Newsletter

OF

The Geological Society

of

NEW ZEALAND

GEOLOGICAL SOCIETY OF NEW ZEALAND

N E W S L E T T E R

No.5. April 1958.

CONTENTS

SUBSCRIPTIONS

You are FINANCIAL ~~NOT FINANCIAL~~ for the current year (ending 31st Dec. 1958).

PLEASE REMIT..... (sub. for.....year(s)) to make you financial.

Members who have not paid their subscriptions for two years will be struck off the list of members three months after a reminder has been sent. They will be permitted to rejoin only after payment of subscriptions for those two years.

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 medium 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, hydrology, mining, and the utilization of minerals and rock products. There is only one class of members, and the annual subscription is at present 2/6d.

OFFICERS

1957*

President		Dr J.T. Kingma
Vice President		Dr D.S. Coombs
Secretary	(Jan. to June)	B.W. Collins
	(July -)	L.E. Oborn
Treasurer	(Jan. to June)	R.P. Suggate
	(July -)	D.R. Gregg
Committee	Mr J. Bradley	
	Mr J. Brodie	
	Dr R.N. Brothers	
	Mr D. Kear	
	Mr F.E. Studt.	

* Officers for 1958 will be elected at the Annual General Meeting to be held at Reefton on Wednesday 14th May 1958.

THE NEWSLETTER

The Society publishes a NEWSLETTER at irregular intervals; it is hoped about twice a year.

Contributions, in the form of personal notes, short items of geological and geophysical interest, news of the mineral industries, suggestions for Society activities, reports of meetings, descriptions of recent field trips, reviews or criticisms of recent publications, 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.

This NEWSLETTER is edited by L.E. Oborn, Secretary of the Society, and published for the information of members by the Geological Society of New Zealand, C/o New Zdaland Geological Survey, P.O. Box 2110, Christchurch, C.1.

GEOLOGICAL SOCIETY OF NEW ZEALAND

Annual Report 1957

This report covers the period January 1957 to April 1958, and willbe presentedat the Annual General Meeting at Reefton May 14, 1958.

Constitution

The constitution of the Society was published in Newsletter No.4 page 3 which was circulated in August 1957.

Change of Officers

Messrs B.W. Collins and R.P. Suggate who were elected Secretary and Treasurer respectively at the Annual General Meeting in January 1957, resigned in July when their professional duties took them overseas. The vacant offices were filled by L.E. Oborn and D.R. Gregg.

Membership

The Society's membership on 31st December 1957 was 196 (197)*.

11	(10)*	members	had	subscriptions	paid	to	1955
59	(48)	"	"	"	"	"	1956
108	(97)	"	"	"	"	"	1957
14	(27)	"	"	"	"	"	1958
8	(10)	"	"	"	"	"	1959
3	(3)	"	"	"	"	"	1960
1	(1)	"	"	"	"	"	1961
1	(1)	"	"	"	"	"	1963

There was a 40 per cent increase in the number of financial members during 1957. The total membership rose from 147 to 196. The ever-increasing membership is encouraging and it must arouse in members, and especially in their officers, a deepening sense of responsibility towards their duties to the Society.

* Figures in parenthesis are totals at 23rd April 1958.

Newsletter

Two issues of the Newsletter were circulated in 1957, one (No.3) in January and the other (No.4) in August. The format of the August issue was changed from foolscap to quarto.

Complementary copies of the August issue were sent to all who attended the Geological Section (c) of the thirty-second Meeting of the Australian and New Zealand Association for the Advancement of Science (A.N.Z.A.A.S.) which was held in Dunedin in January 1957.

The response to specific requests for contributions to the Newsletter has been excellent and the editor wishes to thank all contributors; but the general request, as it appears in the Newsletter, has not been successful. Reports of meetings held by the Auckland Branch are a valued contribution to the Newsletter.

McKay Hammer Award

At the 1957 Annual General Meeting in Dunedin, rules were drawn up for an award that is to be known as the McKay Hammer Award. The name commemorates Alexander McKay whose name will long be synonymous with New Zealand geology. The award is to be made annually for the most meritorious published contribution to New Zealand geology in that year.

On February 22, 1957 a subcommittee convened by Dr R.N. Brothers and consisting of Messrs D. Kear and E.J. Searle recommended that the 1956 award be made to Mr G.R. Stevens for his work on the Hutt Valley. A suitably inscribed geological hammer has been sent to Mr Stevens and a certificate has been designed and will soon follow. The geological hammer that was once owned by Alexander McKay has not yet been made into a form suitable for presentation.

A subcommittee convened by Dr Allan, Professor of Geology at the University of Canterbury, is at present studying geological literature published in 1957 and will shortly make recommendations to the committee for the 1957 award.

Branches

The success of the regular meetings of the only branch of the Society, which is at Auckland, should encourage other large centres to give some thought to establishing their own branches.

Finances

A financial statement for 1957 appears in Newsletter No.5, April 1958.

The Society gratefully acknowledges the donation of £4.17.6. from Dr J. Allan Berry of Napier.

The heaviest expenses have been the purchase of six geological hammers. One of these was given to Mr W.F. Heinz in exchange for Alexander McKay's hammer, and the others are for winners of the McKay Hammer Award.

The cost of the A.N.Z.A.A.S. entertainment was very largely borne by donations given by members attending the function.

Other expenses have been light and present subscriptions have proved adequate.

Discount on maps and geological literature

An approach to the Minister-in-Charge of the Department of Lands and Survey, through the Surveyor-General, to enable members to purchase maps at a reduced rate, has been successful. Details are published in Newsletter No.5, April 1958. An attempt to have the discount scheme extended to include the purchase of aerial photographs, was unsuccessful.

A request has been made to the Director of the N.Z. Geological Survey that members of the Society be enabled to purchase Geological Survey Publications (Bulletins, maps and reprints) at a reduced rate, but as yet no reply has been received.

Geological Conferences

A.N.Z.A.A.S.

Ninety members of the Society attended the A.N.Z.A.A.S. Congress at Dunedin in January 1957. The success of this congress was due, largely, to excellent organization within and between the various sections, and of the field excursions.

The discussions which followed the papers presented at the Congress were recorded, and a report compiled, by Dr D.A. brown, Professor D.S. Coombs and Mr D. Hamilton. This report was duplicated by the Wellington office of the N.Z. Geological Survey, and circulated by the Society to all who had enrolled in Section C.

The Society sponsored a very successful sherry party to which all members of Section C were invited. It is to Professor and Mrs D.S. Coombs and Mr and Mrs D. Hamilton that the success of this function is largely due, and the Society extends its appreciation to them and to all who helped them.

The next meeting of A.N.Z.A.A.S. will be held in Adelaide in August 1958. All members have been advised, by the organizers of the geological section, of the topics to be discussed and the field excursions arranged.

Geological Survey

The Society is grateful to the Director of the New Zealand Geological Survey (Mr R.W. Willett) for inviting members to attend and actively participate in the 1958 Geological Survey Staff Conference at Reefton.

Goodwill

Goodwill messages from the Society were borne to several Divisions of the Geological Society of Australia by Dr R.P. Goldthwait when he visited Australia in 1957. A reply in the same vein has been received from the Tasmanian Division.

The Society's congratulations were conveyed to Sir Vivian Fuchs, Messrs G. Warren and B.M. Gunn, and to Dr H.J. Harrington and his party, on their contributions to Antarctic Geology.

GEOLOGICAL SOCIETY OF NEW ZEALAND

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED DECEMBER 31, 1957

EXPENDITURE	£. s. d.	INCOME	£. s. d.
To Sundry expenses - Stamps, stationery	6.13. 3.	By Subscriptions	21.12. 6.
Exchange	2. 6.	By Donations	29.13. 6.
To McKay Award presentation hammers	11.19. -.	Total Income	51. 6. -.
To Engraving McKay Award presentation hammer	12. 6.		
To A.N.Z.A.A.S. entertainment	27. -. 6.		
Total expenditure	46. 7. 9.		
Excess of Income over Expenditure	4.18. 3.		
	£51. 6. -.		£51. 6. -.

BALANCE SHEET AS AT DECEMBER 31, 1957

LIABILITIES	£. s. d.	ASSETS	£. s. d.
Accumulated Fund		Cash -	
Balance at 31.12.56.	31.19. 4½.	Post Office Savings Bank	36.15. -.
Add excess of Income over Expenditure	4.18. 3.	Petty Cash	2. 7½.
	£36.17. 7½.		£36.17. 7½.

6th January, 1957.

(D.R. Gregg),
HONORARY TREASURER.

REFLECTIONS ON THE STRUCTURES OF METAMORPHIC ROCKS AND THEIR SIGNIFICANCE IN RECONNAISSANCE MAPPING.

By

A.R. LILLIE

During a recent period of leave I decided to learn something of teaching and organization of geological work in universities, but to concentrate chiefly on examining the smaller structures (mesoscopic structures of Weiss and McIntyre) in slates, schists and gneisses, and to see how they fitted larger structural patterns that had been mapped. I tried to think of the visible geometry, to keep petrography, structure and stratigraphic inferences apart whilst observing, and to ignore for the time being massive generalizations about what geosynclines used to look like.

I saw a number of localities in Britain, France, Switzerland, Austria, Belgium, Canada and the United States and I was tremendously impressed by the diversity of structures and different ways of describing them, or leaving them undescribed! The following comments arise from what I have seen and read but are all very much influenced by earlier observations in the N.Z. Alps.

A first generalization which I would accept is that degree of metamorphism and of evident structural deformation are often quite independent things. Slates and even less recrystallized rocks can show tectonic styles much more complex than many gneisses. In Cornwall slates show two sets of folds with trends at right angles to each other in adjacent beds, the lineations of one set seeming to be folded along axes parallel to that of the other set; I also saw three superimposed cleavages each nearly normal to the other. The sedimentary structures can be almost obliterated and closely spaced quartz veins parallel to axial planes can simulate recrystallized siliceous beds.

We can accept the evidence of high grade schists and gneisses that seem to show clear sedimentary structures and, in places, present a banded aspect like fine stratification. Many petrographers are inclined to stress (or overstress) the likelihood that such aspects are produced by metamorphic segregation along S planes that may be quite independent of bedding, but most workers who have done a lot of structural mapping as well as petrography accept the existence of much clear relict bedding in gneisses as well as schists. The degree of metamorphic segregation along such relict bedding planes and the amount of shear that may have taken place along them is a more contentious matter: McIntyre and Weiss reason very pertinently that stratigraphic sequences with thicknesses built from such relict bedding planes are often likely to be mythical. Nevertheless piles of thin and regular layers many hundreds of square feet

in area do, very locally, indicate metamorphism that seems to have occurred without folding and with only minor shearing along the recrystallized bedding layers.

