GEOLOGICAL SOCIETY OF NEW ZEALAND (Inc)

Newsletter Number 142 **March 2007**

The Future of Our Newsletter

The Editor writes…………

At the AGM in December 2006, our Treasurer reported that the present year's operating budget appeared to be heading for a deficit of $7000 by April 2007, and moved that the annual subscriptions for full and retired membership of the Society be increased by $5.00, but leaving student's subscriptions the same. After lengthy discussion, mainly about reducing Newsletter costs, the motion was lost (16/13). February estimates now suggest an even larger deficit.

Because only 33 (including 4 abstentions) of 730 members were present the Committee urgently need to hear from a much more representative sample of members about your preferences for the future of the Newsletter. We need to hear especially from the many members who receive little besides the Newsletter for their subs.

We print about 750 copies of each issue (some spoil during printing), if say half that number were printed and the rest distributed electronically we will save $600 from packaging and postage and about $400 from printing fewer copies. ***i.e. printing and mailing only half as many copies will save only about $1000 per issue or $3000 per year, or about $4 per member.*** Savings elsewhere will also have to be made. Reducing the number of pages from 64 to 40 each issue could additionally save $4 per member per year. Offset printing is done in sets of 8, with 4 pages per side of a sheet, hence the number of pages an issue is always divisible by 8. Two issues year make a larger saving at $5500 per year, $7.50/ member.

Setting up is a major printing cost. If we could ship 1000 copies the extra cost would climb by only $300, thus the best solution would be to find 100 more members for the $7000 we need.

The Newsletter costs last year were $16165 or $5388 an issue excluding GST which is refundable. The cost includes packaging addressing and posting of $3385, about $1125 per issue. This accounts for about one third of membership subscriptions at about $24 per member. The cost reduction of $1600 for the November issue compared to the March one was made with some arm twisting by the editor who solicited bids from 4 other printers. The annual cost was further reduced by $1000 by selling advertising with three full-color advertisments bringing in $850 and a B/W one contributing $150. Three other B/W ads were inserted for free. Auckland area printing costs were about $3000 more than those in Nelson the previous year with about half of the extra cost because of 4 color pages each issue. One colour page or four bears the same cost. Postage and wrapping increased by $1200 or $400 per issue because in previous years packaging and addressing was done by Nelson committee members. In all, prices rose $1150 per issue or $3450 per year in 2006 over 2005.

Barring an increase in members or increasing circulation by combining our newsletter with another organization---the question is, do we find more funds from increased subs, more advertising, or do we reduce the number of issues and/or pages, and/or email the newsletter.

Please register your preferences and opinions using the Questionnaire on page People answering with a hearty yes to question 2 need not answer the others!

The Changing Face of Science and the Geological Society

President Keith Lewis writes

The Geological Society was set up more than half a century ago with basically the simple aim of improving communication between geologists by getting together at conferences, and informing/exchanging ideas in a newsletter. These are still pretty much its reason for being. Over the years, the society has taken on the roles of publishing (mainly guidebooks and monographs to inform non-specialists and interest the wider public on local geology), attempting to preserve geological features, and awarding prizes for excellence.

The Society was, and mainly still is, run by volunteers who, in some cases, give inordinate amounts of their time. In the early days, the jobs were relatively manageable and either directors or professors were on the National Committee themselves, or they were generous in awarding "brownie points" to any of their staff who were elected. However, with the new order in science in the late 80s and 90s, and scientists increasingly stressed by administration, applications and review, there were few "brownie points" to be gained, and many to be lost, by diverting concentration from "goals and objectives". With membership near 800, the first job that proved too much of a burden for volunteers was the office of Secretary, and in 1999 a paid Administrator was appointed to deal with most routine membership and secretarial work. Since then each of you has paid about $13 from your annual subscription for administrative services. Frankly this has taken a huge burden off the President and overworked Treasurer. The other big item in the day to day operations account financed by subscriptions is the Newsletter, which costs each of you about $24 per year.

At about the same time, organising the annual conference without help also became too much for some branches and a professional Conference Organiser was appointed to handle registration, bookings, finance and social events. This adds about $65 to your registration fee. Several years ago, organisers of a conference without professional help estimated it took 7 man months of their time – two thirds of a working year. No wonder therefore that the small Waikato branch have found that, even with professional help, organising a conference yet again is just too much for them.

Because of the enthusiasm for Waikato's plan to hold the next conference in Tauranga, the National Committee has got together with the Geophysics Society Committee and divvied up the jobs necessary to continue with a Tauranga conference in 2007. <u>Co-ordinators</u>: Keith Lewis & Susan Ellis (presidents of each society). <u>Science Program Conveners</u>: Nick Mortimer & Laura Wallace, <u>Conference Finances:</u> David Skinner, <u>Registration:</u> Janet Simes (Absolutely Organised), <u>Field Trip Conveners:</u> Ursula Cochran & Annie Douglas, <u>Social Program</u>: David Skinner & Janet Simes, <u>Programme and Field Trip Guides</u>:David Skinner, <u>AV Equipment and Student Help:</u> Dan Barker & Susan Ellis, <u>Sponsorship</u>: Jan Lindsay, <u>Newsletter Circular:</u> Kerry Stanaway, <u>Contracts on the Spot</u>: David Kear & Cathrin Ortel-Cass. We are all looking forward to another successful conference with all the fun and camaraderie that being away from a main centre seems to include.

QUESTIONAIRE

1. Do you read the Newsletter ---is it useful to you?

2. Would you prefer an on-line-only 64 page Newsletter?

3. Do you prefer keeping the newsletter as is and paying increased subs?

4. Would you cancel your membership if there were no printed newsletter?

5. Would you support reducing the number of issues per year to two?

6. Should we solicit more advertising? (we have made little effort to date)

7. Do you want colour pages? They help sell advertising. Currently four pages cost about $500 with a one page advertisement selling for $400

8. Would you support reducing the number of pages to 40?

9. Would you support reducing the Newsletter to stapled A4 Xerox notes?

10. Do you have any other suggestions to reduce costs?

11. Do you wish to see any parts removed and seen only on-line eg
    - Editorial/Presidents page
    - Notices
    - Society Business
    - Feature Articles
    - Members Forum
    - People News
    - NZ Rocks
    - Reviews of films, books, conferences, papers

Reply to EDITOR. *A numbered yes or no to the questions will be sufficient.*
Those wanting an all on-line newsletter need only answer questions 1 & 2.
For addresses see inside front cover.

New Zealand Lower and Middle Jurassic belemnites.

Brian Challinor

Neville Hudson.

This is a progress report on the study of some hundreds of New Zealand Lower and Middle Jurassic belemnites, most of which were collected by Hudson during 1981 and 1996 as part of the work for his MSc and PhD theses. Challinor contributed a few specimens accumulated over the last c. 30-40 years; a few specimens from Otago University and collections of GNS Science have also been made available for study. The chronostratigraphic correlations and ages used are those of Hudson (2003), with some modifications in the Early Jurassic. Three new genera and eleven new belemnite species are to be formally described; one species of *Cylindroteuthis s.s.*; two of *Hibolithes* and one of *Belemnopsis* are briefly described under open nomenclature.

Belemnites are relatively common in the Late Temaikan but less abundant in the Middle and Early Temaikan; no late Early and Late Aalenian specimens were present in the collections.
Sparsely distributed passaloteuthid belemnites are present in Early Temaikan sediments in the Awakino region, Southeast Otago and Southland (and probably in South Auckland although that identification is provisional at present). At least four genera are present. Two (*Dactyloteuthis*, Lower to Upper Toarcian) and *Brevibelus* (Upper Toarcian to Aalenian) occur in Europe and the former USSR; two are apparently new genera and have no known overseas correlatives. One of the new genera together with other taxa, is part of the Temaikan type fauna of the Opapaka Sandstone at Kawhia Harbour; the same taxa including the new passaloteuthid (formerly identified as *Cylindroteuthis*, Stevens 1965, Speden 1971) are also present in the upper Omaru and lower Boatlanding Bay Formations in the Catlins District of Southeast Otago, correlated by Hudson (2003) with the Early Aalenian. *Dactyloteuthis* is associated with *Belemnopsis deborahae*, currently used as one of the indicators of basal Temaikan strata (Stevens 1965, Hudson 1983, 2003) suggesting that the base of the Temaikan Stage is possibly of Middle Toarcian age. *Belemnopsis mackayi* Stevens and *B. deborahae* Challinor are to be included in a new belemnopseid genus, the first of that family to appear in New Zealand and, as far as is known, the earliest globally. *Belemnopsis mackayi* and *B. deborahae* are abundant but confined a thin set of beds at the base of the Early Temaikan (?Middle Toarcian), the passaloteuthids are sparsely distributed but extend through the early part of the Early Temaikan (?Middle Toarcian to Early Aalenian) . *Belemnopsis s.s.* appears briefly in the Middle and Late Temaikan (c. Bajocian to Bathonian) but is very sparsely distributed in the New Zealand Temaikan. *Hibolithes catlinensis* appears in the latest Early Temaikan (latest Aalenian) and extends into the later Late Temaikan (Late Bathonian), and is followed by two new *Hibolithes* spp., both confined to the latest Temaikan (Early/Middle Callovian).

Two short ranging *Dicoelites* species (Middle Callovian) and two longer ranging *Conodicoelites* (Middle Bathonian to Middle Callovian) are present in the New Zealand Late Temaikan. All three *Conodicoelites* species recognised by Stevens (1965) will be united under *C. flemingi* Stevens; the other *Conodicoelites* is new and of divergent morphology. The succession of belemnite genera in the New Zealand Temaikan is similar to that of the Middle Toarcian to Middle Callovian of Europe, but the times of appearance of some taxa differ and some genera are poorly represented or missing.

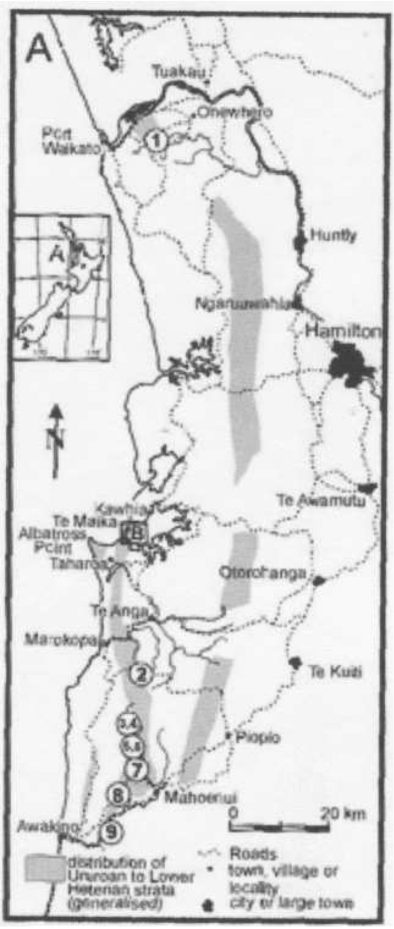

Fig. 1 Location of Kawhia Regional Syncline.

