2 mm/sec. and using transistorised electronics and batteries. Such a seismograph would record for up to a month unattended, and cover the frequency range 18 to 1/10 cycles/sec. The tapes are played back at normal speeds and the audio frequency electrical output is very suitable for insertion into computing devices.

He played a number of earthquakes on his tape recording seismograph at Welling and Benioffs tape recording seismograph at Pasadena. The play back speeds were from 250 to 1,500 times the recording speed, so that the earth quake vibrations became audible as booms for P & S onsets, and rising notes for dispersive surface wave trains.

The last paper of the day was by MR M. FISHER, read by MR J. SMITH - What an Engineer expects from a Geophysicist. Briefly this was rapid and accurate surveys of inaccessible sites to give a basis for selection and initial design considerations, and the development of new equipment and techniques such as geophysical logging of geothermal bores, detecting where grout has got to etc.

The second day of the conference opened with MR A.C. BECK'S paper - Outline of Salient Features of Various Structural Conceptions of New Zealand. He described the Macpherson, Wellman and Kingma concepts of New Zealand structure. He favoured Wellmans 300 mile shift on the Alpine fault, because the Permo-Carboniferous formations all match across the fault. Usually the same formation is not recognisable for more than 50 miles along the strike, let alone 300. However, geophysical profiles are necessary to decide definitely between the Kingma and Wellman concepts. He proposed that structural features should be arranged in order of importance so that discussion between geologist and geophysicist is on common ground. For instance strong folding of strata is more important than faults crossing the folded area.

The next paper was to have been DR F.F. EVISON on Plastic Flow as a Structural Factor in New Zealand - a really new and controversial subject, but to everyones disappointment he was kept at home by sickness.

New Zealand Metamorphic rocks was the subject of DR H.W. WELLMAN'S paper. He pointed out that metamorphism commences from the moment of deposition of a sediment, first by expulsion of water, causing changes of density and velocity, and then by mineralogical changes. The rate of change of metamorphism with depth is probably determined by the geothermal gradient. The depth of burial for the higher rank part of the Otago schist is known to be about 10 miles. Coal is a very sensitive indicator of metamorphic rank up to about 5 miles depth of burial.

Next was MR A.A. THOMSON on Determination of Crustal Thickness in New Zealand from Phase Velocities of Rayleigh Waves. This involves the recognition and timing of the same surface wave crests at three seismograph stations arranged in a triangle. Distant Earthquakes are used and the times have to be corrected depending on the station component and instrument constants. The velocities for

different wave periods are compared with theoretical and empirical curves of velocity against period for different crustal thicknesses and the best fit gives the thickness for the crust within the triangle of stations. This is found to be between 30 and 40 Kms for the central North Island.

This paper was followed by one by MR R.A. GARRICK who gave a review of the literature on Crustal Thickness Determination from Explosive Seismic Studies, and advocated 4 Km long seismic refraction spreads for crustal structure work with the seismic truck. DR E.I. ROBERTSON then spoke on Structural Aspects of Gravity and Magnetic Surveys of New Zealand. The Rangitikei - ~~Wairarapa~~ Wanganui gravity anomaly indicates an uncompensated crustal downwarp which intersects the axial ranges of the North Island and is apparently related to seismicity, Taupo - White Is. volcanicity, thick upper Tertiary sediments and to the Hikurangi Trench. In the South Island, however, the Bouguer gravity anomaly is caused by the roots of the Mountains, which are approximately compensated. The Bouguer anomalies suggest an average crustal thickness in New Zealand of about 30 Kms; a maximum thickness of 37 Kms near Marton and a minimum of 26 Kms near Cape Palliser and Bluff.

Following this we heard MR G.A. EIBY tells us about the Earthquakes of the Sub-Central Rift. This was illustrated by maps based on reliable epicentres only. He also announced that the direction of faulting for earthquakes under the Bay of Plenty region tended to reverse several times with increasing depth of focus.

Sea Seismics and Proton Magnetometry in the Antarctic was the subject of MR R. ADAM'S paper. Although plagued by instrumental troubles he was able to show that at least 5,000 ft of low velocity sediments were present in the centre of the Ross Sea, and that previous magnetic maps of the area were considerably in error. Some fairly large variations in the field of about 10 to 15 miles wavelength were found in the vicinity of Campbell Is.