To state this seeming common independence of degrees of metamorphism and of structural deformation does not deny that in other places there are evidences of close interdependence between metamorphism and structural deformation, as implied in the scheme of Hutton and Turner for subdividing the chlorite zone. I would not however accept such a thing as prevalence of quartz veins as a reliable indicator of degree of metamorphism. One might conclude, after a journey through an extensive field, that quartz veins tended to be more abundant in the more metamorphosed rocks but an abundance of veins in some rocks as compared with a paucity in other rocks a few miles away very often bears no relation to the degree of metamorphism. It is of no diagnostic value. Similarly slatey cleavage is of slight value as a criterion in assessing degree of metamorphism, say, in separating parts of the chlorite zone. Certain writers refuse to use the term when the cleavage becomes parallel to the bedding; this eventually leads to absurdities; when this slatey cleavage is parallel to the axial planes of folds, as it most commonly is, the cleavage is bound in places to become parallel or very nearly parallel to the bedding when the folds are isoclinal. The surface is still there, only now coincident with the plane of stratification and it makes a rock which most geologists would call a slate. The older Survey workers were quite correct in using the term slate in the New Zealand Alps if the terminology used in Cornwall and Devon is to be taken as sound. Slatey cleavage seen in Chlorite 1-4 rocks is also clearly visible in some biotite schists, and even garnet schists in favourable tectonic circumstances. I mean that there is a plane very like that in a Welsh slate to be found in these different rocks but that very often it has not been called 'cleavage' because the field worker saw, using his knowledge of petrography, that the rock was a 'schist' so he calls it a 'schistosity plane'. In a recent paper we used both terms so as to bridge the gap for those who like such distinctions. On the whole this flat planar surface does tend to disappear in biotite schists where, as Fourmarier observes, microfolds become abundant and the cleavage becoming undulous disappears, but I do not think presence of cleavage is of much diagnostic value concerning degree of metamorphism, since the spread of its possible appearances through the lower grade zones between biotite and chlorite is too great.

The more one sees of rocks the more desirable it seems to keep the petrographic criteria separate from the description of macroscopic and mesoscopic structures. Degree of metamorphism applies really to the degree of mineral reconstitution, i.e. alteration of the body of the rock on the microscopic scale accompanied by growth of minerals. Since this is the basis of the classification of Hutton and Turner which, insofar

as it touches on structure, refers to that seen in the minutae of microscopic texture their scheme remains valid, but even better would seem to be the later and more strictly petrographic - mineralogical criteria cited by Hutton in a slightly revised version of the original scheme (Wakatipu memoir, pp. 61-65).

A second impression is that patterns of small structures (mesoscopic structures) and schemes of larger tectonic interpretation may be very misleading if both are not handled together with a very nice sense of proportion. I have every sympathy with those who like to get a sweeping comprehensive view from a field and a tremendous amount of good work had been achieved in intelligent generalization from reconnaissance mapping. But the chief value of such work is in giving a general description of the rocks and their attitudes. Such a description is not an account of the tectonics or the stratigraphy until examination of a much closer order is undertaken. A much clearer idea of the tectonics is obtained by the laborious methods initiated by Sander and practised by Phillips, McIntyre, Weiss and others. This method is not complete in itself since one is expected to examine the pattern of larger folds also and furthermore the detailed pattern may be so complex that it only makes sense when the macrostructure is known. (Clifford, Fleuty, Ramsay, Sutton and Watson, Geol. Mag. January, 1957.) The time taken on highly detailed work is the disadvantage, for those who work in a new country want to map at a pace that will take them within a reasonable time out of the valleys. It is to my mind a strain to engross oneself in detail with ridges towering above one; the scale of the country demands sweeping views but how easy it is to finish with vasty nothings. On the other hand geology has advanced by broad interpretations before every shred of evidence has accumulated and the larger scale tectonics into whose pattern the smaller structures fit has often been elucidated before the latter have been studied. Confidence in interpreting these smaller structures is based on their fitting into tectonic patterns well elucidated before more detailed work was done.

The great merit of the work of Argand, Lugeon and many of their Alpine colleagues was their just and delicate sense of proportion in mapping first a huge semi-cylindrical nappe front with a few lines on a map and, at the next moment, some minor stratigraphic detail indicating that unconformity and not a shear plane was the explanation for the wedging out of a stratum. It is very likely that the technique of axial prolongation, so lauded by some recent English writers on tectonics, was sadly overworked in places by Argand and his confrères; but the whole effort remains tremendously impressive and it is a pleasing thing to find little chevron folds and tiny drag folds with axes and lineations, parallel to the frontal nose of the Dent Blanche Nappe passing high into the ridges and the air above one's head. Did Argand see these little things? - Almost certainly, but as confirmatory details not mentioned in his curious texts.

Probably much of the synthesis of embryo nappe patterns etc. will be largely discarded in the European Alps, (although the writer has himself worked in a field where the hinge of a recumbent fold 'must' have been a ridge in early Tertiary times), but the maps will remain fairly intact for large tracts of the Pennide Alps and, by a bold use of scissors and the concept of minor digitations to replace collossal nappe prolongations, the observational data will be pieced into new patterns for large areas.

The Highland workers were on monstrously difficult ground. With structures more complex than many Alpine structures, the exposures are poorer and the relief insufficient to show the 3-dimensional relations clearly. Some of the older workers appear to dislike recent modifications proposed for their mapping. It is difficult however, when one follows carefully the descriptions of Phillips, Weiss, McIntyre and others, not to agree with them that larger errors in tectonic interpretations have been made in the Highlands than in the Alps. These errors too are more likely to demand some remapping, as well as reinterpretation, than those of the Alpine school in the Pennide Alps. The evidence of strong fold patterns at right angles to postulated trends are very convincing and are not minor details but significant of the whole tectonic pattern. Nevertheless in new country it does seem that we must still try to decipher the larger structures in the beginning but the work should be tempered by a judicious examination of the small structures, for they are highly significant pointers to what out larger structures are likely to be, as well as checks on our larger tectonic views.

The third thing that is impressed on one is the tremendous difficulty of working out a stratigraphy in metamorphic rocks. In many places the more one sees of the structures the more will o' the wisp becomes the stratigraphic interpretation. Closely spaced shear planes, even in chlorite schists, can give a continual repetition or telescoping of the true sequence. Perhaps one gets too pessimistic and perhaps in some metamorphic rocks the stratigraphic sequences devised have considerable validity and some modifications in our manner of describing such sequences will help us in our larger assessments (infra).

It is incontestable that bedding can be deciphered in the schists in large tracts of the New Zealand Alps and in Otago. But the parallelism between bedding planes and schist planes so common in our Alps and elsewhere can lead to generalizations on which we may build over simplified and erroneous concepts that affect our field mapping profoundly. For the clear evidence of hinges of major folds cut by a pattern of regular cleavage (or schistosity) planes, in even a few places, casts

doubt on the idea that, anywhere within a considerable distance, will similar rocks allow us to build up stratigraphic sequences of any great thickness, unless the structure of the field is examined in considerable detail; perhaps not necessarily with such extremely detailed analysis of mesoscopic structure as that of McIntyre and Weiss but certainly with the mind prepared to accept much complexity in structure.

To illustrate this point let us consider some aspects of the relation of quite simple structural features to sequence more closely. In the steeply dipping limbs of isoclinal folds the cleavage planes, parallel to axial planes, are often also approximately parallel to bedding planes but on approaching the hinges the two sets of planes diverge to become eventually nearly normal to each other. Across the axis the sequence, assuming it to be intact and not duplicated or cut out by shear planes will repeat itself. Fourmarier has described this sort of thing excellently. In the field especially on a reconnaissance survey these coincidences or near coincidences of the two sets of planes may seem to be the rule with no exceptions, yet the sequence can be so repeated several times. Now the hinges of isoclinal folds can be very hard to detect because only in certain beds do they stay intact; in many other strata they are crushed out, separated by faults, or obscured by features of incompetence; particularly in the cores of anticlines where the appressed opposite limbs of a fold may be juxtaposed in parallel position. Furthermore one's chances of seeing anticlinal hinges are better on the ridges, and probably greater than the chances of seeing synclines. How many such folds do we miss in reconnaissance?

From the detailed study of smaller structures where they show a regular pattern one may deduce the presence of larger folds that may otherwise pass undetected. Thus Gunn and Robinson when working with me saw certain things whilst together but we saw others, often different features, whilst working apart. I drew a map marking areas of the Franz Josef and Fox regions within which I inferred major folds on the evidence of smaller structures. I saw some but not all of the larger folds. Gunn returned my map, putting in the traces of the axial planes of larger folds that he had actually seen in the positions which I had indicated, and where he also would have independently put them on the evidence of 'drag folds'.

These remarks concern the biotite and biotite garnet schists and there must be repetition of sequences in these, as also in the chlorite schists. In earlier reconnaissance work with Mason, I missed the signs of these folds and we considered the "schist planes to coincide nearly everywhere with bedding planes with only local and minor departures from this coincidence" (we at least avoided that very ambiguous word "general"). On

looking back it is evident that the local and small departures were significant clues to what was seen later. We had noticed a bedding schistosity and seen a separate schistosity cutting the axial planes of microfolds but not collected enough data on the pattern of microfolds to see clearly. Where the dip of schist planes is not steep we may still have very complex tectonics. In nappes the limbs lie flat and it takes a lot of work to see some of the nappes in schists when relief is low. If there are complex microfolds or lineations we should be aware of possible larger complexities before we assume simplicity of structure.

Having concluded that reconnaissance mapping of schists is worthwhile it appears that much of our trouble lies in our method of describing such terrains and here I see no solution except to write carefully and to take advantage of words to convey the degree to which a certain feature is clearly or unclearly observed, above all to let the reader realise when we are on very hypothetical grounds. This is a very difficult task because we all employ certain smaller features in our mapping as valid in drawing conclusions on larger structures without discussing at lengths the background of supporting evidence, particularly that cited in older literature. The writer's use of what he has called, probably laxly, 'drag folds' is a case in point.

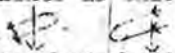
Structures of metamorphic rocks are sometimes described by a bewildering array of terms, some of which were sound to begin with and which have been marred for useage by having extra meanings tied on them. Probably it would be best to discard some or all of these terms and resort to the useage of S, S1, S2 etc., an S surface being any distinct planar element repeated in rock at close intervals.

It may nevertheless be desirable to link the more traditional terms to these and to consider their meaning. Most geologists use 'cleavage' for a set of planes very closely spaced which show no clear displacement along them. To insist that this must be axial plane cleavage is to carry hypothesis, correct in many places, too far. One can see cleavages cutting across folds and not in the axial plane position. It can be argued that they are axial planes of some invisible larger folds cutting earlier folds but that, again, is often more hypothesis.

'Fracture cleavage' was used by Harker for cleavages showing visible small displacements along the planes. But other writers often use fracture cleavage for the more widely spaced cleavages common in strata of coarser grain. This is the way I have used it. One finds some writers then talking of cleavage seen in finer grained beds of pelitic type, which shows generally remarkably regular orientation, and of fracture cleavage for that in the intervening strata of coarser grain

where the planes generally show a different dip to that of the finer beds, although the strikes are usually parallel in both sets. But I have seen photos of rocks which showed both a cleavage and a fracture cleavage crossing it. When we consider the term 'schistosity' again we find unnecessary qualifications attached to it. Cleavage obviously passes to planar schistosity but many schists show many S surfaces. One of these is often the bedding plane which in my opinion is rightly called schistosity when a schist splits well along it. Fourmarier suggests the use of the term 'straticulation' for such schistosity parallel to bedding and prefers not to use the term 'schistosity plane' here. This seems to be a restriction of no value: what an English writer calls a schist might then have no schistosity plane. One often finds schists in which one is not sure whether the schistosity plane is or is not parallel to bedding. When we discover it to be really coincident with bedding we can qualify it as bedding schistosity. For good general accounts of what we can see of slates and schists in the field few descriptions equal those of Fourmarier: it is because I find his description so excellent that I criticise some of his terminology and a tendency to push the generalized statements a little too far, e.g. his statements that 'clivage schisteux' must be parallel to axial planes of folds. Foliation, now used by several modern workers in a very old and wide sense, was restricted by Harker, to the coarse banding of gneisses. The latter practice has become so well established that it seems better either to discard the term or to define one's useage anew in every account. But to go through all the terminology of metamorphic structures would demand a monograph. The best thing to do is to cite one's own definitions clearly.