1. *Opuatia Stream Port Waikato.*
2. *Pomarangai Road*
3. *Te Heruera Stream*
4. *Te Patuhaehae Stream*
5. *Te Whakapatiki Stream*
6. *Spellmans Stream*
7. *Gibbons Stream*
8. *Rauroa Stream*
9. *Awakino Gorge*

B *Ururoan Stratotype Section*

A series of Early to Late Temaikan belemnite chronozones can be recognised. A Temaikan *Hibolithes* chronozone extends from just below the base of the Middle Temaikan (Late Aalenian) into the early Middle Callovian (topmost Temaikan) and is relevant to the age of Rengarenga Group at Kawhia Harbour.

We consider the formations of Rengarenga Group in descending order as we have some evidence of age for the two younger formations (Wharetanu Measures and Opapaka Sandstone), but little for that of the Urawitiki Measures. The top of the Wharetanu Measures (uppermost formation) is slightly younger than the top of the Temaikan *Hibolithes* chronozone and is of c. late Middle Callovian age; the base of the formation is significantly older than the base of the *Hibolithes* chronozone and probably of c. Late Aalenian age. The marine Opapaka

Sandstone and its contained type Temaikan fauna can be correlated with the fauna of the Omaru and Boatlanding Bay Formations of the Catlins district, southeast Otago. The Opapaka Sandstone is probably late Early Temaikan (c.Early Aalenian) in age.

The Urawitiki Measures immediately underlie the Opapaka Sandstone. The formation consists of c. 600 m of conglomerates, medium and coarse sandstones, and rare siltstones, with carbonaceous material and plant fragments throughout, and *in situ* tree trunks near the top (Fleming & Kear 1960). It is probably non-marine throughout, although an unidentified shell fragment is known from R15/f57, c. 300 m below the top. We are unable to correlate most of the Urawitiki Measures. If an Early Aalenian age is accepted for the Opapaka Sandstone, then a Late Toarcian to Early Aalenian age is likely for the Upper beds of the Urawitiki Measures. The next reasonably well-dated horizon below the Opapaka Sandstone is that provided by the Early to early Middle Toarcian ammonite *Dactylioceras*, at R15/f8005 towards the top of the Ururoa Formation, some 700 m below the Opapaka Sandstone. Locality R15/f55 c. 70 m above the *Dactylioceras* horizon, contains *"Inoceramus" ururoaensis*, and the youngest beds in the Ururoan stratotype.

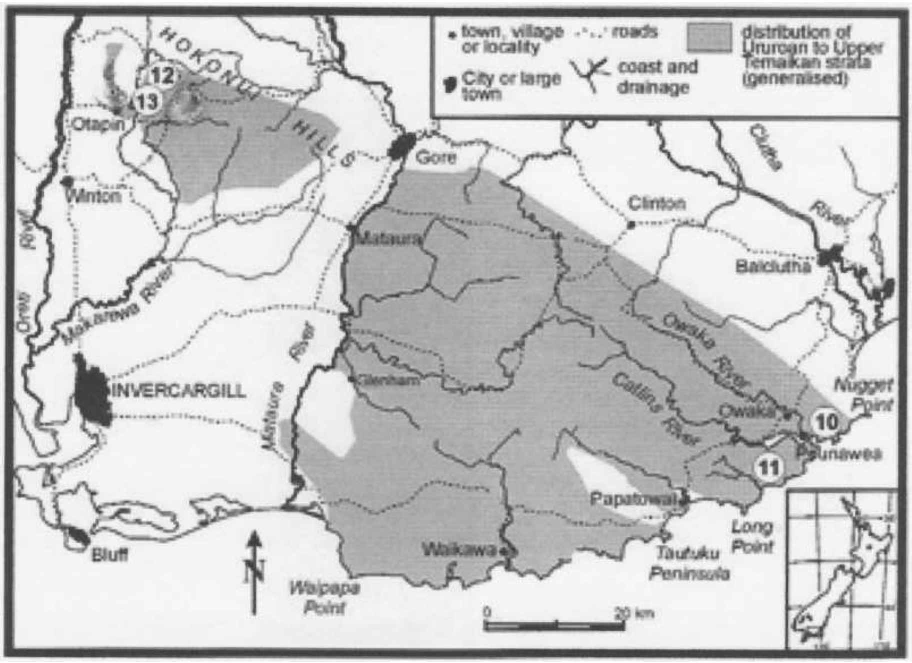

Fig.2 Location of Southland Regional Syncline
10. northern limb, Catlin district
11.southern limb, Catlin district
12. Ben Bolt
13. Conical Hill, Astarte Hill and McCraes Road

The 610 m of Urawitiki Measures above the topmost Ururoan presumably contains correlatives of the passaloteuthid and *Belemnopsis* beds in the fully marine sections that we correlate with the Middle and Late Toarcian. As the *Dactylioceras* horizon is dated as Early to early Middle Toarcian, the base of the Temaikan Stage may correlate with horizons somewhere in the lower part of the Urawitiki Measures, and could be as old as Middle Toarcian.

The approximately 500 m of Urawitiki Measures represents most of the Middle and Late Toarcian (c. 5 my), whereas the approximately 300 m of Wharetanu Measures represents most of the Middle Aalenian to Middle Callovian interval (c. 15 my). These are estimates, the latest New Zealand timescale does not include formal divisions of international stages for the Jurassic.

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Publication of a new AusIMM Monograph on New Zealand Mineral Deposits and the New Zealand Minerals Industry over the past 16 Years

Bob Brathwaite (GNS Science, Lower Hutt) left;
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The publication of a new Aus.IMM monograph on the Geology and Exploration of New Zealand mineral deposits (Christie and Brathwaite 2006a), reviewed in GSNZ Newsletter 141 by Stanaway (2006), highlights developments in mineral production, exploration and information availability since the publication of the previous monograph in 1989 (Kear 1989).

Mineral production

Gold production increased dramatically from 1989 to 1992 (Fig. 1) with the opening of hard-rock gold mines at Martha, Golden Cross and Macraes. In the North Island, the Martha open pit gold-silver mine at Waihi opened in 1988 and has continued to the present, with a production of 1.66 Moz Au and 11.45 Moz Ag from 1988-2005 (Brathwaite et al. 2006c). The Golden Cross combined underground and open pit gold-silver mine in the Waitekauri valley, northwest of Waihi, opened in 1991 and closed in 1997 with a production of 0.66 Moz Au (Mauk and Purvis 2006). Exploration in the vicinity of the Martha mine discovered the blind Favona gold-silver deposit, which has been developed as an underground mine and commenced production in January 2007 (Torckler et al. 2006). Although Favona has a strike length in excess of 1000 m and vein widths up to 25 m, over a vertical range in excess of 400 m, it was discovered as late as 2001, 120 years after the discovery of the Martha deposit and following nearly 30 years of area exploration by companies associated with the Martha mine.

In the South Island, the Macraes gold mine in east Otago opened in 1989 and has produced more than 1.8 Moz Au from a number of open pits along a strike length of 12 km on the Hyde-Macraes Shear Zone (Mitchell et al. 2006). The gold mineralised shear zone dips shallowly northeast and planned open pit mining will extend as deep as 250 m below the surface, with an underground mine being developed in the down-dip extension of the largest pit at Frasers. In the Reefton district, a mining permit was granted for the Globe-Progress open pit gold mine in 1996 (Whetter 2006), but mine development was postponed until 2004 while additional resources were drill defined. The Globe-Progress mine commenced production in late 2006.

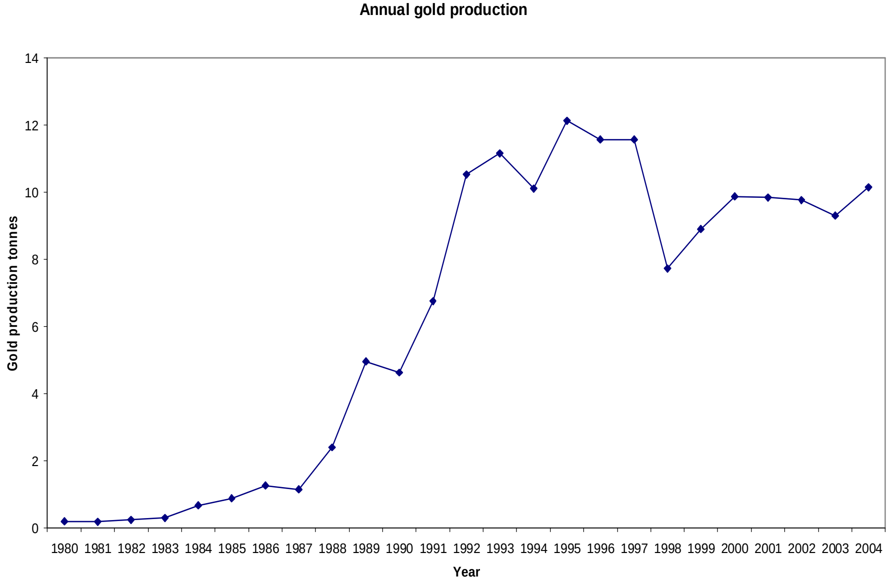

Fig. 1 Annual New Zealand gold production 1980-2004. Data supplied by Crown Minerals, Ministry of Economic Development.

The c. 150 placer gold mining operations of the mid to late 1980s on the West Coast and in Otago and Southland decreased dramatically during the 1990s, with only a few carrying over into the 2000s (Cotton and Rose, 2006a). L&M Mining was the largest operator with large projects on the Arahura and Mikonui rivers in Westland and at Glenore in Otago, and Nokomai, and Waikaka in Southland during the period 1987 to 2002 (Manhire et al. 2006). The bucket ladder gold dredge operating on the Grey River produced 55,000 oz Au between 1992 and its closure in 2004 (Cotton and Birchfield 2006). This dredge is currently being recommissioned to mine a new permit area on the Grey River, which contains an estimated recoverable resource of 46,000 oz Au. Between 1988 and 2004, 65,000 oz Au was produced from open pit mining of alluvial gravels at Ross on the West Coast (Cotton and Rose 2006b).