The next paper - The Antarctic Crust by MR P.E. EVISON was ably presented by MISS J. LE FORT. By measuring the relation between velocity and period (dispersion) for earthquake surface waves which have crossed Antarctica, and comparing this with curves calculated from different models of crustal structure, an average thickness for the crust along the path can be found. It was shown that the crust is about 35 Kms thick throughout Eastern Antarctica and 25 Kms thick in Marie Byrd land, suggesting continental and archipelago structure respectively.

The next paper - Palaeomagnetism in the Antarctic by MR C. BULL - was presented by MR J. GELLEN. Samples from the Wright Valley area suggest ancient pole position of 51° S. 132° W. and 29° S 149° W. for the dolerite sheets and older basic dykes respectively. The ages are uncertain but the results are not inconsistent with Du Toit's reconstruction of Gondwanaland. He also outlined the demagnetising method used to decide whether samples are stable or unstable. The latter are not included in the analyses.

The last paper of the second day was Movement of the Ross Ice Shelf near Scott Base by MR P. MACDONALD. He began the I.G.Y. glaciological work in Antarctica as a spare time hobby. He found that the ice shelf near its terminal face south of Scott Base, where it is only about 3 metres thick, was moving East at the rate of 23 cms/day, and that the ice thickened to the West. Poles stuck in the ice showed that snow was accumulating at the rate of about 30 cms/year, and therefore the shelf near Scott Base must be melting away underneath.

The last day of the conference was devoted to the ionosphere and apart from MR P. GILL'S paper on the Present Position of Earth Current Studies, contained little of geological interest. He pointed out that the observed relations between earth currents and geomagnetic variations must reflect the electrical properties of the layers in which the currents flow. Cagniard considers this to be a considerable advance in geophysical prospecting and the method is available in areas where there is no magnetic or gravitational contrast.

Thursday was spent on an excursion across the area covered by the Waiotapu geological map. The really impressive feature seen was the Paeroa fault scarp. This was followed by visits to the Wairakei geothermal field and the power station which was producing about 50 megawatts at the time.

The conference dinner was held in the evening, and a presentation was made to Mr R.C. Hayes for his impending retirement. It was a memorable occasion and the stories of the past made us realise we are not so badly off today afterall.

Friday saw us regretfully departing from the Spa Hotel whose proprietors Mr and Mrs Tim Bernie and their staff had been so good to us. We stopped at the Chateau for lunch and to see the Chateau Observatory and then set out for home.

PERSONAL NOTES

MEMBERS of the Society attending the 21st International Geological Congress in Copenhagen during September include Dr R. N. Brothers, Professor R. H. Clark, Mr B. W. Collins, Professor D. S. Coombs, Dr C. A. Fleming, Dr M. Gage, Dr J. T. Kingma, Dr B. H. Mason and Mr R. W. Willett.

MISS A. G. CHALLIS, Geology Department, Victoria University, has been awarded a University of New Zealand Senior Scholarship.

MR M. HALL is now with the Wellington district office of the Geological Survey at Lower Hutt.

MR A. V. WEATHERHEAD, Geological Survey, Lower Hutt, has been awarded the Diploma of Gemmology of the Gemmological Association of Great Britain.

MR P. M. CHANDLER has left the Dunedin district office of the Geological Survey and until recently has been working with the Fiordland National Park Board at Te Anau.

DR J. T. KINGMA left in April for the United Kingdom and Europe. While overseas he will spend several months at the Shell Company's sedimentary laboratories in Holland.

MR B. C. McKELVEY, Geology Department, Victoria University, is shortly taking up a position at the University of New England, Armidale, N. S. W.

DR C. A. FLEMING is spending nine months overseas on leave, and will visit research institutions in Britain and Europe. He will represent the Royal Society of New Zealand at the tercentenary celebrations of the Royal Society of London. On his way home he plans to travel via the United States.

MR R.W. WILLETT is leaving in July for a two-month visit to Australia, Britain, Europe and the United States. While overseas he will lead the New Zealand delegation to the Special Committee on Antarctic Research conference in Cambridge, and will also attend the 21st International Geological Congress in Copenhagen, as Official New Zealand Government delegate.