Symbols for structural maps are also in some confusion and it would be worthwhile having a committee to ruminate on them. I would like map symbols which convey at least vaguely a picture of what we see in nature. The double fish hooks to illustrate overturned anticlines and synclines do this well. Plunging folds should be drawn thus:



A symbol (which I detest)

in universal use is that used for beds believed to be slightly or considerably reversed.

This symbol is misloading in two senses - it introduces a hook suggesting a hinge where there is no hinge: put the three symbols side by side and one sees that even in simple cases it can be confusing. With more complex fold patterns it looks an even more illogical piece of graphics. Secondly the reasons for inferring the bed to be overturned are often based on lithologic reasoning, not always as sound as some writers assume. I think it is better to keep geometric and stratigraphic symbols distinct even when the two are to be read together. I strongly advocate that this symbol be discarded. We can replace it by using values over 90°, with arrow pointing in direction of dip, when we feel happy that it

does not conflict with the visible geometry. 80 100
If not, letters are sufficient - Y for younger, O for older to make our meaning clear.
These letters may seem 80 80
clumsy but they are preferable yo yo yo
to putting on supplementary arrows to indicate tops of successions.

The difficulty in making symbols which have clear resemblances to plan of outcrop in nature is that they should be valid for regions of both low and high relief. When one can see the 3-dimensional forms, especially in mountains, one hankers after something more graphic than can be found on most maps, something that can combine very schematically outcrop pattern along with the symbols for bedding plane attitudes as seen from above. The sort of thing illustrated does give some idea of the amplitude and wave length of folds seen in mountains even if the outcrops are not very precisely drawn. Argand drew such lines on his maps and they are useful. I think in New Zealand we have been too averse to putting sketchy lines on our maps. Many of the European maps in papers have a rougher appearance but show more of the data known to the author, e.g. Moret's maps of Haute Savoie.

Returning to the matter of stratigraphy of metamorphic rocks I believe that locally stratigraphic successions can be perceived in these and local correlations of a sort can be established which will eventually lead to much more extensive correlations. But before we arrive at the latter stage I think we shall go through a stage of "hit and miss". Metamorphism as well as small displacements repeated thousands of times may have altered the original thickness of the sediments. We are hardly dealing with thickness as the stratigrapher understands the term in less metamorphosed rocks. When the folds affecting our rocks are large and we do not see them we may be correlating sheaves of similar rocks folded, more or less to a similar pattern, to give apparently similar sequences which are really repeated sequences. It appears to me that when we get into fields of a certain complexity and particularly when in metamorphic rocks, the very tentative nature of our 'sequences' should be emphasized by always calling them 'seeming sequences' or some similar term until we can work in much more detail. Our preliminary rough and ready correlations may later shed light on the significance of a feature in each 'seeming sequence' and eventually help us to unravel something more like true sequences. I am well aware that by covering large tracts quickly we sometimes see significant relations that pass unperceived if we work slowly and in great detail; nevertheless we should convey to the reader the

reconnaissance nature of our work. To wind up I want to throw in a few comments on petrology in relation to field structural studies. Having commenced working chiefly in the field and having supplemented the field information by a somewhat inexpert microscopic examination of the rocks collected, my approach has been different from that of the petrographers who have done such excellent petrographic work in New Zealand metamorphic rocks. I have read some of the details of petrographic papers only after publishing results and I have been very struck by the correspondence of my observations with those of the petrographers. Indeed, I have been more than a little surprised to see how much they deciphered by detailed examination of only a few rock slides without extensive field work, and at the same time relieved when my own petrographic observations yielded the same results as this more detailed work. I find Turner and Hutton in Otago describing bent biotite flakes on schist surfaces and axial plane schistosity cutting microfolds in this section (Turner 1940, p.89), and pointing out that two metamorphisms seem likely. These features correspond to what we have seen in the Fox Range and Fox and Franz Josef Glaciers.

Turner's petrofabric work too indicates, on the evidence of slices, that there have been at least two superimposed foldings and these views seem to be partly in agreement with that of later workers e.g. Robinson. But petrographic work without much field work only tells us a very limited amount about the geology. In general I think New Zealand geologists can advance quickly in structural work on schists only if we bear in mind the limitations of any particular line of field work and that in the long run we shall have to consider petrographic evidence, often quite detailed, particularly for stratigraphic correlations. We have a remarkable field in the New Zealand Alps and it will retard progress if either the geologist engaged in reconnaissance or the specialist imagines that the other's work is irrelevant in the total picture.

April, 1958.

Professor A.R. Lillie,
Department of Geology,
University of Auckland.

PROGRESS REPORT ON THE SEARCH FOR OIL IN TARANAKI

By

DR J. VAN DER SIJP

The search for oil in the Taranaki area, which was begun by Shell BP and Todd Oil Services Ltd in November 1955, has now covered a large part of the area over which prospecting licenses were granted to the Company.

Surface geological work has been continued with the objective of obtaining a detailed picture of the paleogeography of the Taranaki Basin. Having completed a stratigraphical study of the older Tertiary formations, work is continuing on the Upper Miocene and the Pliocene.

The seismic party has now completed a "basin reconnaissance" consisting of some 250 miles of continuous reflection profiling in a series of long regional lines, mainly in the western part of the Basin. The use of multiple seismometer arrays and multiple shotholes has been general practice in an attempt to get the best quality of reflections. In general the reflections obtained may be classed as satisfactory. Some indications of deep-seated structures were obtained and the more interesting of these will now be covered with a more detailed network.

It is expected that the drilling of the first deep exploration well will start sometime during the last quarter of 1958.

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SEARCH FOR OIL IN BRITAIN (1944-1955).

Mr B.W. Collins, writing from London about a meeting of the Geological Society of London that he attended on March 26, 1958 and at which Messrs Falcon and Kent of B.P. presented geological results of the search for oil in Britain during 1944-55, says:-

> "They showed specimens of some of the upper Palaeozoic shales and sandstone (Millstone Grit), which are the source and reservoir rocks respectively, and I was surprised at the high degree of induration - something like the East Coast (North Island) Cretaceous, but much less jointed, as they get out some very good cores."

He notes also that Britain has produced over one million tons of oil to date and has another million in sight.

N.Z. GEOLOGICAL SURVEY EXPEDITION TO CAPE HALLETT 1957-58.

The New Zealand Geolcgical Survey expedition of eight men which recently spent several months in the Cape Hallett region of Antarctica (see Geol. Soc. N.Z. Newsletter No.4 pp. 12-15) returned to New Zealand on 24th February much impressed by the scenic beauty of that part of Antarctica and by the scale nature used when constructing that frozen continent.

Dr Harrington, leader of the party, has communicated the following signal which he sent to the Director of the Geological Survey from Hallett Station summarizing the expeditions activities.

"HALLETT STATION, 11th February 1958, 1.55 pm'
Markham, Secretary I.G.Y. Research, Wellington
Pass to Director, Geological
Info Comnavsupfor

Party came around Fantail Mountain over Quarterdeck Ridge and down into Hallett on 9 February with Elan and Eclat to meet ship schedule as instructed but because shipping difficulties will not now be removed until late February or early March. Please inform wives.

Last five days in particular were heavy going in soft snow at 5000 feet. Party tired and very sunburnt but no accidents frostbite or sickness. Weather far warmer than expected with lowest temperatures minus 6 degrees fahrenheit and rarely enough wind to even blow your hat off. But man hauling is delirious.

Results of 7½ weeks' field work follows.

GEOGRAPHICAL RESULTS. Found route to Tucker Glacier 20 miles south Hallett and then travelled further 66 miles up Tucker plus side trips and climbs for survey and geology. Tucker is great highway and could hold Tasman Glacier sideways. At farthest point climbed Mount Shadow and Mount Twilight for views and photographs of 100 miles radius over magnificent peaks out to plateau. Country made for field glasses being on huge scale without smog or heat haze. Future alpine type trail parties with dogs or mechanical transport could operate over huge area if supported by light plane operating from strip on Hallett Spit.

SURVEY RESULTS. Fitzgerald extremely active with Croll Heine Hearfield established over 20 survey stations with positions determined by sun shots on high points 3000 to 4000 feet above camps. Many hundreds other features resected from survey stations and recorded by photo theodolite. With American air photos will be able to complete maps from Cape Adare to Lady Newnes Ice Shelf.

GEOLOGICAL RESULTS by Wood McKellar Lensen Harrington from over 250 miles manhauling partly in rough country in three journeys. Coastal ridges consist basalt shield volcanoes with some Phonolite and Trachyte and some recent cinder cones. Inland mountains of Admiralty Range to limit of views consist eastern and western granitic complexes intruding Robertson Bay group of unfossiliferous argillite and quartzose greywacke metamorphosed to biotite schist and granulite and folded on west north west axes repeat west north west. These beds extend at least from Robertson Bay to Terra Nova Bay and possibly to Skelton Glacier and beyond. An extensive distribution previously unsuspected and comparable with extent Beacon Sandstone. Robertson group possibly correlates with sediments and intrusives of similar lithology and strike described by Americans in Marie Byrd Land and if so there follows important result that east and west Antarctica geologically repeat geologically one continent.

GLACIOLOGICAL RESULTS. Snow pits dug to measure annual snow accumulation and mean annual temperature. Lines accumulation and ablation stakes drilled into Hallett Glacier which is ideal for detailed regimen study. Stakes moved 4 inches in 4 weeks. Running streams abundant for 4 weeks.

MISCELLANEOUS RESULTS. Lichens and mosses collected. Breeding places found abundant Snow Petrels and Wilson's Storm Petrels. Regular meteorological observations on the trail. Paleomagnetic samples. Until removal will do immediate report, repair boat damaged in fall from helicopter, and short boat trips Moubray Bay. Americans request situation report. Please draft and forward Washington.

HARRINGTON."

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NEW HOMES FOR GEOLOGICAL SURVEY OFFICES

The Head Office of the N.Z. Geological Survey has gathered together its scattered Sections and moved from its long established home at 156 The Terrace, Wellington to new and palatial accommodation a little nearer the active Wellington Fault, at Lower Hutt. Postal Address:- P.O. Box 368, Lower Hutt.

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The "Ngaruawahia" office has moved to Otahuhu, Auckland. The postal address is:- C/- Otara Research Station,
Otara Road, Otahuhu, Auckland.

THE PALAEONTOLOGICAL ASSOCIATION

The Palaeontological Association was founed on 27th February, 1957, by a group of paleontologists from all parts of Britain. It aims at furthering the study of Paleontology by holding meetings in London and elsewhere for the discussion of paleontological topics and the exhibition of specimens, and by publishing a new journal called "PALAEONTOLOGY". The founders believe that the Association satisfies a long-standing need and that its activities will be complementary to those of the older geological and biological societies in Great Britain; it is also hoped that the Association will form a link between paleontologists at home and in the Commonwealth.