Ironsand mining has continued at Waikato North Head (Barakat and Drain 2006) and Taharoa (Barakat and Ruddock 2006), with a recent upsurge in export demand from Asia. Ironsand production in 2005 totalled 2.207 Mt of titanomagnetite concentrate. High-value ultra-white halloysite clay, from Matauri Bay in Northland, has continued to be exported for the manufacture of fine china tableware and for technical ceramics (Townsend et al. 2006). Dolomite produced from a quarry in Ordovician sedimentary rocks near Collingwood is used as a fertilizer to aid the growth of grass and crops ranging from grapes to pine trees. Bentonite (an iron-rich smectite clay) derived from weathering of basaltic ash near Coalgate in Canterbury is mined and used for media for growing mushrooms, a stockfeed additive and a thickener in oil drilling muds. Extensive zeolite deposits in lacustrine tuffs were discovered at Ngakuru south of Rotorua in 1992 and production commenced in 1993 (Brathwaite et al. 2006a). Zeolites are natural mineral absorbents and are used for sports turf, slow release-fertiliser, stockfeed additives and pet litter. Microsilica produced from a deposit at Tikitere near Rotorua is used as a cement additive to improve the durability of concrete (Taylor and Thorpe 1999). Small to moderate quantities of diatomite, serpentinite, pumice and perlite are also produced. New industrial markets for finely ground high purity limestone were developed as filler in paper, paint and polymers (Martin 2001). Ilmenite mining at Westport (Player et al. 1994) and Barrytown (Mann & James 1989; Burgess & Wootton, 1990) was shelved.

Mineral exploration

Most exploration has been for gold in epithermal, mesothermal (orogenic), intrusion-related and placer deposits and was mainly focussed on prospect-scale exploration of past mining areas or known prospects. Intensive drilling programmes have been carried out on the hard rock gold prospects in the Waihi area, Reefton area, and Macraes "line of strike". Other hard rock gold prospects that had detailed exploration from 1989 to the present include Huia-Backyard and Puhipuhi (Grieve et al. 2006a) in Northland, Ohui (Fitzgerald et al. 2006), Onemana (Stevens and Boswell 2006a), Neavesville (Barker et al. 2006), Broken Hills (Rabone 2006a), WKP (Christie et al. 2006b), central Maratoto valley (Simpson et al. 2006), Karangahake (Stevens and Boswell 2006b) and Muirs Reefs (Rabone 2006b) in the Coromandel region, Ohakuri (Grieve et al. 2006b) in the Taupo Volcanic Zone, Sams Creek (Brathwaite et al. 2006b) in northwest Nelson, and Bullendale (Begbie and Craw 2006), Rise and Shine (MacKenzie et al. 2006a), Carrick, Oturehua, Ophir, Nenthorn and Barewood (MacKenzie et al 2006b) in Otago. Many placer gold prospects on the West Coast (Cotton and Rose 2006a), and in Marlborough, Otago and Southland were also investigated.

This extensive "brownfields" exploration contrasts with limited regional-scale (greenfields) mineral exploration from 1989 to 2003. Some BLEG (bulk leach extractible gold) stream sediment surveys were carried out by ACM (1989-1991) in the Coromandel Peninsula and in Otago mainly by Tasman Gold (1994-1995) and Welcome Gold Mines (1993-1995). More recently, Glass Earth Ltd completed airborne geophysical surveys (magnetics/radiometrics and gravity) of the Taupo Volcanic Zone in 2005 (Henderson et al. 2005) and are drilling some of the identified targets. Glass Earth Ltd also commenced new regional airborne geophysical surveys (magnetics/radiometrics and EM) in Otago in January 2007. Other recent developments are exploration for gold offshore: placer gold on the seafloor off the West Coast (Youngson and Fraser 2005) and gold associated with seafloor hydrothermal systems in the Kermadec Arc (de Ronde 2006; Massoth and de Ronde 2006). Gold-bearing volcanic massive sulphide mineralisation in the Matakaoa Volcanics in the East Cape region has also been a target for exploration (Christie and Brathwaite 2006b) together with exploration for platinum group elements in layered igneous complexes of the South Island (Christie et al. 2006a).

An increase in commodity prices and international marketing of New Zealand's mineral prospectivity have encouraged many new companies to explore in New Zealand since 2003 including Aurora Minerals, Australasia Gold, Auzex Resources, Bonaparte Diamond Mines, CanAlaska Ventures, Continental Resources, HPD (their prospects are now under the wing of Glass Earth), Mathana Mining, Mercator Gold, Overland Resources, PFN and Paramount

Platinum. This is in addition to Glass Earth and Seafield Resources, companies that evolved in New Zealand. Activity by this large number of new companies is expected to result in some of the most intensive exploration seen in New Zealand for many years.

Minerals information and databases

There has been an explosion of information available to mineral explorers partly through the increased access to information in digital form, as digital products such as CD-ROMs (e.g. Anon 2002, 2003) or via the www. The increased use of Geographic Information Systems (GIS) in research and mineral exploration has revolutionised the way spatial data is visualised. Recent Government-funded prospectivity studies resulted in the public release of a large amount of digital research and exploration data (Anon 2002, 2003; Partington et al. 2006). The digitising of mineral exploration reports by Crown Minerals and their availability from the Crown Minerals web site is also another example of the increasing ease of access to information.

Databases managed by Crown Minerals and accessible from www.crownminerals.govt.nz include minerals permits, technical reports and a catalogue of drill holes and samples. The technical report database is an annotated bibliography of mining company technical reports lodged with Crown Minerals under the terms of prospecting and exploration permits. Scanned versions of many of the reports can be downloaded from the database. The drill hole database catalogues core and other samples submitted to Crown Minerals and is stored in four core libraries managed by Crown Minerals and located in Paeroa, Gracefield (Wellington), Christchurch and Dunedin.

GNS Science manages several databases of New Zealand earth science information, and many of these are accessible from www.gns.co.nz (e.g. MinMap). The main databases available in digital form and of interest for mineral exploration and research are geological maps (1:1 million and QMap 1:250,000 series, Nathan 1998), a mineral deposit inventory (GERM - Geological Resource Map of New Zealand, Christie 1988; Christie et al. 1994), lithogeochemistry (PETLAB, Mortimer 2005), geochronology (Nathan et al. 2000), and stream sediment geochemistry (REGCHEM - Regional exploration geochemistry, Warnes and Christie 1995). The Metallogenic Map of New Zealand monograph (Brathwaite and Pirajno 1993) is also an important source of information on metallic minerals.

Significant websites

In addition to the Crown Minerals and GNS Science web sites, several other web sites provide information on mineral resources, exploration and mining in New Zealand. The New Zealand Minerals Industry Association's web site (www.minerals.co.nz) provides information on the minerals industry for public education, including downloadable teaching modules for schools. Similarly, Te Ara, The Online Encyclopedia of New Zealand, has a Mineral Resources section (http://www.teara.govt.nz/EarthSeaAndSky/MineralResources/en) that provides information on New Zealand minerals and mining at a level aimed at the general public. Companies exploring and mining in New Zealand maintain activity information on web sites including:

www.auroraminerals.com.au
www.australasiagold.com.au
www.auzex.com

www.bentonite.co.nz
www.bpmnz.co.nz (zeolite)
www.canalaska.com
www.favona.co.nz (Newmont Waihi)
www.glassearthlimited.com
www.heritagegold.co.nz (also Northland Minerals, Coromandel Minerals and Prophecy)
www.marthamine.co.nz (Newmont Waihi)
www.neptuneminerals.com
www.newmont.com
www.oceanagold.com.au
www.pumice.co.nz

The Department of Geology, University of Otago has web pages on gold in Otago and environmental aspects of mining: www.otago.ac.nz/geology/features/gold/otago.htm

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Discovery and Development of New Zealand's Oil and Gas Endowment – Half Empty or Half Full?

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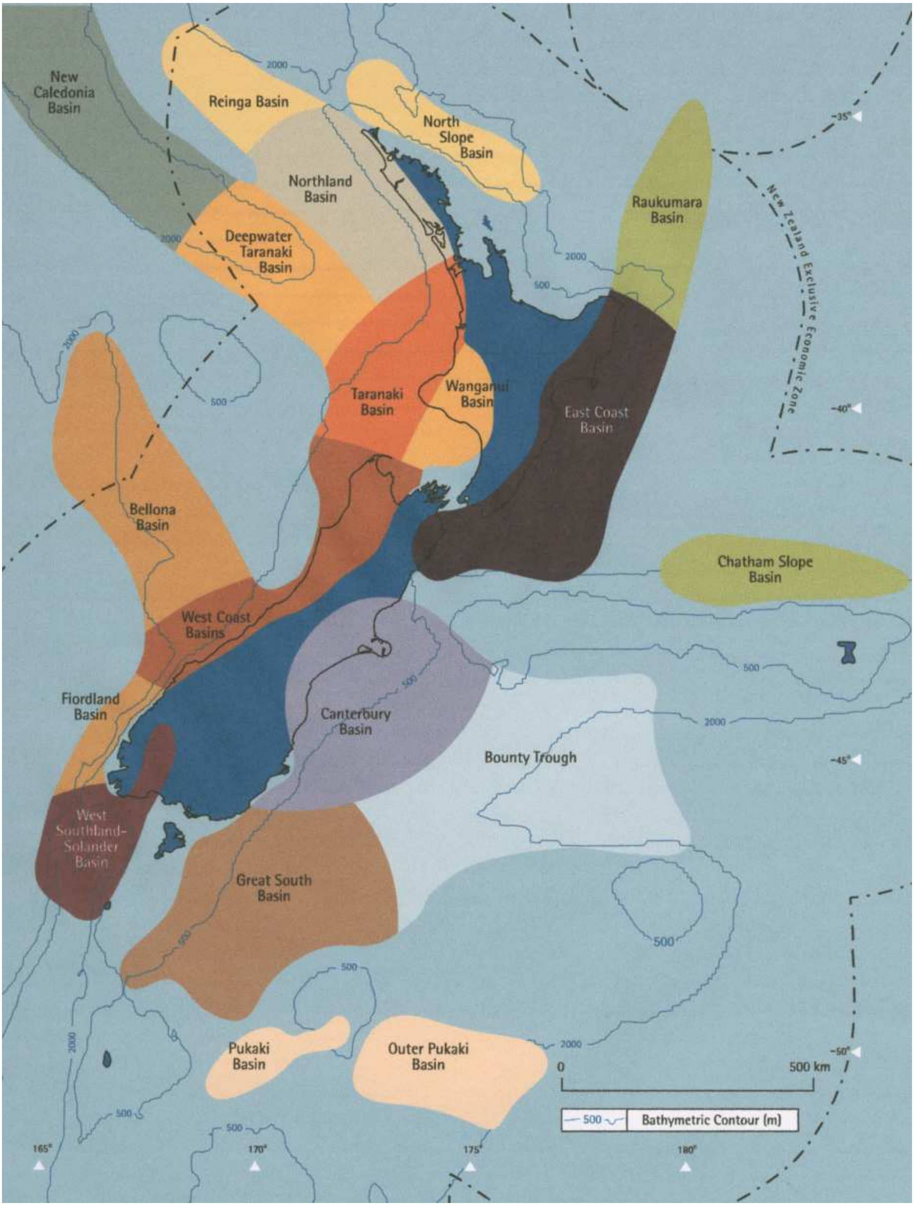
New Zealand's petroleum potential has always had its enthusiasts and its detractors, and from time to time the former have been able to affect public policy, sometimes to a dramatic extent. The focus on opportunity has stimulated science funding and policy at these times, and while industry investment has waxed and waned mainly as a function of oil prices, the somewhat smoother level of effort on public-funded research together with a reasonably robust system for the capture of high-value industry data, has resulted in the development of a knowledge base we can be very proud of – a cup half full. The modern era of exploration has delivered a number of important discoveries on the back of this knowledge base, those of commercial significance all being in the Taranaki Basin. Conversely the incidence of dry holes continues to feed skepticism as to the materiality of the nation's endowment, and at the very least demonstrates that there is much more to learn before this field of enquiry can be considered mature.