DR N.E. ODELL, who is now living in Cambridge, England, toured Scandinavia in November, 1959, lecturing under the auspices of the British Council.

AN ARTIFICIAL TRACER MINERAL EXPERIMENT IN COOK STRAIT

By H.M. Pantin

In the latter half of 1958, a tracer mineral experiment was undertaken by the New Zealand Oceanographic Institute with the purpose of estimating the sediment-transporting power of the strong tidal streams which occur in the narrowest part of Cook Strait. Even in the narrows, the depth is too great for effective wave action, except near the coasts, and on this basis it might be expected that the central part of the narrows would be floored by fine sand and mud. However, the sediment is nearly all coarse, consisting of shingle, gravel, and sand, and it is clear that the observed tidal streams, running more or less parallel to the axis of the Strait, are quite powerful enough to remove the finer grades of sediment. On the other hand, marine growth is abundant on particles down to about 2 cm in diameter, and the currents are apparently incapable of shifting material of this size or over.

The experiment was designed to estimate the maximum size of particles which the currents can transport. This was done by releasing on the sea-bed a quantity of artificial sediment of suitable grain-size, and returning later to see whether any of the material had been shifted. The material chosen was magnetic concrete, made from 3 parts Patea ironsand (powdered in a ball-mill) and 1 part Golden Bay cement. This magnetic concrete can be readily identified, and can be recovered magnetically from sediment samples in very low concentrations. Bulk natural ironsand was not used for the experiment, as small quantities of ironsand also occur naturally in the Cook Strait sediments themselves. Fluorescent and radioactive tracers were considered, but rejected as being too difficult to obtain, too expensive, or too dangerous in the necessary concentrations. About 38 cwt of magnetic concrete was made, and this was crushed and passed through a 1 mm mechanical sieve.

The concrete was released on the evening of 1.10.58, at a locality about 6½ miles west of Karori Light. This locality is situated in about 120 fathoms, near the axis of the submarine channel which runs through the narrows and is orientated approximately N-S. in the area of the experiment. The material was placed, 5-6 cwt at a time, in a specially-adapted 44-gallon drum attached to a counterpoise release gear normally used for a piston corer. This ensured release within a few feet of the sea-bed, and minimised the possibility of scattering in the sea-water. Altogether 7 separate drops were needed to complete this phase of the operation.

A series of 18 dredge samples, extending over the period 4 to 5 days after the release of the concrete, were collected in

the surrounding area. These samples, with an average volume of about 1 cubic foot, were taken from stations as far as 5 miles north and south of the release point, and all contained shingle or gravel accompanied by variable quantities of sand. The magnetic fraction was separated in the laboratory by placing each sample on a 3/16" mesh sieve to remove the shingle and gravel, and washing the sand through into a magnetic flume. This consisted of a galvanised iron tray, narrowing at one end into a small brass channel lying between the poles of large permanent magnet. The magnetic material collected against the sides of the brass channel, while the non-magnetic sand and wash-water flowed into a sink at the lower end of the flume, which was tilted slightly to allow a free flow of water. Every sample was run through twice, but the amount of magnetic material collected in the second run was always far less than the initial recovery, showing that the separation was very efficient in spite of the low magnetic content (0.05 to 0.15 per cent by volume).

Natural ironsand proved to be the dominant constituent in the magnetic fractions, and this was accompanied by smaller quantities of magnetite-bearing sedimentary and metamorphic rocks, together with magnetic cinders derived from ships. Each sample also contained a few grains of magnetic concrete, the number of grains ranging from 3 to 34 with an average of about 11. In several of the samples, the largest grains reached a width of about 1 mm, which shows that the tidal currents in the narrows can transport grains of magnetic concrete (density about 4) up to 1 mm in diameter, and hence ordinary sand grains (density about 2.7) up to 2 mm in diameter. The maximum net rate of movement that could actually be demonstrated was 1½ miles per day, for a sample 5 miles away from the point of release, but the actual paths followed by particular grains of concrete would be oscillating and irregular, (due to the periodic reversal in direction of the tidal stream) and the actual speed of transport at a particular instant must often have been considerably in excess of 2 miles per day. Available data on the velocity of currents necessary to shift particles of different sizes indicate that bottom current velocities in the Cook Strait narrows must reach at least 1 knot (50 cm/sec) or thereabouts to be capable of transporting grains of the required diameter.