The Council of the Association that was elected on 27th February, 1957, is as follows:

President:	Dr. R.G.S. Hudson, Iraq Petroleum Co., London.
Vice-Presidents:	Dr. E.I. White, F.R.S., Department of Palaeontology, British Museum (Natural History), London.
	Mr. N.F. Hughes, Sedgwick Museum, Cambridge.
Secretary:	Dr. Gwyn Thomas, Department of Geology, Imperial College of Science and Technology, London, S.W.7.
Treasurer:	Dr. W.S. McKerrow, Department of Geology and Mineralogy, University Museum, Oxford.
Editor:	Dr. W.H.C. Ramsbottom, Geological Survey and Museum, Exhibition Road, London, S.W.7.
Other members:	Dr. F.W. Anderson, Geological Survey and Museum, London.
	Dr. T. Barnard, University College, London.
	Prof. O.M.B. Bulman, F.R.S., Sedgwick Museum, Cambridge.
	Dr. F.E. Eames, British Petroleum Co., London.
	Mr. G.F. Elliott, Iraq Petroleum Co., London.
	Prof. T.N. George, The University of Glasgow.
	Dr. F. Hodson, The University of Reading.
	Dr. Dorothy H. Rayner, The University of Leeds.
	Mr. P.C. Sylvester-Bradley, The University of Sheffield.
	Dr. J.T. Temple, Birkbeck College, London.
	Prof. T.S. Westoll, F.R.S., King's College, Newcastle-on-Tyne.
	Prof. W.F. Whittard, F.R.S., The University of Bristol.
	Prof. Alwyn Williams, Queen's University, Belfast.
	Prof. Alan Wood, University College of Wales, Aberystwyth.

The Association does not at present seek to maintain any permanent office or library, and it is intended that only administrative charges of meetings shall fall on the Association; the major part of its income is therefore to be devoted to publishing.

Membership is open to individuals and to institutions on payment of the annual subscription of Two Guineas (£2.2s.-d.). "PALAEONTOLOGY" will be sent to all members.

By August, 1957 over 200 members (mostly individual members from Britain) were enrolled. The first part of "PALAEONTOLOGY" the Association's journal was due to appear in the Autumn of 1957.

INVITATION: The Council desires to enlarge the membership of the Association in the Commonwealth and overseas. Palaeontologists and others interested in the science are invited to subscribe or to write to the Secretary of the Association or to Dr. D.A. Brown, Department of Geology, University of Otago for further information.

This new journal will appear half-yearly. It is Crown Quarto in size, printed by the Oxford University Press, and the first part will consist of 88 pages of text and 14 collotype plates. It is intended that papers published in the journal shall have the fullest possible illustration, and it is hoped that contributions will cover all aspects of palaeontology.

Dr. Brown is of the opinion that "Palaeontology" should prove a good medium for rapid publication and knows that the Association will welcome papers from New Zealand and Australia.

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INTERNATIONAL ASSOCIATION OF SCIENTIFIC HYDROLOGY

L.E. Oborn has succeeded B.W. Collins as Corresponding Member of the Commission on Subterranean Waters of the International Association of Scientific Hydrology (Internation Union of Geodesy and Geophysics).

Anyone interested in the topics to be discussed at the next Assembly of the Union, which will be in Helsinki in 1960, should write to L.E. Oborn,
C/- Geological Survey,
P.O. Box 2110,
Christchurch.

GEOLOGY IN NORTHERN RHODESIA.

By

H.S. GAIR@

Northern Rhodesia is about 300,000 sq. miles in area (i.e. three times as large as N.Z.) and more than three-quarters of the country is over 3000 ft above sea level. The surface configuration is that of a peneplain, the monotony of which is broken in a few places by occasional monadnocks (both isolated Kopjes and ranges of hills) and by large tectonic depressions (structurally aligned with the Rift Valleys of East Africa) some 2000 ft below the general plateau level. Parts of the peneplain rise to over 6000 ft above sea level but most of it lies between 3000 and 4500 ft above sea level.

Climatically the year consists of two seasons, the wet from November to mid-April, and the dry from April to October. The last two months of the dry season and particularly October, are referred to as the hot season. Annual rainfall ranges from 15 ins to over 60 ins and is characterised by high variability. As a result of the high altitude of much of Rhodesia, the climate is very pleasant and even in the hot months temperatures on the plateau are usually below 90° F. In the so-called rift valleys, however, the temperature is generally 10-15° higher and the heat is more trying. Fortunately, it is a dry heat and lasts only a month. A difference of 2000 ft of altitude in central Africa can make all the difference between a pleasant climate and hell. The climate starts to become somewhat trying below about 3000 ft. During the dry season an occasional frost has been recorded and when sleeping out in a tent several blankets are necessary particularly in June and July.

Contrary to what is generally thought, there is no true jungle in Rhodesia. The "bush" is, on the whole, open to the extent that a Land Rover could probably be driven through much of it although the course would be somewhat tortuous and progress painfully slow.

There are about 3 million Africans and 50,000 Europeans in Northern Rhodesia. There is but one railway line and this links up with the South African Railways in the south and continues to the north into the Belgian Congo. The country is not well roaded except near the line of rail where most of the European settlement has taken place.

Because of the climate, geological field work is carried out mostly during the dry season. Six to eight months of the year were spent continuously in the field and we returned to our head office in Lusaka only during the rainy season.

During the field season we would come in from the field about once a month to the nearest store (probably Indian-owned) in order to obtain food supplies etc. Africans were sent on bicycles once a week to the nearest Port Office for the mail, often as far as 70 miles distant. Whilst in the field we had a permanent African staff of one driver (wages £6-£12), two Field Survey Assistants (paid by Govt. - wages £4-£6 per month), and a cook-boy (paid by us - wages £4-£6 per month). As well as these we recruited a few local natives from nearby villages. Our practice was to leave two "boys" in camp to do the camp chores, such as wood and water collecting, while we took from 2 to 6 in the field with us. As our work involved coal-prospecting, it was very convenient to have this labour on hand to open up any coal exposures that looked promising. As there are relatively few roads, practically all the field work was done on foot and it was not uncommon at the end of a month's field work to find that we had walked as much as 200 miles (mileages were recorded on a bicycle wheel with cyclometer attached). Camp (we lived in tents) was shifted about every two to four weeks by Land Rover, if possible, but quite often by carriers - we were allowed to engage 25 (35 if accompanied by wife) carriers for this work. Where possible, we brought the Land Rover close to our camp so that we could get out quickly in case of illness. Each camp shift was about 10 miles and the carriers were paid 2/- to 3/- per day (the rate of pay varied with distance from the line of rail). A 40 lb load was about the maximum that one African would carry. The Africans did not care for the "carrying" work but as we had the Government in the form of the local District Commissioner behind us they knew that a refusal could mean a short stay at the "Boma"* as semi-prisoners.

In the field one had to contend with insect pests such as the tsetse fly and mopani (or sweat) flies. The latter were about the size of sandflies and had only an irritant effect, hovering about one's eyes and ears and occasionally disappearing into one of these organs. The bite from most tsetse flies is like having a red hot needle jabbed into one's body; some however contrive to get a bellyful of one's blood without causing pain. There is also a wild bean (called a Buffalo bean) that is covered with fine velvety hairs which on coming into contact with one's skin set out an intense irritation (much worse and for a much longer time than a stinging nettle). Snakes were, at times, quite common but they usually took evasive action, however the fact that at least one geologist was known to die from snake-bite was a small worry. Wild game, and in particular, Elephant, Buffalo and Rhino can necessitate an alteration in course but are not troublesome if left alone.

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* A "Boma" is the seat of the local Government Representative (District Commissioner) and staff.

A first impression of the geology is that everything is on a grand scale - it is possible to drive for scores of miles on the same formation with very little facies change.

My field work was devoted almost entirely to the Karroo Rocks - continental deposits which range in age from Carboniferous to Jurassic. These sediments are at present restricted mainly to the so-called "rift" valleys of the Zambezi, Luangwa and Lunsenfwa Rivers which lie at elevations about 2000 ft below the main Rhodesian Plateau of 4000 ft. Over most of Southern Africa the Karroo Rocks fall into a fourfold subdivision with coal-measures at the base overlain by mudstones then sandstones (arkoses mostly) and finally basalts. In the Cape Folded belt the Karroo rocks are over 20,000 ft thick. In the middle Zambezi Valley (where I did most of my field work) they were 10,000-15,000 ft thick, the thicknesses being as follows:-

Basalt	1000 ft plus.
Sandstones (Arkoses)	8-10,000 ft.
Mudstones	2000-3000 ft.
Coal Measures underlain by a few feet of varves and tillite in places.	300 ft.

The Karroo sediments in the Zambezi Valley are hard rocks which are about midway in induration (induration including compaction and cementation) between a typical N.Z. Tertiary mudstone and an argillite. Wetting a Karroo mudstone does not convert it into a plastic clay and it is not until a late stage in the weathering process that this happens. I am sure that any N.Z. geologist visiting Rhodesia would see the marked similarity between the relation of the Karroo Rock cover to the pre-Cambrian Rock undermass, and the Cretaceo-Tertiary rock cover to our greywacke-argillite undermass. Both covering strata have been folded and faulted to about the same degree, and in both cases the surface of the undermass had been peneplaned prior to the deposition of the covering beds.

To the visiting geologist the African Landscape appears to consist of a "concourse of peneplains" lying at varying inclinations and at varying altitudes above sea level. Some of these peneplain surfaces have been recognised as the same surface lying at different elevations due to either warping or faulting or both. Dixey and King have recognised several peneplains of different ages but the ages they assign to them differ markedly. I think that this problem of multiplicity of peneplains can be explained by postulating one peneplain only, an exhumed fossil peneplain - the sub-Karroo Floor - which now lies at highly varying altitudes and inclinations due to the considerable amount of earth movement known to have taken place since its formation.

@ Mr H.S. Gair graduated Master of Science with first class honours from Canterbury University College in 1949, and spent nearly two years with the New Zealand Geological Survey before joining the British Colonial Service. As a geologist he spent 6 years on field surveys mostly in the Zambesi and Luano Valleys of Northern Rhodesia. When he returned to New Zealand towards the end of 1957, he rejoined the Geological Survey and is now in their Christchurch office.

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IN MEMORIUM

W.N. BENSON. D.Sc. (Syd.), B.A. (Cantab.), F.R.S., F.G.S., F.G.S.A., F.R.G.S., F.R.S.N.Z., F.A.N.Z.A.A.S. Emeritus Professor of the University of Otago, died in August 1957. His death came as a shock to his former students and to those who heard him deliver his paper during the A.N.Z.A.A.S. Congress in January 1957, and who took part in the excursion he lead on the Otago Peninsula.

During his life Professor Benson created, as a geologist, a lasting monument for himself by his research and writings, and as a man, an affectionate place in the memory of his students and associates. He was a member of the Society.

GEOLOGICAL INVESTIGATIONS DURING T.A.E.

By

G. WARREN*

The 1956-58 Trans-Antarctic Expedition had (as its name would tend to suggest) the crossing of the Antarctic continent as its primary objective, but at the same time carried out a fairly extensive scientific programme. Results of the geological studies are of course still largely in the undigested "field notes" state, but a brief account can be given of the areas visited by members of the expedition and the generalized geological results.