I have been invited to write this review of developments in our knowledge of New Zealand's petroleum resources over the past several decades. Thirty years was suggested, and a shorter period permitted. Unfortunately my recall of the past decade or two is somewhat unreliable, so to fill out the story and maintain a level of scholarship commensurate with this publication's reputation I've elected to cast back not less than seven decades – which symbolically takes us to a key milestone – the passage of the Petroleum Act 1937.

In theory this Act, which transferred ownership of oil and gas in the ground (undiscovered) from surface land title owners to the Crown, would facilitate and stimulate exploration investment. The hopefully inevitable and near-immediate result would be discoveries that would transform a land oozing with geological promise into a globally significant producer.

World War Two can perhaps be blamed for the low quantity and quality of exploration effort over the following 20 years, delaying the true birth of a commercially sustained industry until the mid 1950's. During this period, in which so many of the smartest geologists to ever practice in New Zealand were being born, the joint venture between Todd family interests and the imperial oil companies BP and Shell was established to apply the best technology and exploration practice of the day to a substantial portfolio of licences on both sides of both islands. Out of that arose, in 1959, the first unequivocally commercial discovery of petroleum in New Zealand – the Kapuni gas field in South Taranaki.

This workhorse has been in production since 1970 (it had to await the installation of complex processing and pipeline infrastructure and the development of a market to consume its product) and today accounts for about one eighth of New Zealand's gas consumption annually. While conceived as geologically relatively simple, a domal anticline mapped from a coarse grid of technologically primitive 2D seismic lines, the Kapuni field has revealed plenty of complexity some of which remains to be fully understood – a high CO_2 content, moderately



New Zealand Petroleum Basins. *From Crown Minerals Petroleum Website* heterogeneous reservoir sands, a system of late-stage trans-tensional faults revealed by the 3D seismic data acquired in the late 1980's. Kapuni has so far produced over 800 petajoules (PJ – that's 10^{15} joules) of gas and over 60 million barrels of condensate from a relatively small number of wells, some of which were used to re-inject gas for much of the field's life. Even with the accumulated knowledge of the wells, and 3D seismic, the most recent prospect drilled on the flank of the structure in 2003 was unsuccessful. A cup half-empty.

The success of Shell BP and Todd with Kapuni led them to bring the emerging technology of offshore exploration to bear in the Taranaki Basin at a relatively early stage, and a quick success with the Maui discovery in 1969. This important validation of New Zealand's geological viability for material petroleum resource potential coincided with a period when energy and resources came to geopolitical centre stage. The field's appraisal and development planning was conducted under the shadow of the first OPEC oil shock, and its production commenced while the west was preoccupied with the 1979 encore.

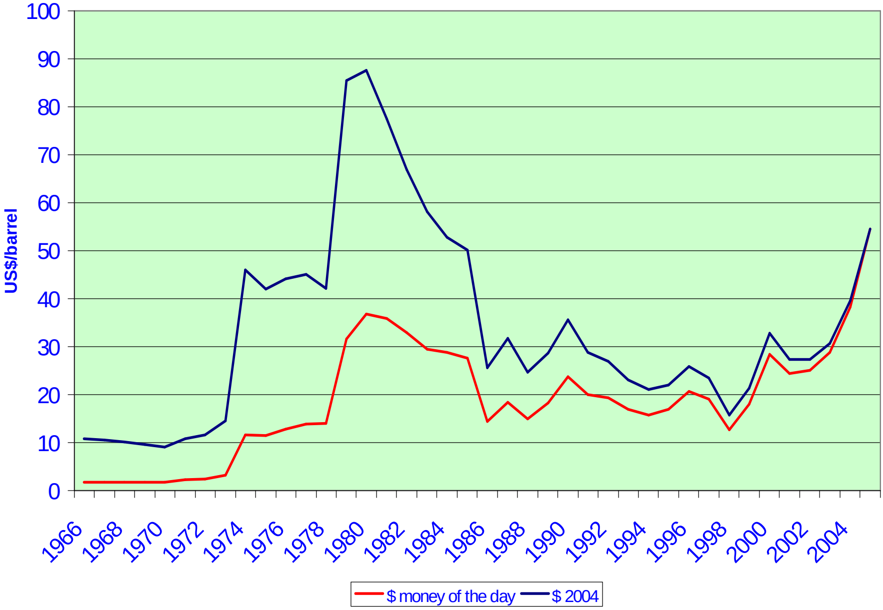


Figure 1: average annual oil prices (from BP Statistical Review of World Energy 2006)

Government intervention was the order of the day in the 1970's and early 1980's, and a number of energy programmes involved significant geoscience research and development. Many bright baby-boomers were induced into geoscience qualifications and careers. The New Zealand Geological Survey initiated the Cretaceous-Cenozoic Project, which was ultimately to produce (between 1986 and 1999) a set of authoritative monographs and many spin-off publications on the main prospective basins. Petrocorp was established as a state-owned oil company, and led the discovery of a number of oil and gas fields in Taranaki.

The 1980's saw a good deal of exploration investment by private sector ventures as well, including multinationals such as Shell, BP, Amoco and ARCO, as well as small listed ventures including New Zealand Petroleum, New Zealand Oil & Gas, and Southern Petroleum.

Of course by the mid 1980's, global oil prices had collapsed as non-OPEC reserves (in such places as the North Sea and Alaska) were brought into the market. Exploration and production companies struggled to make a profit let alone a case to invest in frontier situations. A dispassionate consensus of New Zealand's prospectivity in about 1980 would note a simple mode: Taranaki Basin, Kapuni Group sandstone reservoirs, gas condensate with a risk of high CO_2. Fortunately, the discovery of the McKee oil field in 1980, and a then sub-commercial oil accumulation offshore in Moki-1 in 1983 illustrated some of the underlying diversity and complexity, but as the grand frontier campaigns (most notably, Hunt's in the Great South Basin) wound up without commercial success, exploration investment contracted and became concentrated in the low-cost theatre of onshore Taranaki.

Stimulated by the CCP programme and by a vast growth in seismic and well data from the preceding exploration boom, the scientific evaluation of New Zealand petroleum potential, albeit under-funded, has continued unabated except by the distractions of post-1984 re-organisation.

Impact of Geological Science

The practice of petroleum geology involves the integration of whatever knowledge and technologies prove relevant to discovery, appraisal, development and production of sub-surface resources. Over recent decades and indeed previously, this practice has been molded by the consecutive emergence of important new paradigms in the geological sciences as well as by stricter economic disciplines due to relatively low oil and gas prices and hence, profits in the industry.

The most important geological paradigm has been plate tectonics. While the main elements were worked out in the 1970's, important refinement and application to resource exploration continues to the present day. New Zealand's plate boundary situation has attracted research that has certainly informed our understanding of how the petroleum-prospective sedimentary basins have formed. This remains a fruitful contributor as the complexity of New Zealand's evolution over time continues to be debated and explained.

During the 1980's, a radical new (or revived) approach to stratigraphy – sequence stratigraphy - arose within the oil industry and has gradually found widespread acceptance and application to the prediction of the existence, distribution and characteristics of petroleum reservoir, seal and source rocks. Again, recent and current lines of research are revealing important results. Peter Kamp's group at Waikato deserve special mention, as does the GNS team and their associates (local and overseas) who have elucidated so much from the Mt Messenger sequence of north Taranaki.

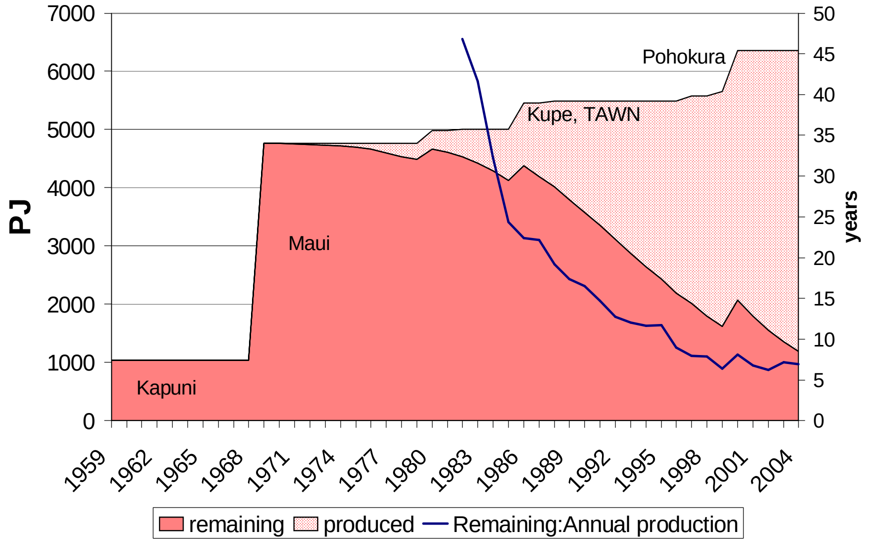


Figure 2: Growth and depletion of New Zealand's known gas reserves. Official reserves of gas by field (as at end 2005) assigned to year of discovery.