A TRAVELLING PETROLOGIST LOOKS AROUND - WITHOUT A MICROSCOPE

By A. Steiner

On my recent trip overseas I had the opportunity of visiting a number of interesting geological sites, and of discussing at various research institutions hydrothermal and other mineralogical and petrological problems related to the geothermal power project.

The first call was to the Hawaiian Volcano Observatory where I was received by Dr Murata and his staff. After I was shown around their laboratories and a lengthy discussion of the acute petrological topic, i.e. the genetic relationship between tholeiitic ~~tholeiit~~ and alkali basalt magma, an excursion was arranged to inspect the craters of the Kilauea Volcano. A conspicuous feature of the Hawaiian volcanoes is the common absence of sulphur-bearing gases in the volcanic exhalations. This seems to explain why the vegetation around the local steaming grounds is not affected by the escaping gases in contrast with the thermal areas in the Taupo volcanic zone where the vegetation on and around steaming ground soon dies away.

In California I spent a great deal of my time visiting the following research institutions: Scripps Institution of Oceanography, University of California at Los Angeles and Berkeley, California Institute of Technology Pasadena, U.S. Geological Survey at Los Angeles and Menlo Park, and Stanford University. At the Scripps Institution I met Prof. Harmon Craig and Dr Urey. Prof. Craig is working on isotopes of hydrogen, oxygen and carbon in thermal waters, and is much interested in our work at Wairakei.

I was very impressed by the work of Dr G.C. Kennedy at U.C.L.A. who is dating volcanic rocks, except for lavas over 500 millions years old, by a newly developed method based on thermo-luminescence. The luminescence depends upon the time the rocks have been exposed to bombardment by cosmic rays. Thus, a fresh lava, e.g. from the 1952 Paricutin eruption, behaves almost like an ideal black body. The fact that he can date a brick 10 years old seems to indicate a high accuracy for this method.

The main subjects discussed with Prof. S. Epstein at Caltech were the variation of the ratio O^{18}/O^{16} in hydrothermal

minerals, its temperature dependence and the application of isotope research to geothermal investigation. At Caltech I saw also an Electron Probe Microanalyser in action. This newly developed apparatus is a valuable tool for non-destructive local chemical analyses of minute samples, e.g. of a spot in a thin section; the minimum volume for practical quantitative analyses is as small as about 0;2 cubic microns.

At the Geological Survey and the California Division of Mines at Los Angeles I inquired about a widely reported huge geothermal field at the Salton Sea, South California, but was informed that this was a business stunt promulgated by a land speculator! At the University at Berkeley I gave a talk on hydrothermal rock alteration at Wairakei and Waiotapu. I also discussed the origin of ignimbrites with Profs Howell Williams and Curtis who told me of their recent visit to the Valley of Ten Thousand Smokes. I was also able at Berkeley to observe their work on the synthesis of hydrothermal minerals in the laboratory of Dr Meyer, and to discuss various petrological questions with Prof. F.J. Turner and Dr Fyfe. The work done at Berkeley and also the research facilities of the Mineralogical Department, under Prof. C.O. Hutton, at Stanford University are most impressive.

The U.S.Geological Survey at Menlo Park, situated in beautiful surroundings, is another outstanding and large research institution. The discussions that followed my talks at Menlo Park on hydrothermal rock alteration and petrogenesis of ignimbrites continued for a few days. In company with Messrs E.H. Bailey and C.T. Jones from the U.S.G.S., and Prof. Takaharu Fukutomi of the Department of Geophysics, Hokkaido University, Japan, I visited the thermal and volcanic areas of Northern California and Nevada. The well known locality The Geysers has been of much interest to me because of the occurrence of superheated steam there, and the absence of both volcanic rocks and active volcanoes nearby. I noticed also the distinctly different hydrothermal alteration from that at Wairakei. Other thermal areas inspected were the Sulphur Bank, Wilbur Springs and Steamboat Springs. The active dacitic volcano Lassen Peak displays a prominent and ominous spine protruding from its flank.