Shackleton Base, the starting point of the British crossing party, is situated on shelf ice at the head of the Weddell Sea. Two small nunataks about 20 miles away are the only rocks exposed nearby, but three ranges of mountains with extensive ice-free outcrops occur between Shackleton and the advance base "Southice" about 300 miles to the south. These ranges were visited by Jon Stevenson, the Australian geologist with the Shackleton party, and he reports a succession there that is basically similar to that of the mountains of South Victoria Land on the opposite side of the continent - metamorphics intruded by various granitic rocks, a coarse quartz sandstone in which are finer beds with Glossopteris-like leaves, and the characteristic thick dolerite sills.

The crossing party travelled beyond these ranges over some 1600 miles of ice and snow before they sighted another rock, but during this long journey extremely valuable geophysical work was going on. An uninterrupted series of seismic soundings and gravimetric readings was taken, and when analysed these will give results of fundamental importance to Antarctic geology.

On the New Zealand side, Bernard Gunn and I were able to make only one major geological excursion from Scott Base before the 1957 winter, but this proved of great value. We collected extensively during a 2½ week trip in the Lower Skelton Glacier, and later, during the winter cut and examined about 80 thin sections of these rocks. As a result of this work we were able to start the 1957-58 summer field season knowing which aspects of the geology needed particular attention.

"Get fit" trips for dogs and men in the early spring took Gunn to the neve of the Blue Glacier beneath the giants of the Royal Society Range, while I made an (unsuccessful) attempt to relocate elevated marine muds at various places on the shores of McMurdo Sound.

On October 4th when the four-man "Northern Party" left with two dog teams, the first of the season's major journeys from Scott Base was under way. We were a combined geological and topographical survey team and as we were independent of the depot laying parties to the south, were able to concentrate all our time and energies on our mapping programme, and moved about whenever and wherever the circumstances at the time suggested would be most profitable.

To cut a very long story short, during the four months' sledging before the party returned to base, we were able to map, albeit sketchily, all the main features between the coast and the most westerly nunataks, from the Skelton-Mulock divide in the south, to the immense Mawson Glacier in the north. The number of outcrops actually visited in this huge area is of course relatively small. However as the structure is quite simple and the number of rock types limited and easily distinguishable, it is often possible to map large areas quite confidently with field glasses from a good vantage point.

The rock types in the Ferrar-Granite Harbour area are quite well known from the work of the earlier expeditions and throughout the rest of the area visited the succession is very similar. Perhaps the most interesting new feature was the finding of a thick consolidated tillite in nunataks on the plateau edge near the head of the Mackay. This tillite unconformably overlies Beacon Sandstone, and in one place has been intruded when wet by basic lavas which have formed well developed "pillows". "Gondwanaland" enthusiasts may be tempted to jump straight to the conclusion that it is Permian, as indeed it may be (it is certainly not Pleistocene) but it is fruitless to discuss this point further until the rocks have been examined much more thoroughly.

An extensive collection of plant fossils was gathered from various localities in the Beacon Sandstone, and with these and fragmentary fish material, there seems every chance of getting some well dated horizons. Limestones and greywackes in the older basement rocks appear to be unfossiliferous, and no sign was found of the Archaeocyathine Cambrian limestone.

The large number of specimens of igneous and metamorphic rocks that were collected have yet to be sectioned and examined under the microscope, and comment on them is better left until this is done. There is a wealth of new material to be studied, and this work should add much to our knowledge of the nature and relationships of the various members of the "basement complex" of South Victoria Land.

* Mr G. Warren of the Geological Survey, together with Mr B.M. Gunn formerly of the University of Otago but now on the temporary staff of the Geological Survey, spent 14 months in the Antarctic with the New Zealand party of the 1956-58 Trans-Antarctic Expedition.

THE NEW ZEALAND REGIONAL FOSSIL RECORD SYSTEM

By

C.A. FLEMING

Introduction: Paleontology is an indispensable tool in geology. Fossil collections are so numerous that they have to be numbered for classification and reference. Many museums number individual specimens or locality "lots" of single species, but the association of fossils at one horizon and locality is so important to paleontologists that a number is usually applied (at least in the first instance) to a whole collection from one locality or horizon. The N.Z. Geological Survey began numbering its fossil collections last century and this numbering system (prefix GS) is still in use for macrofossils; new and independent numbering systems were later begun for microfossil samples (prefix F) plant macrofossils (prefix B), and spore and pollen preparations (prefix L). Such numbering systems, and those of museums and University Departments, given to collections of fossils in one institution, apply to the whole of New Zealand, and are not otherwise "classificatory" except that the serial numbers generally reflect the chronology of collecting or acquisition. For use, such collections have to be classified in several ways. The commonest approach to geology being areal (regional), a geographic-ic classification of fossil collections has been found essential. Hector classified his Geological Survey fossil collections geographically under counties. Later (1920-1950) Dr J. Marwick card-indexed macrofossil collections at the Geological Survey under Survey Districts, but no geographic index was available for increasing numbers of microfossil samples examined by Dr H.J. Finlay.

The purpose of the N.Z. Fossil Record System is to provide a workable classification for fossil data; it

(a) is geographic,
(b) includes all types of fossil material (macro, micro, plant, animal, etc.) and links records of different types from a single horizon,
(c) can include collections in all holding institutions in N.Z. and elsewhere, in private collections, or even specimens reported but not preserved,
(d) is accessible to all geologists.

History: The need for a fossil record system arose in the nineteen-forties when Finlay's microfaunal work for many Survey and University geologists led to gradual development of a Fossil Record Form to record data uniformly, and eventually to a regional filing and numbering of such records, under the N.Z. Mapping Service numbered one-mile map sheets. These sheets are the basis of the Lands & Survey Department's one inch to

the mile topographic maps, many of which were published during and since the war; they offer the best topographic information available on this scale, with a convenient grid for locating points. The sheet-boundaries and grid can be applied to areas not yet covered by published maps, and the sheets have now largely replaced counties and survey districts as a basis for geographic classification of data.

Dr H.W. Wellman played a prominent part in designing the fossil record system and record form, and the scheme was adopted by the Geology Section of the N.Z. Science Congress (Christchurch, 1951) on the basis of a report by Dr M. Gage (Canterbury University), on which I have drawn heavily in compiling this article.

Outline of System: A geologist who has made a fossil collection fills in a record form with all data available, noting whether his collection includes macrofossils, a microfaunal (foram) sample, plant fossils, microfloral material (for pollen and spores), or material for 14C tests (or any combination of these) and ascertains where the master file is housed for the sheet in which his collection was collected. He sends two copies of the sheet to the master file holder who allots a number, files one copy on the sheet master file and returns the other to the collector. Copies of the record form accompany all specimens and samples sent to specialists for determination and the sheet fossil number is recorded in specialist catalogues as part of the data accompanying the specimen (s). Collectors should forward determinations made by specialists to the master file holder for entering on the record form.

A geologist planning work can readily ascertain the localities and ages of past fossil collections in a particular region by consulting the appropriate master file.

Geographic Basis: One-mile Sheets: The N.Z.M.S. 1 sheets are uniform in size and are numbered in two series, N1-N169 (North Island) and S1-S191 (South Island). Only about 197 sheets are published, but the boundaries of unpublished sheets can be transferred to other maps (4-mile, county, survey district) with enough accuracy to locate samples. Every sheet has a corresponding fossil record file in which samples are numbered independently. The Geological Survey has also established Master Files for outlying Islands and Island Territories (Chatham Is., Auckland Is., Campbell Is., Niue, etc.)

Fossil Record Regions: Master File Repositories: For fossil record purposes, New Zealand has been divided into twelve "Fossil Record Regions", the boundaries of which are shown on the accompanying maps (Fig. 1 & 2). The master files for the sheets in any one region are held at one institution where a geologist is responsible for their care and for filing new sheets and allotting them numbers. The present regions, master file repositories and curators are:

Northland	N.Z. Geological Survey P.O. Box 368, Lower Hutt	C.A. Fleming
Auckland	Geol. Dept., Auckland University	R.N. Brothers
South Auckland	N.Z. Geological Survey Otara Research Station, Otahuhu	D. Kear
Rotorua-Taupo	N.Z. Geological Survey P.O. Box 499, Rotorua	J. Healy
Taranaki-Wanganui) East Cape-Hawke's Bay)	N.Z. Geological Survey, P.O. Box 368, Lower Hutt	C.A. Fleming
Rangitikei-Wellington-Wairarapa	Geol. Dept., Victoria University of Wellington	J. Bradley
N. Nelson-Marlborough	N.Z. Geological Survey, P.O. Box 368, Lower Hutt	C.A. Fleming
Canterbury	Geol. Dept. Canterbury University, Christchurch	M. Gage
West Coast	N.Z. Geological Survey P.O. Box 90, Greymouth	F.E. Bowen
North-Central Otago	Geology Department Otago University	D.A. Brown
Southland-South Otago	N.Z. Geological Survey P.O. Box 60, Invercargill	B.L. Wood
Outlying Islands	N.Z. Geological Survey P.O. Box 368, Lower Hutt	C.A. Fleming

Note: Boundaries of regions do not correspond with provincial boundaries (check with map). Sheets are occasionally transferred from one repository to another to facilitate mapping. Curators may change with staff changes.

Fossil Record Form: The form at present in use has evolved with experience and needs, and provides for record of data of many kinds. Most of the headings need no explanation. Sheet Number should have appropriate prefix (N or S). A Grid Reference is a six-figure number giving the co-ordinates in yards to the nearest 100 yards of a point in terms of the National Grid. Instructions for citing a grid reference are printed on published One Mile Sheets. For approximate references prefix "c" (eg. c123123). Where a grid reference cannot be readily obtained, collections can be located by bearing and distance from a trig. station, road corner, etc. and this data can be a valuable check on ambiguous grid references. Recording of Survey Districts is useful to locate trigs, especially when there is no topographic map. The Lands & Survey Department's "Provisional Sheets" carried a provisional grid that differs slightly from the "Geodetic Grid" on the final editions of the same sheets,

and this can lead to ambiguities of location. Such ambiguity can generally be ironed-out if the date of the grid reference (and thus map edition) can be determined but some operators indicate whether the grid used is "provisional" or "geodetic". This potential ambiguity has not detracted from the value of the scheme. Details of locality should be stated in terms that will allow recognition in the field and should thus if possible mention place-names, homesteads, etc. Stratigraphic Position should be recorded in terms of feet above basement, above or below other samples or prominent contacts (e.g. base of limestone, conglomerate band, etc.). "Collected for": Mark the appropriate category or categories with a small "x" (Note that printed forms supplied by the Geological Survey cite Survey prefixes, GS, F, L, B; for specimens deposited in other collections the prefix should be altered). Repository: State the institution or private collection where specimen(s) is lodged. Mapped as: cite appropriate stratigraphic unit from bulletin or other published map and date. Known age limits: Many worth-while fossils are not diagnostic of age and not collected for age determination (e.g. a fossil crab or whale bone) and the collector should record what he knows of its age from his knowledge of the local stratigraphy. Lithology: a code of numbers and letters (from key printed on record form) gives a useful record of lithology, e.g. 6843fGM indicates "silty medium sandstone, moderately soft, very calcareous, medium brown-grey, slightly glauconitic and slightly micaceous". This is perhaps the least satisfactory part of the record form, but is hard to improve and a lot better than nothing; it can be amplified in words. Obvious fossils: Useful to note conspicuous forms (e.g. shark teeth, corals, Cucullaea). In Place? Enter "yes" (from solid), almost (fallen specimens or blocks), "no" (boulders). Guessed age: collectors idea of age, in terms of stage or formation. Formation: if from a named stratigraphic unit. Marine, Estuarine, Non-marine etc.: mark appropriate word with (x). Remarks: refer to previous collections, to the problem to be solved, to references in literature to this locality, etc. Re-collections: Later collections (collector and date) from the same locality should be recorded on the form (and not allotted a new number). Age Determinations: Enter here paleontologist's determinations, using stage symbols where appropriate, or ND (age not determinable) or NF (no microfossils).