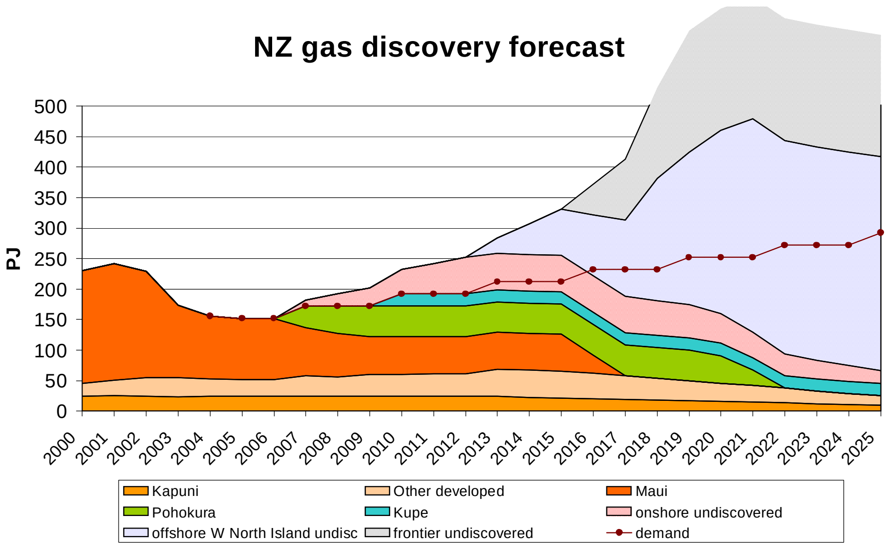


Figure 3: An optimistic forecast (from a 2004 study by CAENZ) of the future supply and consumption of natural gas in New Zealand, given sufficient quantity and quality of exploration investment.

Perhaps not truly a paradigm in the same sense, it is the application of information technology that seems to have driven progress in the science of oil and gas exploration and development through the 1990's and the present decade. This industry must be one of the most technologically advanced in the world, and a vast array of increasingly sophisticated and scientifically robust tools are now available to those who have the skill to combine the computational power (Generation Y for the most part) with sound fundamental geological principles. Now, an assessment of the uncertainty associated with necessary conditions for prospect viability, hydrocarbon charge for example, can be narrowed by an increasingly detailed knowledge of the character of source rock and its kerogen; as well as by powerful numerical modeling of maturation, expulsion and migration.

Exploration in New Zealand today

Consumption of oil in New Zealand has largely been met from overseas sources, although self-sufficiency exceeded 50% for a few years of the 1990's. Our natural gas is a significant and economically preferred source of industrial, commercial and domestic energy, both directly throughout most of the North Island and as a fuel for electric power generation. Gas consumption has depleted most of the inventory of known, proved, reserves arising from Kapuni, Maui and subsequent discoveries. More recent discoveries, under development, extend the cover for continuing consumption by a few years but the sustainability of the important contribution hydrocarbons make to the national economy relies upon further discoveries and hence, increased investment in exploration.
With strong global oil prices, a domestic gas market constrained (in the medium term) by shortage, and an impressive array of both concept and technology available, the requirement for well-educated geoscience professionals has returned to levels not seen since the early 1980's. As in many areas, New Zealand struggles to achieve an effective critical mass and is still dependent on overseas sources for a significant proportion of the expertise as well as the technology and the capital to invest in exploration and development. Nevertheless, the research and academic entities provide a crucial degree of "local content" that inevitably improves the effectiveness of what remains one of the most high cost and high risk, yet potentially lucrative and beneficial applications of our science in the modern world.

New Zealand is increasingly acknowledged as being the sort of place that might have the geology to contribute material resources under current and forecast economic conditions.

The potential extends beyond the proven geography of Taranaki, and will require solutions to some substantial challenges in offshore regions that are both remote and climatically hostile. Taking an optimistic view of both the level of investment and the geological and technological factors, it can be suggested that the New Zealand markets' demand could be satisfied and potentially, an excess exported. In fact, Maui gas has been exported in the form of methanol (manufactured mainly in the former Synfuels plant near Waitara), with a sharp reduction in formal contractual reserves severely curtailing the scale of the exercise in 2003.

Summary

Whether New Zealand's promise (as perceived by us optimists) can and will be fulfilled depends on the actual extent of the undiscovered endowment within our extensive territory;

and on the quality of effort and capital expended in the search. Geological science has been the fundamental driver for historic successes, which were not consistently sustained because of a combination of global (low energy commodity prices) and domestic (limited scale of demand) factors.

The opportunity to contribute to discovery and development of a further tranche of petroleum resources, which constitute a highly convenient source of energy to which the world economy and society is thoroughly attuned, is a rewarding and satisfying career path for geologists.

"… a ferocious competitive climate … is providing incentives to pursue high risk/high potential plays, often in remote or challenged settings. Exploration in these frontier areas is being enabled by both **a return to fundamentals** and the **next generation of basin concepts and modeling capabilities**."

From *Current Petroleum Exploration Trends: Prudent Investments or Irrational Exuberance? Kurt Rudolph, ExxonMobil Exploration Company, AAPG Convention address 2 April 2007*

NEW ZEALAND ROCKS

Protecting New Zealand's earth science heritage – chalazoidites and cheniers

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Chalazoidite = accretionary ball of mud, often tuff (also known as accretionary lapilli or "volcanic hailstones").

Chenier = long, narrow, often sinuous, ridge of shell or sand formed roughly parallel to a prograding shoreline, seaward of marsh or mudflat deposits.

What have chalazoidites and cheniers got in common? Very little, but I like the alliteration and both are formed by different forms of accretion. Both are relatively uncommon earth science features that have examples listed in the NZ Geopreservation Inventory (Fig. 1), but I am sure there are other excellent examples that should also be identified, so that they may be protected from the adverse effects of any future unforeseen developments.

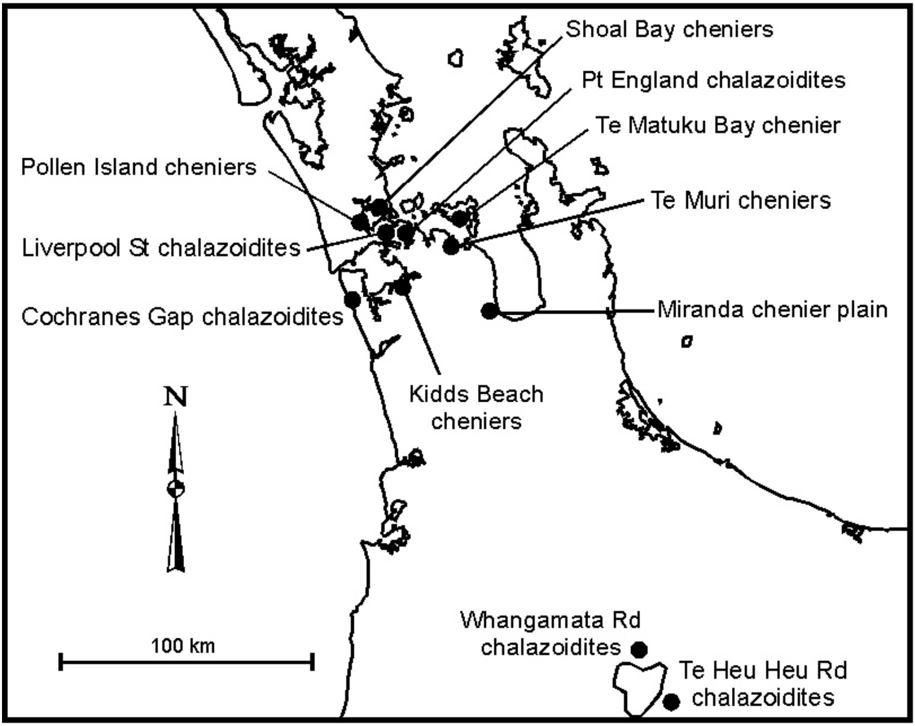

Fig.1Chalazoidite and chenier localities currently listed in the NZ Geopreservation Inventory.

Chalazoidite localities

Tuffaceous chalazoidites are believed to accrete in moisture-laden conditions, such as when volcanic ash is erupted up into clouds. Chalazoidites may also form inside water-rich pyroclastic flows (e.g. Alloway et al., 2004). In New Zealand, chalazoidites usually occur in isolated single beds within tuffaceous sequences and have been recorded from both basaltic and rhyolitic settings. Are there any andesitic chalazoidites in New Zealand? Like most small-scale geological features, chalazoidites are seen in only a few, relatively small exposures, each of which could readily be lost, or hidden, through natural or human processes and activities. The aim of trying to protect chalazoidite-bearing exposures is to ensure that there are several easily-accessible sites where interested people can see and study examples.

Of the listed sites in the inventory, there has been on-going management issues with the Liverpool St exposure in Auckland city (Fig. 2) over the past 20 years to ensure it does not become overgrown with creepers nor hidden by the construction of a retaining wall. The second Auckland city chalazoidite exposure occurs at low tide at Point England and it may be difficult to argue successfully to ensure its continued visibility as the adjacent beach is planned to have sand enhancement in the next few years.

Within the rhyolitic examples, one widespread pyroclastic flow deposit around South Auckland appears to have a characteristic intra-flow, chalazoidite-rich horizon (Fig. 3) seen in many places (Battey, 1949; Alloway et al., 2004).

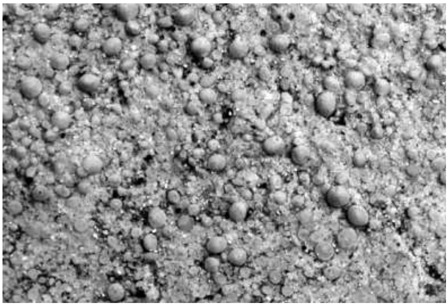

Fig. 2. (left) Bed of small basaltic chalazoidites (3-5 mm diameter) from Liverpool St, Epsom, Auckland.
Fig. 3. (right) Horizon of large rhyolitic chalazoidites (5-20 mm diameter) from Cochranes Gap, Awhitu Peninsula, south Auckland.

Sites listed in the NZ Geopreservation Inventory:
Liverpool St tuff exposure and chalazoidites, Auckland city (R11/679 760). Bed within basaltic tuff from Three Kings Volcano. In suburban road cut.
Point England chalazoidites, Auckland city (R11/774780). Bed within Waiuku tephra (1 Ma) rhyolitic pyroclastic flow deposit. At foot of low sea cliff (Moore, 1991).
Cochranes Gap chalazoidites, Awhitu (R12/513479). Horizon within Waiuku tephra (1 Ma) rhyolitic pyroclastic flow deposit. In low sea cliffs.
Whangamata Rd tephra section A, Taupo (T17/618831). Air-fall rhyolitic tephra beds (20 ka). In road cut (Self and Healy, 1987).
Te Heu Heu Rd ash chalazoidites, Taupo (U18/721552). Air-fall rhyolitic tephra beds at base of Taupo Tephra sequence (1.8 ka). In road cut (Houghton and Wilson, 1986).

Chenier localities

Here I restrict the listings to sand or shell spits that are parallel to the shore and separated from it by marsh or mudflats. All the listed sites are from northern New Zealand and in most instances mangroves have colonised the intertidal mudflats between the spit(s) and the coast. These northern cheniers are composed dominantly of the shells of dead cockles that have been transported across the tidal flats by small waves and tidal currents.