My visit to the Yellowstone Park followed shortly the disastrous earthquake in that area in August. Numerous cracks and fissures were still open. I could also see a part of the recent fault scarp showing a vertical displacement up to 20 feet and my thoughts were on the Hutt Road!

Travelling across the U.S.A. short stops were made at Salt Lake City to visit the University of Utah and the Kennecot Research Centre, the U.S.Geological Survey at Denver, Colorado, and the Universities of Chicago and Illinois and the Illinois Geological Survey.

At the Geological Survey at Washington I found a considerable interest in our results obtained from the study of hydrothermal rock alteration at Wairakei. While in Washington a visit was paid to the Geophysical Laboratory of the Carnegie Institution where I had the good fortune to see their work on synthetic ignimbrites. From Washington I made a side trip to the Johns Hopkins University at Baltimore and the Pennsylvania State College, University Park. At both places extensive work has been done on natural and synthetic zeolites. At the Johns Hopkins University they claim that wairakite is as common as quartz in the North-western States. At Pennsylvania State College a talk on the occurrence of zeolite at Wairakei was given.

In New York I had a discussion on hydrothermal rock alteration with Prof. Kerr at Columbia University, and on some mineralogical and geochemical questions with Dr B. Mason at the American Museum of Natural History. By arrangement of the N.Z. Legation I met Father de Breuvery, the head of the United Nation's Council for Social and Economic Development. This council has a section on geothermal power and is greatly interested in the geothermal power project in New Zealand. By coincidence, the Prime Minister of New Zealand was addressing the United Nations the same day and I was able to listen to his speech.

My stay in London, although short, was very pleasant due to the kind assistance I received from Mr B.W. Collins, Scientific Liaison Officer in London. Ignimbrites are at present a much-discussed topic among British geologists. They are finding ignimbrites here, ignimbrites there, and ignimbrites everywhere. Thus, it happened that I came into a real wasps' nest. However, I had a pleasant discussion on this subject with Dr J.G. Ramsay, Reader in Petrology at the Imperial College, and Dr P.A. Sabine, petrologist at the U.K. Geological Survey and British Museum. In London I also attended as a member the annual meeting of the Mineralogical Society. Their seating arrangement is similar to that in the House of Commons.

On the way home, I stopped over in Italy to visit Larderello (= Wairakei in N.Z.) which has a great attraction for anyone interested in geothermal steam. Here, as at The Geysers, the absence of volcanic rocks and nearby volcanoes is striking, a fact that forces one to think about the origin of geothermal steam.

NEW MEMBERS

A welcome is extended to the following new members who have joined the Society in the last six months.

Barton, J.W., 54 Lucerne Road, Remuera, AUCKLAND, S.E.2.

Freeman, R.S., C/o N.Z. Geological Survey, P.O.Box 368, LOWER HUTT

Gardner, M.W., C/o N.Z. Geological Survey, P.O. Box 368, LOWER HUTT

Hamilton, Dr Warren, Geologic Division, U.S. Geological Survey, Federal Center, DENVER 25, Col., U.S.A.

Jansen, Rev. E.G., Tangao Training Institute, SANTO, NEW HEBRIDES.

Ker, D.S., Department of Mines, P.O. Box 38, Rundle Street P.O., ADELAIDE, S.AUSTRALIA.

Kruta, Dr T., Moravian Museum, Namesti 25, unora 8, BRNO,CZECHO-SLOVAKIA.

Nicholson, D.S., C/o Mineral Engineering Section, Dominion Laboratory, Gracefield Road, LOWER HUTT

Norris, G., Sedgwick Museum, Downing Street, CAMBRIDGE, ENGLAND.

Robins, A.H., C/o P.O. Box 494, CHRISTCHURCH.

Sonntag, Mrs E.J., Makomako R.D. 3, PAHIATUA.

Weatherhead, A.V., C/o N.Z. Geological Survey, P.O. Box 368, LOWER HUTT.

Membership of the Society, including unfinancial members, is now about 270. This issue of the Newsletter has not been sent to members whose subscriptions have remained unpaid since before 1958.

We hope so!

On mineral exploration - "In recent years the wandering donkey has been replaced by the trained geologist. The geologist may be more expensive than the donkey but he is far more dependable." From an exam paper - quoted in Geotimes.