Fossil Lists: Back of form is ruled to facilitate listing of fossils. Lists can often be typed through as a carbon copy.

Master Files: The Master Files at a holding institution consist of a series of foolscap files, one for each sheet, in which the record forms are firmly held by staples or file pins, last number uppermost to allow easy addition of the next sheet. They should be housed in a safe place.

Responsibilities of Master File Curators: The master files should be housed in a safe place and not readily accessible without supervision to any but the curator or his authorised deputy. The curator is responsible for their care, for replying to enquiries, supplying numbers for new collections promptly (vacations sometimes cause inconvenience!), and entering new data or identifications supplied. A collection should not be given a new number without a search of the file to see if it already has a satisfactory number and thus ranks as a re-collection. Foram, macrofossil, and pollen samples from the same place and horizon should not be given separate numbers but linked on a single record. Files should be accessible for enquirers to consult or copy but individual records should under no circumstances be detached; files should not, in general, be loaned, and if ever sent by post should be registered. They should not be taken into the field. Changes in the domicile of files should be notified to all University geology departments, Geological Survey offices, and the Museum and other geologists using the system.

Responsibilities of collectors and users: Foram, macrofossil, and pollen samples from a single locality should be entered as one record, not several (a common fault). Some effort may be needed to determine whether a collection is new or a re-collection. Recording a sample costs some effort and trouble, so make sure the sample is worth recording (a few oyster shells from Hawke's Bay, e.g., are not worth recording). Study of the file and results before going out into the field is profitable and saves later work; if an area is to be subject of special study, the geologist can help the system and his own interests by taking some trouble to organise old data. When doing field work (survey, thesis, etc.) don't delay recording your fossil collections in the scheme. Make out record forms for all collections. Never submit a collection to a specialist without a duly-filled-in record form. Its no use thinking "I'll wait and see if its any use" because there is nothing so annoying to the specialist as having to fill in forms for your samples, and the samples cant play their full part in N.Z. geology till they are in the system. Students should use the system, under supervision, for thesis work: if their samples are worth examining, they are worth recording fully.

Organization of old data: If a sheet is to be mapped for the first time since the scheme started, begin by searching the master file. Then ask the paleontologists (N.Z. Geological Survey) for any data on early collections from that sheet. Locate this from maps, make new record forms and have them numbered and added to the master files (old collections are generally given numbers 1-500, new ones begin at 501). If other collections from the sheets are known (e.g. in Vienna Museum, N.Z. Museums or University Departments) they should be similarly treated. Plotting all sample numbers on a copy of the map sheet is most useful to the geologist, for determining whether a fossil collection is a new one.

Present Status of the System: The majority of sheets have files including all collections by Geological Survey and many by University geologists made since the scheme was started. The incorporation of Geological Survey collections made prior to 1951 has gone on whenever there was a need and an interested person, but less than a third of the approximate 4,000 macrofossil collections made prior to 1951 have so far been incorporated, and there are also large numbers of microfaunal samples to be dealt with. (Possibly some of the latter will never be brought into the scheme). Little effort has been made to incorporate old University or Museum collections. All plant microfossil samples are in the system.

Oil Company Samples: The two oil companies working in the North Island East Coast area have used the record system under special conditions. Blocks of numbers have been allotted (and noted in master files to prevent duplication) but owing to the special conditions of oil company work the data and results are not available for other geologists at present. It is hoped, however, that this large amount of information will eventually be fully incorporated in the scheme. (The principle of allotting blocks of numbers in any one (or more) sheet for use as field numbers should not be extended to other geologists; in general the number is given only when a record with data is permanently lodged in the collection.) The Shell D'Arcy Todd Company (operating in western North Island) does not use the system.

Summary: The regional fossil record system has proved most valuable both to the Geological Survey and to geologists in the University geology departments. It is a "going concern" that now presents little difficulty to operate to those who know it; a valuable tool in the integration, dissemination, and use of scattered data that can serve us all.

April 1958.

Dr C.A. Fleming,
N.Z. Geological Survey,
LOWER HUTT.

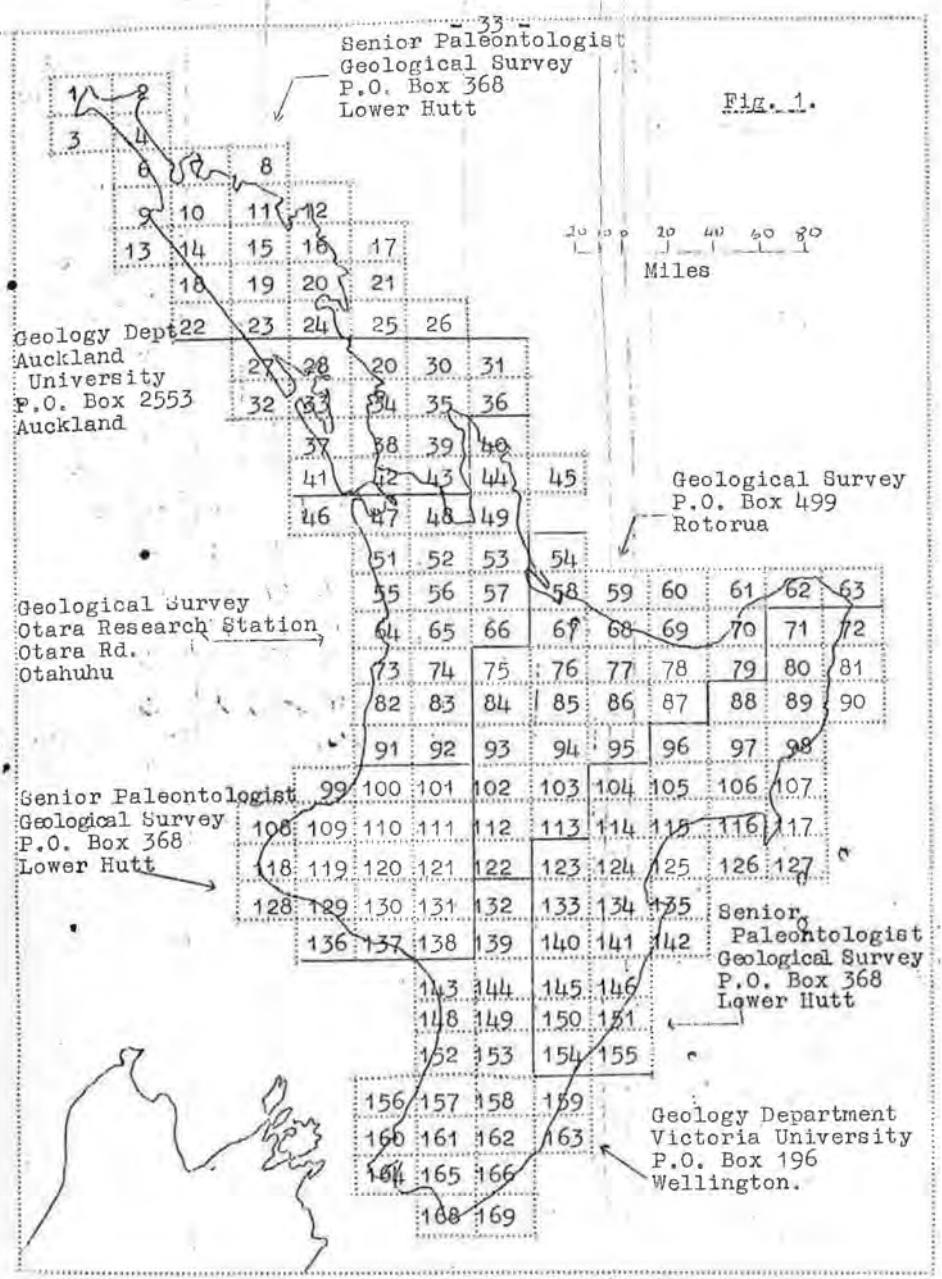
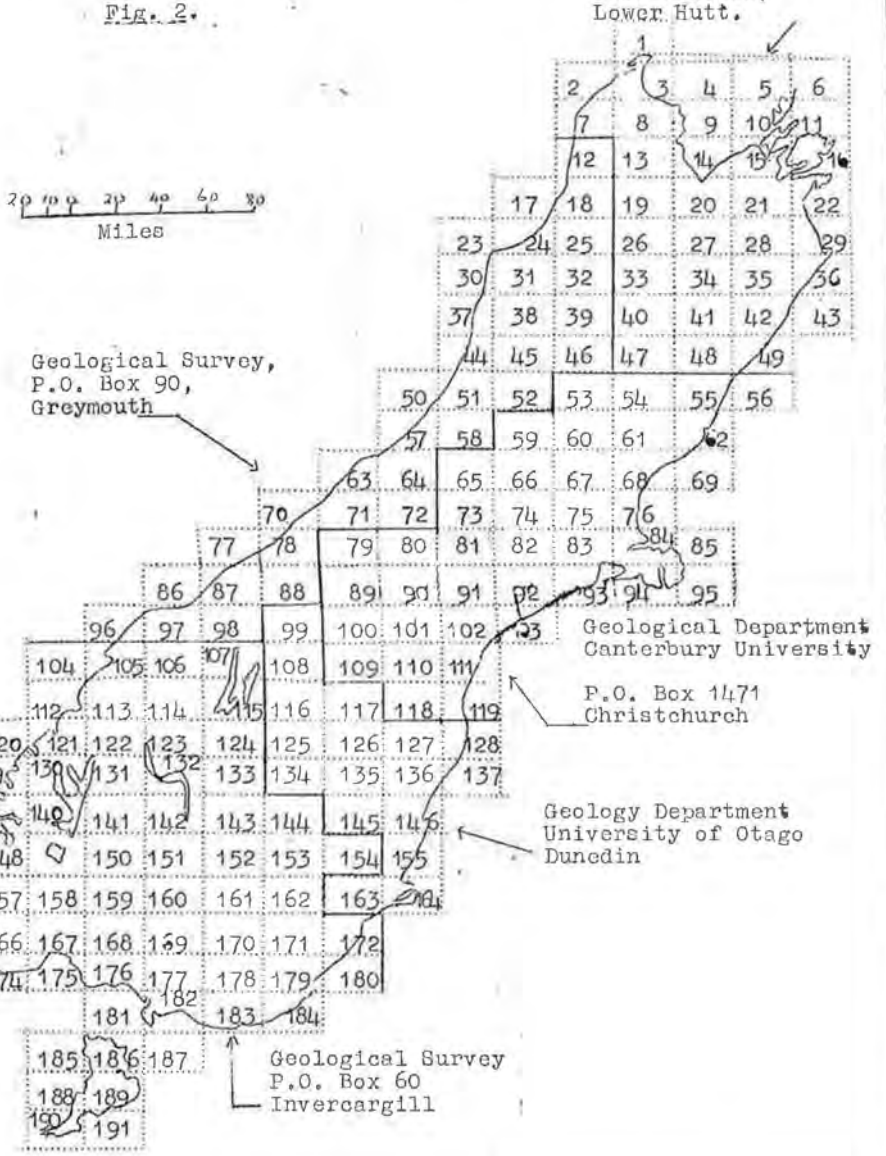

Senior Paleontologist
Geological Survey
P.O. Box 368
Lower Hutt
Miles
Geology Dept
Auckland
University
P.O. Box 2553
Auckland
Geological Survey
P.O. Box 499
Rotorua
Geological Survey
Otara Research Station
Otara Rd.
Otahuhu
Senior Paleontologist
Geological Survey
P.O. Box 368
Lower Hutt
Senior
Paleontologist
Geological Survey
P.O. Box 368
Lower Hutt
Geology Department
Victoria University
P.O. Box 196
Wellington.