Nowadays coastal and intertidal features are generally more strongly protected from reclamation and quarrying than in the past, and thus the threats to cheniers are diminshed. New Zealand cheniers have been lost and damaged in the past and even today the internationally-significant Miranda chenier plain continues to be degraded by removal of the shell from many of the older land-locked cheniers. The shell spits that run through the farmers' paddocks dry out faster in summer than the intervening mudflat plains and thus tend to promote the growth of weeds, rather than good grass. Removal of the old chenier improves pasture and the shell can be sold.

In the 19th century many shell spits were quarried away (e.g. Pollen Island) to be used as feed stock for the production of lime for building. These days there is a ready market for shell which is widely used for gardens and paths, and in the north most of it comes from the Miranda area and can be readily identified by the co-occurrence of small, rounded greywacke pebbles.

Two years ago, a chenier in Shoal Bay on Auckland's North Shore (Fig. 6) was modified at the cost of many tens of thousands of dollars for the cause of biotic conservation. The nearby northern motorway was being widened for a bus lane, thereby removing a strip of dry shoreline used as a nesting site for endangered New Zealand dotterel. After considerable lobbying, it was decided that alternative dry land above high tide needed to be constructed and the ideal site was identified as the chenier, 50 m away across some low mangroves. Shell, with greywacke pebbles, was imported from Miranda and helicoptered out to create several low mounds atop the chenier. These are readily visible by passing motorists and I, for one, find them an eyesore in an otherwise natural coastal area that is identified on planning maps as a coastal conservation area. To my knowledge, the dotterels have yet to use these costly artificial mounds.

Of the six chenier sites listed in the inventory, two occur in marine reserves, but the Miranda chenier plain has only limited planning protection.

Fig. 4. Active shell chenier on the coast of the Miranda chenier plain.

Fig. 5. Chenier and enclosed mudflat and salt marsh, Te Matuku Bay, Waiheke Island.

Sites listed in the NZ Geopreservation Inventory:
Miranda chenier plain and active cheniers, Firth of Thames (S12/146469). 13 chenier complexes form plain with active accretion at shore (Fig. 4; Woodroffe et al., 1983).
Pollen Island, Waitemata Harbour (R11/595805). Chenier island and active accretionary shell spits. Pollen Island Marine Reserve.
Shoal Bay cheniers, Waitemata Harbour (R11/676872). Several separate shell cheniers separated by mangrove forest from shore (Fig. 6).
Te Matuku Bay chenier and salt marsh, Waiheke Island (S11/010826). Single shell/sand spit with marsh behind (Fig. 5). Te Matuku Bay Marine Reserve.
Te Muri cheniers and salt marsh, Tamaki Strait (S11/955740). Long shell spit with salt marsh behind.
Kidds Beach cheniers, Manukau Harbour (R12/726564). Several active shell spits separated by mudflats from shore.

Request for information

As you can see the number of chalazoidite and chenier localities listed in the inventory (and consequently in District Schemes) is small. If you know of any additional examples that you consider are worthy of inclusion please send information about them to me at b.hayward@geomarine.org.nz. All currently listed sites are in the northern half of the North Island. This is understandable for chalazoidites, but surely there are sand or shell spits that qualify to be called cheniers further south.

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Fig. 6. Low shell mound that was added by helicopter to the top of a Shoal Bay chenier, beside Auckland's northern motorway. Mt Victoria scoria cone sits beyond.

Sculpture at Dorrie Leslie Park, Wellington

Bill Watters,

This note is to supplement a short article I wrote in Newsletter no 135 (November 2004) on rock types in some Wellington sculptures. The one shown in the accompanying photo is based on one of the famous moai of Easter Island and was presented by the President of Chile to mark the friendship between New Zealand and his country. The statue, which is 2.2 metres high and was carved from a single large block of Hinuera Ignimbrite, stands in Dorrie Leslie Park, a small reserve near the entrance to Lyall Bay. There is also (not shown) a commemorative plaque detailing the background leading to the placement of the statue.

The first GSNZ noticeboard

Simon Nathan, *Wellington*

The Geological Society of New Zealand has always had a strong focus on providing information about geological features to the general public. Over the years this has led to considerable voluntary effort by members in producing guidebooks and pamphlets. It is worth recording the erection of our first noticeboard, especially as it is still standing today.

There has always been debate about whether noticeboards are an effective way of publicising geological features. They can be located right on a feature – or tell people where to look – but they are subject to vandalism. About 1969-70 Norcott Hornibrook decided to try an experiment erecting an informative noticeboard at the White Creek Fault in the Upper Buller Gorge, which ruptured during the 1929 Murchison earthquake. I'm not sure who was involved, but my guess is that Gerald Lensen helped prepare the text and diagram, and that it was drawn up by one of the Geological Survey cartographers. When transferred to a metal plate, Norcott prepared a plastic cover and put galvanised the edges to keep out the rain.

In 1971 I was working in the Geological Survey office in Greymouth, and large parcel arrived containing the noticeboard arrived from the Railways freight office, with a request from Norcott that I arrange for it to be erected at the site. I was about to leave Greymouth at this stage, so I passed it on to Mike Johnston in Nelson who arranged for Automobile Association to erect the sign. Over 35 years later it is still there, in pretty good condition. There are no bullet holes, and no-one has scratched the plastic cover. It stood uncovered for a number of years, but now sports a shingled roof needing maintenance.

If you go to the site today, there is a large car-park for the swing-bridge (reputedly the largest in the southern hemisphere) a few hundred metres to the east (on the Murchison side). You need to walk back along the road to the west – taking care as it is narrow – and you will see the GSNZ noticeboard on the left (south) side. Originally you could look across the river and see the 1929 fault trace cutting across the last glaciation terraces.

An AA signpost on the north side of the road also marks the offset of the road. If you scramble a few tens of metres into the bush behind the noticeboard you may be able to find an old water-race that was offset about 4.5 metres during the 1929 earthquake, and helps mark the exact position of the fault.

There is a tiny sliver of Tertiary rocks preserved along the fault, and detailed examination shows evidence of a complex structural history. If you cross the suspension bridge, its worth scrambling down to the river to look at the deformed sediments which are well exposed there.

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PEOPLE

The Kingma Awardee 2006

Ian Smith and Louise Cotterall, *Geology Programme, School of Geography, Geology & Environmental Science, University of Auckland*

Dr Ritchie Sims of the Department of Geology (now part of the School of Geography, Geology and Environmental Science) has been awarded the 2006 Kingma Award by the Geological Society of New Zealand. The Kingma Award recognises the important contribution made by technicians in the earth sciences in New Zealand and is awarded annually to the outstanding New Zealand Earth Science technician of that year.

Dr Ritchie Simms

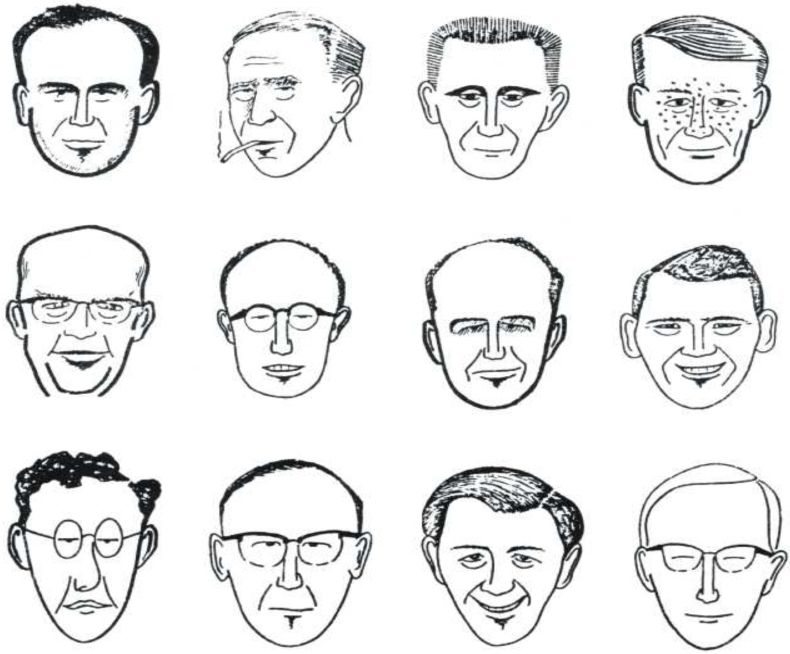
Ritchie has worked in the Department of Geology for 19 years as technician responsible for the Electron Microprobe and general instrumentation and electronics. He has a PhD in Chemistry, and also manages the Thermal Analysis facility used for mineral identification and coal characterisation. During that time he has assisted numerous students through the technicalities of collecting scientific data and has been a mainstay of many staff research projects. Ritchie is innovative, inventive and curious, he is a thinker. He is extremely able and has a wide knowledge of the way that things work and is always generous with his time.

Perhaps the best illustration of Ritchie's ability is his solution to the problem of replacing a 20 year-old electron microprobe that was at the end of its days. Faced with the impossibilty of raising $2,000,000 for a new instrument, Ritchie located and relocated a used electron microscope and then converted it into an electron microprobe. Thus he essentially built an electron microprobe for about a tenth of the cost of a new one and he did it within budget and within the time frame required. We recently completed an international bench-marking exercise and the data from our 'new' probe is demonstrably of high quality.

Outside work, Ritchie is now applying these talents to tinkering with a growing collection of modern and antique motor scooters. So watch out for him on Sundays as he terrorises Grey Lynn pedestrians. *From an article in the SGGES*

50 years of mapping

At the Kaikoura Conference, a poster was displayed reproducing Ron Brazier's sketches from Newsletter 51 of NZGS geologists involved in the 4 mile mapping programme in the 1950s and 60s.



More sketches (by anonymous artist "Hal Fanglegraben") were offered of geologists of the 1990s and 2000s involved in GNS's QMAP programme.

A competition was run at Kaikoura for the person who could recognise the most faces with three points scored for each correct "four miler", and one point for each "Qmapper". David Smale was closest to maximum 50 points with (reputedly) 48 points. How well can you do?
Answers on page 36

More NZ Geological Survey History

John Mackie, *University of Otago*

A bit of NZ geological history, taken, probably in late 1929 during one of Horace Fyfe's field seasons in the Waiau area of North Canterbury when we were preparing for a flying camp up the Seaward Kaikouras. The people in the photo are. left to right: John Mackie, Otago University student (field assistant), holding pack-horse), Sam Sylvester, staff, Canterbury College Geology Dept, Johnny Rodgers (cook), part-time jockey.

A Tribute to Phil Maxwell

Jack Grant-Mackie, *University of Auckland*

The following is a slightly abridged version of an address given at Phil's memorial gathering in Timaru. It is primarily concerned with Phil's contributions to the Society's Newsletter.

Science in New Zealand, and especially the paleontology community, has suffered a blow – we have lost someone who has been an unwavering supporter of and advocate for paleontology, and a contributor to paleontologic knowledge.