Fig. 1.

Fig. 2.


Senior Palaeontologist
Geological Survey,
P.O. Box 368,
Lower Hutt.
20 10 0 20 40 60 80
Miles
Geological Survey,
P.O. Box 90,
Greymouth
Geological Department
Canterbury University
P.O. Box 1471
Christchurch
Geology Department
University of Otago
Dunedin
Geological Survey
P.O. Box 60
Invercargill

N.Z. FOSSIL RECORD FORM

1 MILE SHEET DISTRICT No..... Grid Ref..... SHEET FOSSIL No.....

Macrofauna	Microfauna	Macroflora	Microflora	Radiocarbon
G.S.....	F.....	B.....	L.....	R.....
Thin Section No.				
.....	.....	.....	.....	

Repository of collection:.....

Particular fossils:..... sent to:.....

Full details of locality:.....

.....

.....

.....ch., at.....deg. from....., ...S.D.

Attitude:.....

Stratigraphic position } .....ft. above ..... sample.....

.....ft. below ..... sample.....

Collected by:..... Date: ..... In place?.....

Formation:..... Reference:.....

Mapped as:..... by....., 19.....

Obvious fossils:.....

Lithology:..... Marine; estuarine; lacustrine; fluviatile; glacial; eolian; wood; peat; coal; igneous; redeposited.

Grade Range		
Bould.	1	1
Cobbl.	2	2
Pebbl.	3	3
Granl.	4	4
C.Sst.	5	5
M.Sst.	6	6
F.Sst.	7	7
Silt	8	8
Mud	9	9

Hardness	
Unconsol	1
V. Soft	2
Soft	3
Mod. Soft	4
Mod. Hard	5
Hard	6
V. Hard	7

Calcite	
Non Calc.	0
Sl. Calc.	1
Mod. Calc.	2
V. Calc.	3
Imp. Lst.	4
Rich Lst.	5

Colour	
Almost White	a
V. Lt. Grey	b
Lt. Blue Grey	c
Md. Blue Grey	d
Dk. Blue Grey	e
Md. Brown Grey	f
Dk. Brown Grey	g
Green Grey	h
Yellow Brn.	i
Reddish '	j
Green Brn.	k

Supplementary			
Tuff	T	TT	TTT
Glauc.	G	GG	GGG
Mic.	M	MM	MMM
Pyr.	P	PP	PPP
Carb.	C	CC	CCC
Weath.	W	WW	WWW
Conc.	O	OO	OOO
Qtz.	Q	QQ	QQQ
Phos.	F	FF	FFF
ShlBds.	S	SS	SSS
Borings	B	BB	BBB

Known age limits:..... to.....

Guessed age, remarks, and significance:.....

.....

.....

.....

.....

Forwarded by rail/post on...../...../..... Re-collected by:.....

.....

DETERMINATIONS

Macrofauna	Microfauna	Macroflora	Microflora	Radiocarbon
.....	.....	.....	.....	.....
Identifications by				
.....	.....	.....	.....	.....

Identifications published:.....

Extreme age limits:.....

Adopted age:.....by..... on...../...../.....

.....

250 pds./2/57–74575

FOSSIL LIST

AUCKLAND BRANCH

Report of Meeting held on 27 September, 1957
at the
Department of Geology, University of Auckland

By

J.A. GRANT-MACKIE

Four Honours students of the University gave resumes of their thesis studies, all of which are in areas where basement rocks have yielded fossils.

Mr J.A. Grant-Mackie is making a paleontological and stratigraphic study of the Hokonui rocks in the Awakino-Mahoenui area, S.W. Auckland. These beds, ranging in age from Oretian to Heterian, are nearly 30,000ft thick (c.14,000ft Trias, and 16,000ft Jurassic) and form part of the west limb of the Kawhia Syncline. The beds strike about N-S and their dips range from near vertical in the oldest (westerly) beds, to 20°E in Heterian beds. The strata are mainly bedded mudstones and sandstones, and there is tuffaceous material widespread through the sequence. Conglomerates are rare and thin, though grits are more common; carbonaceous beds occur in the Otapirian and Heterian and accompanied by thin coals in the Oretian; calcareous beds occur at various levels in the Jurassic.

The Warepan has been subdivided into three zones by a study of Monotis faunules - richmondiana-densistriata (lower), routhieri (with two subzones), calvata (upper). A problem posed is the frequent occurrence of a number of different forms of Monotis in the same bed. It is unlikely they all lived in the same environment, and yet the alternative, of current accumulation of dead shells, also seems unlikely, since there is no sign of breakage of the apparently fragile valves. Subdivision has also been made for local Otapirian (3) and Ururoan (2) strata.

A foram fauna of 12 spp. has been found in Aratauran beds and the question arises whether or not it is accidental that all so far found (Awakino, Uruti, Taneatua) are of Liassic age and belong to the Lagenidae. Why are there no pelagic forms, and why have they not been found in other Jurassic beds?

No Temaikan fossils have been found in the area, although the stage could be present. The Heterian is extremely thick, more than 9000ft being exposed (cf. 3500 at Kawhia) and most is of lower Heterian age. While there are 500ft of Heterian beds below the Captain Kings gritty sandstone of Totara Peninsula, below its Awakino equivalent there is at least 5500ft of Heterian sediment.

Discussion Mr Kear stated that in the Waikato basin Pseudaucella increases in size from ¼ to ½ in. long in the lower to 2½ to 3 in. in the upper part of the sequence and asked whether there was a comparable variation at Awakino. Mr Grant-Mackie said that there was a noticeable size increase, although the largest which is also at the top of the beds, is only about 1½ in. long, and that individuals were smaller again.

Mr R.A. Player who has been studying the north Kawhia area outlined the stratigraphic sequence and this is noted, in descending order, in what follows. The younger beds are low Recent dunes in which there are pockets of ironsand. Stratigraphically underlying these are younger Pleistocene dunes on which a 550ft terrace has been cut. The dunes pass down into waterlaid tuff of (?) Nukumaruan to lower Castlecliffian age and then into littoral sands and basalt Pleistocene lignites. The Pleistocene beds in places overlie truncated volcanics. In the area there are seven volcanic centres exposed; one of these is Karioi. The volcanic rocks, basalt or olivine andesite, have in places flowed over the uneven surface of the underlying Te Kuiti limestone. The Te Kuiti Limestone is a westerly-dipping formation consisting of mudstones and arenaceous limestones as well as pure limestones. Its basal beds have been variously dated as Whaingaroan and Duntroonian. Beneath this is the Whaingaroan Formation which at the type locality (Raglan) is some 200ft thick; at north Kawhia is a very thin gritty mudstone which was laid on the probably-uneven surface of the Mesozoic rocks.

The Jurassic basement greywackes are almost entirely of Puaroan age and form an anticline which plunges northwards beneath the Tertiaries and volcanics and is flanked to the east by a minor syncline. The structure is especially well shown by the outcrop of the northern correlative of the Waiharakeke conglomerate. As earlier workers have found, the main problem is the matching of beds at Puti Point with those on the south shore, correlation is better, however, with beds at Waikato South Head. In the nose of the anticline concretionary siltstones very like those at Puti Point have yielded an ammonite (as yet unidentified). These beds overlie the Waiharakeke conglomerate and further work is expected to show that Buchia exists even higher in the sequence.

To a question by Mr Lloyd on basalt-limestone contact phenomena, Mr Player replied that sections he had so far examined showed no evidence of recrystallization. Mr Schofield asked whether there were any terraces on Karioi. Mr Player said that there were possibly some but that he had not yet measured any.

Mr I.M. Paltridge spoke on the Whakatane Hills area, where greywackes of the Whakatane Formation have yielded Pseudaucella at two localities. The structure is complicated by faulting but broadly speaking is that of an anticline overturned towards the west. The regional strike is a little west of north but minor isoclinal folds apparently bear no relation to this. Conglomerates in the basement contain pebbles of acid volcanics

and minor greywackes but not of metamorphic rocks and it is inferred that the landmass supplying the sediment was composed of acid and andesitic volcanics. The beds are probably in part Triassic. Two and possibly three major N-S trending faults occur. Basic igneous rocks which now form a dyke containing titaniferous augites, albitic feldspars and calcite amygdules have been intruded along the eastern fault.

Tertiary beds were probably deposited extensively after submergence which followed post-Hokonui peneplanation. These must have been stripped off later as only the Kapitean beds of the Raurimu Rocks remain. After the precursors of the Kaikoura orogeny, the fossiliferous Castlecliffian Ohope Formation containing andesitic and, at a higher level, pumiceous material, was deposited. As sea level dropped terraces were cut, which today stand at 500,320,175 and 100ft above sea level. Ash showers, probably from Rotoma, blanketed the topography at this time before the sea level dropped further. This was followed by the Flandrian Transgression and deposition of the sands and pumiceous lenses of the Ohiwa Formation, which built terraces at 6-8ft.

Discussion. In reply to a question by Mr Schofield, Mr Paltridge said that evidence for transcurrent faulting was given by streams offset by the Whakatane Fault. Faulting in the area is probably associated with the White Island trench. Mrs Nicholson enquired about cherts and their relation to the dyke rocks. Mr Paltridge replied that the cherts are fairly pure, jaspilitic, probably of chemical origin with no radiolarian remains, and are possibly bedded. They are younger than the dyke rocks which unlike the fine-grained Waiheke volcanics are coarse and doleritic.

Mr Kear noted that the terrace levels appear generally to be 50ft lower than those of Kaipara and Dr Brothers asked in view of the seismic instability of the area how true the levels are. Mr Paltridge replied that the terraces are flat and not tilted.

Mr E.N. Milligan, discussing the north Hokianga region, stated that basement greywackes of the Waipapa Formation give place in the west to Tangihua volcanics - diorites and basalts - with interbedded green siltstones from which have been collected Chlamys aff. wunschae (?Ururoan) and a foram. The lowest Cretaceous beds found are Teratan (Inoceramus opetius) and have a lithology similar to that of the Mangaotane mudstone. This stage also occurs on the south shore. Piripauan (I. pacificus) and Haumurian (I. matatorus and Ostrea lapillicola) are also present, the latter consisting of alternating sandstone and siltstone with grits. Overlying these are massive sandstones and white shales with no Inoceramus (?Teurian). The spatial relations of Raukumara and Mata beds suggests that the structure is one of tilted blocks cut by N.W.-S.E. faults.

No definite Dannevirke is known and the Mata beds are followed by a greensand conformably overlain by one argillaceous limestone (not 2) which at different places is dated as Whaingaroan and Otaian. An unconformity above the Otaian is followed, on the coast, by a conglomerate (?= Manukau breccias) and this is covered by Quaternary dunes and Anadara Trapezia on a good 10ft level.

PERSONAL NOTES

PROFESSOR R.P. GOLDTHWAIT, with Mrs Goldthwait and their four children, left New Zealand at the beginning of February 1958 to return to Ohio after spending about eleven months here as a Fulbright Research Scholar and a consultant on Glaciology. While in this part of the world he and his family saw as much of Australia as the average Australian, more of New Zealand than our average countryman, as well as sandwiching-in a month in the Antarctic that included a flight over the South Pole. All this was accomplished in addition to his own research work in the Tasman Valley and on the Morainic deposits of the Franz Josef Glacier, and in spite of an exceedingly generous number of talks to various organizations including school parent-teacher and church groups, and a persistent heavy rain that seemed to follow him about. A more respected and popular group of ambassadors for the American people it would be hard to imagine. Address: Geology Department, Orton Hall, Ohio State University, Columbus 10, Ohio, U.S.A.

G.W. GRINDLEY represented the New Zealand Geological Survey at the 9th Pacific Science Congress which was held at Bangkok, Thailand, between November 18 and December 9, 1957. While en route to the Congress he spent two very useful and informative weeks at New Caledonia, a country which has much in common, geologically, with New Zealand. His reports on the Congress and the New Caledonian visit may be consulted by members interested.

DR B.H. MASON, a well known New Zealand geologist, Professor of Mineralogy at Columbia University and curator of Minerals at the American Museum of Natural History, New York, is one of the most travelled members of the Society. At the end of last year he returned to New Zealand for several months field work in North-west Otago and South Westland areas to study basement geology. On his way to New Zealand he attended the 150th anniversary of the Geological Society of London where he met numerous members of our Society, and the 9th Pacific Science Congress at Bangkok. In April he left for Australia where he will collect mineral specimens for his museum before returning to New York.

I.P.G. SPEDEN, who until recently was a field geologist with the Geological Survey at Invercargill, is now with the Survey's Paleontological Section at Lower Hutt.

R.P. SUGGATE, who is studying pleistocene research methods at Cambridge, England, attended the 5th Congress of the International Association of Quaternary Research (INQUA) at Madrid and Barcelona in September 1957. The Director of the Geological Survey (Mr R.W.

Willett) has made Mr Suggate's report on this Congress available to those members wishing to study it. During the last week in April 1958 Mr and Mrs Suggate visited Professor van der Vlerk in Holland and with about six other people saw a fairly comprehensive selection of Dutch Quaternary deposits. They expect to arrive in Auckland on about 5th August 1958.

DR H.W. WELLMAN formerly of the Geological Survey and more recently of the British Petroleum Company, has joined the staff of the Department of Geology, Victoria University of Wellington.

G.H. SCOTT recently joined the Micro-paleontological Section of the N.Z. Geological Survey at Lower Hutt.

MISS A.U.E. BOREHAM of the Macro-paleontological Section of the N.Z. Geological Survey at Lower Hutt recently changed her name to Mrs G.H. Scott.

PALEONTOLOGICAL ADVANCES

The remarkable agreement that has been noticed by at least one group of geologists, between ages of rocks determined by micro- and macro-paleontological methods in New Zealand recently, surely reflects the great advances that have been made within the Geological Survey.

N.E. ODELL, who is well known in the mountaineering as well as the geological fraternity throughout the world, recently gave two lectures at the Geological Institute of the University of Oslo on the Geology and Geography of New Zealand. Whilst in Norway Dr Odell attended the jubilee dinner of the Norsh Tinderklub (Mountain Club) as a representative of The Alpine Club (of London). Writing from London, he says that during the greater part of the last year he was in Eire as mining geologist to a Canadian-Irish group interested in working the old metal mines of Connemara, Co. Mayo. Dr Odell's address is:-
Clare College, Cambridge, England.

LETTERS TO THE EDITOR

Sir,

I would like to offer a suggestion which I think could be an improvement to the Newsletter, as well as giving a clearer indication to members, especially to those overseas, of the activities of Branches of the Society.

The Auckland Branch has held a number of meetings now and all I have attended have been extremely interesting and informative and created much discussion. Topics covered were not of interest solely to Auckland members and I believe similarly that meetings in Wellington would be of interest to members outside Wellington.

I would suggest therefore that an attempt should be made to incorporate in the Newsletter resumes of addresses and discussions from the various meetings. Members in the smaller centres would then be brought into closer contact with the work of the Society and even be able to take part more actively if the reports initiated correspondence in the columns of the Newsletter. This in turn could relieve the Secretary of some of the burden of chasing material for each issue and could also make the Newsletter and membership of the Society more attractive for workers in geological and allied sciences and others interested.

I would be pleased to know what other members think about this suggestion.

20/9/57. (Sgd.) J.A. Grant-Mackie
Department of Geology,
University of Auckland, AUCKLAND.

Sir,

I am taking the liberty of asking whether you would kindly insert a note about the new Palaeontological Association that has started up in the U.K. The Association is anxious to enlarge its membership at home and overseas and has asked me to act as its representative in New Zealand. The aim of the Association is to further the study of paleontology not only through meetings and demonstrations in the U.K., but also by publishing a half-yearly journal called "Palaeontology," the first part of which is about to appear. The annual membership fee for individuals, museums, libraries, or other institutions is Two Guineas, and as the Association does not at present intend to maintain any permanent office or library, the major part of this income will be devoted to publishing.

Further information may be obtained from me at the above address or from the Secretary, Dr Gwyn Thomas, Department of Geology, Imperial College of Science and Technology, London, S.W.7.

8/12/57 (Sgd.) D.A. Brown
Department of Geology,
University of Otago, DUNEDIN.

(Ed. See page 19 of this Newsletter).

NEW ZEALAND GEOLOGICAL SURVEY

UNPUBLISHED REPORTS

The Director of the Geological Survey (Mr R.W. Willett) has advised that he has placed the following unpublished Geological Survey Reports on "open file". Members wishing to consult these (in some instances they may be borrowed) should write first to The Director, Geological Survey, P.O. Box 368, Lower Hutt.

COUPER, R.A.	Report on Plant Microfossils from Low-Rank Greywacke in Opau Stream, Foothills of Kaweka Range, Hawkes Bay (N124). 10/12/57. 1pp.
GRINDLEY, G.W.	Four-mile Reconnaissance, Northern Urewera Country Part II. 26/6/57. 8pp, map.
GRINDLEY, G.W.	Present Status of the Fault Theory at Wairakei. July 1957. 5pp.
GRINDLEY, G.W.	Report on Visit to New Caledonia. Oct-Nov. 1957. 9pp, 1 map.
GRINDLEY, G.W.	Report on Ninth Pacific Science Congress in Bangkok, Thailand. 18th November-9th December, 1957. 22pp.
HANCOCK, J.M. Dept. of Geology, Kings College, London.	Submarine Erosional Breaks in the Cretaceous.
HEALY, J.	Hydrothermal Conditions at Tauranga. May 1957. 3pp.
HEALY, J.	The Thermal Springs of New Zealand. 33pp, map.
KEAR, David	Lower Waitetuna Valley and Estuary, and the Stratigraphic Position of the Whangaroa Clay and the Aotea Sandstone. 22/5/57. 4pp, 1 map
KEAR, David	Comments on "Nomenclature, Recording Techniques and Map Symbols for inclined and folded Beds". 15/9/57. 2pp.
SCHOFIELD, J.C.	Recent Sea-level Fluctuations. 20/6/57. 4pp, 2 figs.
SUGGATE, R.P.	Report on 5th Congress of the International Association for Quaternary Research (INQUA), Madrid and Barcelona. Sept. 1957. 7pp.

THOMPSON, BN. Andesite for Aggregate near Mt Misery, Tauranga. 17/10/56. 5pp, map.

WAGER, Prof. L.R.
BROWN, Dr G.M.
Univ. of Oxford. Explanatory Note for Geological Society 150th Anniversary Exhibit.

WATTERS, W.A. Interim Report on Minerals and Rocks from the Mt Pisgah and Canaan Areas, Pikikiruna Range Nelson (Takaka Sheet S8). 3/2/58. 6pp.

It is to be understood that no reference to the subject matter of the Geological Survey reports may be made in any publication without prior permission of the Director of the Geological Survey.

TRANSLATIONS BY DR E.W. BENNETT

(of the Dept Scientific & Ind. Research)

The Secretary has one copy of each of the following translations and these may be borrowed by members.

GONSOVSKAYA, G.A. Features of the Composition of Steam from fumeroles of Southern Kamchatka. Doklady Akademii Nauk S.S.S.R. Vol. 113, 1957, pp 172-4, table 1, bibl.

LAUTENSACH, Hermann. Granite Erosion Forms on the Iberian Peninsula and in Korea, a Comparison. Petermanns Geographische Mitteilungen, Jahrg. 94, 1950; pp 187-196, 2 maps, (Table 13).

SVYATLOVSKI, A.E. Hydrological Location Studies of the Thermal Subsoil Waters of Kamchatka. Doklady Akademii Nauk S.S.S.R., Vol. 113, No. 1, 1957, pp 175-8, fig. 1-2, bibl.

VLODAVETS, V.I. On certain Semyachik Tuff Lavas and their Origin. Izvestia Akademii Nauk, S.S.S.R., Senia Geologicheskaya, No. 3, 1957, pp 96-106, table 1, figs. 1-6, bibl.

NEW MEMBERS

A welcome is extended to the following members who joined the Society between 8 August 1957 and 23 April 1958.

Atkinson, I.A.E., Botany Dept., University of Auckland, AUCKLAND.
Billinghurst, W.M., 81B Avenal St., INVERCARGILL.
Day, J.R., Maungatautari, CAMBRIDGE, R.D.2.
Easton, M.G., 7 Rees St., WANGANUI.
Gair, H.S., Geological Survey, P.O. Box 2110, CHRISTCHURCH.
Garden, E.R., P.O. Box 4, DUNEDIN.
Garden, R.J.P., P.O. Box 4, DUNEDIN.
Guest, Dr J., Geological Survey, Suva, FIJI.
Tily, H.S., 30 Stonelaw Terrace, DUNEDIN, N.W.1.
Van der Sijp, Dr J., Shell-D'Arcy and Todd Oil Services, P.O. Box 1873, WELLINGTON.
Waterhouse, B.C., Geological Survey, Otara Research Station, Otara Rd., OTAHUHU.

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DISCOUNT ON MAPS PURCHASED FROM THE LANDS AND SURVEY

An approach to the Minister-in-charge of the Department of Lands and Survey, through the Surveyor-General, requesting that members of the Society be enabled to purchase maps at a reduced rate has been successful. A subsequent request that the discount be allowed on the purchase of aerial photographs was unsuccessful.

A discount of 33⅓% will be allowed on maps purchased by members provided the following requirements are satisfied:-

1. That all purchases are made through the Secretary of the local branch of the Society.

2. That in each case a certificate is supplied stating that the maps are required for the members' personal use only.

(In practice it is unlikely that the Lands and Survey will require strict observance of these requirements and members wishing to avail themselves of the discount should present their current subscription receipts when buying maps).