Phil saw the huge divide, denied by others, between Science and Religion, more especially, between evolution and creationism/'intelligent design'. He was a fierce defender of the scientific method and of objective analysis, a trenchant critic of spurious pseudoscience and of attempts to replace scientific enquiry with blind faith.

This was not by writing books or giving speeches at meetings – this was not his style! But by a series of short articles in the newsletter of his professional organisation, the Geological Society of New Zealand, articles that came under the title '*Paleo Potpouri – Random notes on fossils and stuff*'.

Phil Maxwell

These articles are not attacks on religion as such, but on literal interpretations of the Bible regarding a short age for the Earth (c. 6000 yrs, vs 4.5 billion), all fossils being products of Noah's flood, creation of each species by a supernatural being. He was also hot on those who twisted scientific evidence for fundamentalist purposes, or manufactured spurious evidence (like chiseled human-like footprints into dinosaur footprint trails).

Much of this material Phil gleaned from the internet, a host of websites – his articles always urged others to look at these blogs themselves – and he clearly spent much time surfing the net himself. In fact, he subtitled his '*Paleo Potpouri'* as a 'sort of off-line blog'!

Phil also raised other very serious issues, showing his real concern for the health of paleontology and the preservation of our scientific heritage: the illegal sale of smuggled Chinese fossils, the protection of NZ fossil sites from commercial exploitation, an appeal for a NZ paleo website to be launched, etc.

Throughout all one finds Phil's quirky sense of humour, most especially in his choice of a series of 'Stray quotes';
David Hull: "Evolution is so simple, almost anyone can understand it!"
Douglas Adams: "Human beings, who are almost unique in having the ability to learn from the experience of others, are also remarkable for the apparent disinclination to do so."
Voltaire: "Doubt is not a pleasant condition, but certainty is absurd."

The Geological Society of NZ will be much the poorer for the absence of Phil's contributions!

In his work, Phil I think was a perfectionist, uncompromising in trying to wring all reasonable conclusions from fossils and other data at hand. He was dedicated and consistent in this, and I suspect this caused dissatisfaction among his superiors. But he believed it important to try to uncover the whole picture.

Phil Maxwell will be missed by his family and by many colleagues.

PETER B. (Sam) MALING, 1912-2006

Simon Nathan, *Wellington*

Peter Maling was a foundation member of the Geological Society of New Zealand, and was still a member 51 years later when he died in December 2006.Aged 94, he was probably the oldest member of the society, and certainly one of the few whose geological experience went back to the 1930s.

Born and raised in Canterbury, Dr Maling had a lifelong interest in the natural world. He studied at Canterbury University College in the early 1930s, spanning the changeover from Robert Speight to Robin Allan. His experiences during those days are recalled in *Reminiscences of the Geology Department at the University of Canterbury*, N.Z. Journal of Geology & Geophysics 9(4): 381-4, 1966.

Few people undertook graduate work in geology in the 1930s. Maling completed an MSc with a thesis on the geology of the Kakahu area, south Canterbury in 1934, and then set off for England, planning to do a PhD at the Royal School of Mines in London. Jobs were scarce at the end of the depression, and when a job was offered by the Anglo-Iranian oil company (later BP) he jumped at it. This led to two years doing reconnaissance mapping in remote parts of Iran. The blistering heat took its toll, and when he returned to London in 1937 he decided on a career change to medicine. Maling was working as an intern at St Thomas' hospital in London during the blitz. His courage rescuing patients and colleagues when the hospital was bombed led to the award of the George Medal, one of the highest non-military honours "for acts of great bravery". Later he enlisted in the British army, serving in military hospitals in Sicily and Italy before going to Greece to help restore medical services after the German withdrawal. With his English wife and 2-year old son he returned to Christchurch in 1946, setting up practice as a GP which he continued for over 30 years.

Outside the medical world, Maling had wide-ranging interests in local history and natural science. He retained contacts with the geological community, often accompanying Max Gage, Doug Campbell and others on field trips. He had a sharp eye for fossils, and a number of his collections are recorded in the Fossil Record File. For example, on a tramping trip in 1961 he recognised a rich locality of Kaihikuan age in Carney Creek, a tributary of the Rangitata River (recorded as I35/f9505), which has been the subject of subsequent study.

In the historical area he published a number of books and pamphlets including *Samuel Butler at Mesopotamia* (1960, reprinted 1984), and the *Torlesse Papers* (1958) giving a view of the early days of settlement in Canterbury. In later years he became interested in identifying and collecting the oldest maps of New Zealand. It was difficult and expensive to publish illustrated atlases of historic maps, so he tackled it by obtaining subscriptions that covered the cost of producing limited editions that were highly prized by collectors. His final book, *Historic charts and maps of New Zealand, 1642-1875,* was published by Reed as a limited edition in 1996. Having covered their costs, it was reprinted at a more affordable price in 1999, and is highly regarded as a reference on early New Zealand cartography. It includes a number of maps by well-known geologists, including an 1870 map of the poorly known central part of the North Island by Hector, Hochstetter's map of the Auckland province, several maps of Canterbury by Haast, and ends with Hector's 1865 geological map of New Zealand.

50 years of mapping answers

Top to bottom, left to right:

FOUR MILERS

Don Gregg, Bob Hay, Jim Healy, David Kear

Ko Kingma, Ian McKellar, Jim Schofield, Ian Speden

Pat Suggate, Bruce Thompson, Guy Warren, Bill Watters

QMAPPERS

Graham Bishop, Ian (Mo) Turnbull, Jane Forsyth, Mike Johnston, Mike Isaac

John Begg, Julie Lee, Simon Nathan, Mark Rattenbury

Richard Jongens, Simon Cox, Colin Mazengarb, Steve Edbrooke, Dougal Townsend

Geoeducation Special Interest Group

At the recent NZGS meeting in Palmerston North there was a push to revitalise the Geoeducation Special Interest Group, particularly with the participation of Jenny Pollock (Nelson Girls High School) in the form of a keynote talk on Earth System Science in schools. The group is now established, under the leadership of Jenny, and including GSNZ National Committee representatives Jan Lindsay, Dan Hikuroa and Kari Bassett.

Jenny has taught Earth Science/Geology all secondary levels, and has been an examiner and developer of resources. She has been involved at all levels of the implementation of NCEA and recently the new curriculum. She is currently the vice-president of the New Zealand Association of Science educators, and we are excited that she has agreed to lead our group.

It seems that Earth Science teaching has been undergoing a quiet revolution over the last few years and Earth Systems Science (the interaction of the geosphere, hydrosphere, atmosphere and biosphere) is being taught at schools rather than straight Geology. Hopefully this new curriculum will reflect similar shifts in teaching at tertiary level.

The group has a number of possible initiatives to discuss, including the development of new resources and teacher training based around the new curriculum, and a possible Earth Science school competition leading up to the next GSNZ conference in November.

You are invited to join!

Jenny Pollock	Nelson Girls High School	pollockfamily@xtra.co.nz
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Simon G. McMillan	Kaikorai Valley College	simmysgm@hotmail.com

Jenny Pollock has this to say,
"We have many challenges when we develop resources for school students. Many good resources have been developed over the years. But we now need to enhance these by trying to understand even further how students build up concepts in their minds.

As a teacher of Earth Science right up to the seven form (year 13), I constantly struggle with how to get across concepts that are very easy for us to understand, such as depth and deep time. What we don't realise though, is that we generally first learnt these at university when our brains had developed enough to understand them. Most school students struggle with these.

Also, concepts are often disconnected. We teach the rock cycle, and at another time plate tectonics, without ever really connecting the two in a way that students can understand. And think about the rock cycle diagram, do school students really understand this, especially the enormous depth and time involved? And how many can connect what is happening on the surface with what is happening underground?

I welcome some of the new web based initiatives. I have started using images, photographs and animations in my teaching, and find that these help students' understanding enormously. For example, seeing a cross section of subduction change into a more three dimensional view is very helpful.

Above all we need to encourage an eco-literacy among our students. It is essential these days that students' understand how our planet functions as a whole and how humans influence the interacting systems and cycles. We need to think hard about how we can get these concepts across to students in a way that sparks their interest and motivates them as citizens and scientists.

It would be good to debate these issues and discuss any ideas. Maybe we need brand new approaches. After all, Earth Science is the greatest collection of detective stories there are!"

Growth in mining hampered by a lack of geoscientists

Gregory Webb, *Queensland University of Technology*

Australia is often called the "Lucky Country," and it is not just a good slogan, it is true. Australia is one of the last nations on earth where low population and abundant natural resources can support a western, resource-dependent lifestyle - the type to which we have become accustomed - and still protect our natural environment by allowing future development to be carried out in a sustainable way, but our "sustainable" future is in jeopardy.

While everyone is familiar with the current skills crisis - there are too few tradesmen, skilled labourers, nurses, and so on - few people outside of the geoscience industries have recognised the severe shortage of university-trained professionals in those industries. Australian universities currently are not producing enough geoscience professionals to meet demand.

And now, more ominously, there is an increasing shortfall in academic geoscientists at Australia's universities, and that shortfall directly jeopardises our ability to train the future geoscientists that Australia requires. Under the current government university funding model, low student numbers in the geosciences are causing the down-sizing and or closure of geoscience departments, so drastically limiting the breadth of geoscience expertise and experience available in Australia's university sector.

If the downward trend continues, it may become impossible to meet Australia's future educational, training and professional needs in this critical area.

So, why should we be worried? Geoscience is fundamentally important to Australia's future in three ways:

1. geological resources drive a large percentage of the nation's economy;
2. sustainable development, encompassing environmental protection, depends heavily upon geoscience; and
3. geoscientists produce most of the data that are required to understand climate change.

The Australian Bureau of Agriculture and Resource Economics reports that export earnings from mineral and energy resources in 2005-2006 were more than $90 billion and forecasts that those earnings will rise to $110 billion in 2006-2007. By comparison, farm commodities exports are forecast at $29.3 billion in 2006-2007.

The minerals and energy exploration industries (or extractive industries) that drive this huge part of the nation's economy depend on professional geoscientists, both geologists and engineers. In addition to export earnings, the extractive industries provide direct tax and royalties to state and federal treasuries.

For example, the Queensland Resources Council estimates that Queensland's extractive industries will contribute over $1.5 billion in direct royalties to the state government next year.

Other commonly overlooked benefits include direct contributions to infrastructure, such as roads, ports and rail systems, which are heavily dependent on users' fees from extractive industries; and it is worthy of note that extractive industries are particularly important in rural and regional Australia. In many cases these industries are responsible for a large percentage of regional economic development and infrastructure: entire cities in rural Australia owe their existence to the extractive industries.

But it is not all about economics. Although geoscience is commonly linked solely with the extractive industries, it is in fact a highly diverse field, encompassing the core disciplines in areas such as hydrology (water supply and quality), catchment and waterways management, mine remediation, hazard analysis (earthquakes, tsunamis, floods), geotechnical analysis for construction, soil conservation, inland salinity, coastal erosion, acid sulphate soils, and others.

It is geoscientists who are playing the lead roles in research to understand our changing climate. The record of climate change over the last million years is contained in sediments from lakes and the deep ocean, corals from the Great Barrier Reef, stalagmites from caves, and ice cores from glaciers; all are studied by geoscientists.

At the same time, palaeontologists are documenting the effects of recent climate change on Australia's ancient faunas and ecosystems. Without such data we cannot begin to predict Australia's future climate or its likely effects on our environment.

However, we currently are producing fewer professional geoscientists than are retiring from industry due to a demographic bulge in the average age of the professional workforce (currently well over 50 years).

On top of that, the Minerals Council of Australia has concluded that growth in the mining industry over the next decade will lead to the need for about 7,600 new geologists and engineers, and those figures do not include the oil and gas industries. As our most skilled and experienced professionals retire, it is unlikely that they will be replaced in number, and it is probably impossible for them to be replaced in kind.

Disturbingly, despite the great number of jobs and incredibly high salaries for new and recent geoscience graduates (for example, $55,000 to more than $100,000 a year), student numbers are low. These low student numbers have impacted on universities at the same time as a wave of economic rationalisation in university funding.

Universities are now funded on a formula based primarily on student numbers. There is no strategic oversight to ensure that critical skills will be taught across the nation; offerings are increasingly market driven and based on the decisions of enrolling high school students. Disciplines that are expensive to teach and have low student numbers, such as science and engineering, provide inadequate income and increasingly are viewed as drains on struggling university budgets.

The net result has been downsizing of teaching staff, merging of many departments into combined schools with other disciplines, and the closing of entire departments. Of 28 geoscience departments in Australian universities in 1990, only five independent geoscience departments remain. In Queensland, the last independent School of Earth Sciences at James Cook University merged this year into a combined School of Earth and Environmental Science. Hence, a state that single-handedly ranks among the largest coal exporting nations in the world, lacks an independent geology department in any of its universities.

Also worrying is the fact that the degradation of university departments in the geosciences has been a global phenomenon. For example, the American Association of Petroleum Geologists reported that only 430 geologists graduated with Bachelors degrees in the United States in 2005! That compares to just over 100 geology graduates in Australia over the same time interval according to the Department of Education Science and Training. Global competition for geoscientists will only increase.

So why are student numbers so low when jobs are so plentiful and salaries are so high?

First, employment in the extractive industries has traditionally followed global economic cycles, and the last major downturn in the late 1990s left many professionals seeking other lines of employment. However, that cyclicity in employment is now buffered by the bulge in retirement-aged professionals and increasing employment in the environmental sector.

Second, there is a poor public perception of the extractive industries, based largely on one-sided, poorly informed and unfair criticism by parts of the environmental movement. Only a tiny fraction of Australian land is affected by the “dreaded” mining industry. In reality, agriculture and urban sprawl do far more environmental damage. Strip mines may be unsightly, but they are ephemeral. They must be rehabilitated and, as far as possible, returned to native habitat once the mine runs its course. Land utilised for agriculture and for human occupation and development, on the other hand, remains degraded forever.

And can we do without the extractive industries? Look around you wherever you are and remove all the stone, cement, bricks and other ceramics, all the metals, glass and even plastics (which are petroleum-based), and what do you have left? You’re sitting amid wooden boards with nothing to hold them together, soft paper, and natural fibers like wool and cotton.

That is the house of cards we live in without the extractive industries, and never mind energy. You’ll be in the dark, because there will be almost no power generation, no wires to conduct electricity anyway, no solar cells, and not even a candle, because candle wax, like plastics, is a product of petroleum. And by the way, the wood came from logging a natural habitat or from a plantation that replaced a destroyed natural habitat. The extractive industries are not the environmental villains here; we share that distinction collectively.

Third, geosciences are poorly understood by Australian students because they are very rarely taught in high school. In Queensland only 20 of 700 high schools taught geology units other than modules buried in multi-strand science courses in 2005. Research has shown that students are unlikely to enter universities to major in subject areas that they are unfamiliar with. Hence, geology is poorly subscribed; most students shift into geology from other majors after they entered the university to study a different, but more familiar field of science. The closure of even one geoscience department removes potential professionals from the future labour force.

So what can be done? We must increase the numbers of geoscience students in surviving geoscience programs, both to produce more graduates, and to help those departments survive. If you know any bright high school students nearing graduation who want challenging, well-paid careers, and love the out of doors, tell them about geoscience. You can also lobby your state education boards to have geosciences added more visibly to school curricula. Everyone lives on this planet and would benefit from knowing more about how it works.

We must also encourage industry to support our universities. While industry has endowed a few teaching chairs in mineral-related engineering and recently, petroleum geology, much more direct support of university departments is needed, particularly for geology, which has received far less attention than engineering. With high commodities prices and record company profits, there has never been a better time for industry to invest in the training of their future work forces.

Finally, we must encourage the federal government to fund university disciplines that are critical for long-term sustainability, even where student numbers are typically low. It must ensure that critical teaching departments remain viable in the face of low student numbers.

The "bums on seats" funding model is not a strategy for future needs. As with brain surgeons and other technical specialists, we may not need to produce thousands of geologists or mining engineers every year (although we currently may need those numbers), but we need to ensure the steady supply of a smaller number of high quality, well educated professionals every year. The current university funding model makes that outcome increasingly difficult.

So, support your university system. You may never obtain or need a university degree yourself, but the quality of your life commonly depends on people who have one. A well-funded tertiary education system is not a luxury; it is a necessity. Our future is at risk.

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Editor's Note: Published with the author's permission who writes

"By the way, as we are advertising for a replacement sedimentologist at the moment, and New Zealand has some very fine sedimentologists/stratigraphers; when is your deadline for advertising and what would it cost to have a small advert? … our applications will probably have to close near the end of March. We are pretty cash strapped, so I don't know what the faculty would say, but I'd love to find a way to reach the New Zealand market. Regardless, please feel free to reprint the attached article. Maybe we can wake people up! Cheers and thanks for your interest."

Editors note:

I guess they were too skint to advertise with us, but does anyone want to help me get our NZ universities and institutes as well as mining companies to advertise their NZ geo-science jobs in our newsletter?

Note also the vastly larger contribution mining makes to Australia when compared to agriculture. And what does NZ rely on? At a recent AusIMM meeting it was reported that NZ makes more from gold than from wine, despite the media hoopla on the latter.

Draft New Zealand Science Curriculum

*The following letter was sent by our President **Keith Lewis** In November 2006*

Introduction:

The Society has long had an interest in science education, in particular secondary school Earth science. A Geoeducation Special Interest Group has been part of the Society for many years and a great deal of time, energy and resources by individual members, their organisations, and the Society in general, has been expended in a various ways. These have included producing a wide range of teaching resources for schools and teachers, acting as mentors (e.g. RSNZ teacher fellowships), organising annual Earth science teacher days, leading field trips, visiting schools and judging science fairs and awarding prizes. A present example of our commitment to schools is a major publication currently in production which details the various aspects and the current state of New Zealand's Earth sciences. This large monograph is aimed at a secondary school audience and we intend that it will be sent to all New Zealand intermediate and secondary schools free of charge through sponsorship. Another would be the contribution of members to the Te Ara on-line encyclopaedia (www.teara.govt.nz) – a great educational resource.

The Society endorses the American Geological Institute's education statement that "If we intend to live on (and with) this planet, we truly need to understand how it works, and to understand the interactions of the many components that make up the Earth. The Earth sciences provide an integrated and inter-disciplinary approach to a true understanding of our planet. Earth science includes and applies knowledge from biology, chemistry, physics, ecology, and mathematics. Earth science education also improves critical thinking skills. It offers a historical perspective and improves our ability to predict future events. To understand Earth processes that affect us now and tomorrow, geoscientists look for evidence of what happened in the past. This connects students to the past, as well as challenging them to think about the future." A good example of this is the contribution of Earth scientists to our understanding of climate change.

Draft Curriculum statements - Earth cycle components

Levels One and Two (Years 1-7)

Observe and describe local natural features and how they can change.

Levels Three and Four (Years 3-10)

Investigate the cause, rate, and signs of change of natural features.

Level Five (Years 7-12)

Investigate the processes that shape and change the surface of planet Earth.

Level Six (Years 9-12)

Understand how plate tectonics shapes the structure of planet Earth.

Level Seven (Years 10-13)

Use understanding of plate tectonics to explain aspects of the New Zealand continental area.

Level Eight (Years 11-13)

Understand the cyclic nature of plate tectonics and use this to investigate aspects of New Zealand's geological history.

Curriculum comments:

There is little in the statements for teachers lacking an Earth science background and good resources to "get their teeth into". The statements need more content and direction.

The use of the word "cycles" is somewhat dated and perhaps Earth systems or Earth processes better describes the way Planet Earth and its biota has changed through time.

A progressive development of knowledge from Levels 1 to 5 appears to be lacking with a deal of repetition occurring. Levels 6 to 8 need to be fleshed out much more.

The fundamentals of Earth science appear to be lacking throughout. These are necessary to have understanding of theories such as plate tectonics. Without such knowledge the theory becomes faith based rather than being critically analysed as science demands.

A great deal of "Planet Earth" is not included at all it seems. Seventy per cent of the planet is covered by oceans yet oceanography doesn't get mentioned. For example the "ocean conveyor" is at least as important to what happens in the next 100 years as plate tectonics and even if you are only thinking in terms of geology, it is just as critical to the past changes.

One of the key reasons that Earth science study is important is missing - societal relevance. Relevance to Natural Resources (oil, coal, metals, aggregates): how rocks differ from other solids; how they are formed; "if it isn't grown, it's mined". Relevance to Natural Hazards (volcanoes, earthquakes, landslides, flooding, tsunami): we live on an active Earth; how safe is your town?

The study of evolution appears restricted to the Living World strand. The "deep time" aspect of geology (fossils, stratigraphy, evolution) is the surely the domain of the Earth sciences and is absent in other sciences. Changing NZ or; Gondwanaland. Fossils are studies students can readily relate to and excite interest.

Plate tectonics theory is "merely" a unifying explanation for the above.

The opportunity for crossover with other strands does not appear to be happening. For example to Chemistry / Geochemistry; Palaeontology, evolution / Biology; Physics / Geophysics.

What is taught is controlled by the assessment standards and these are not available but are derived from the curriculum statements albeit with severe limitations. The key level is Level 6 where the largest proportion of students study for NCEA. This level is limited by the focus on plate tectonics. Level 6 "interacting cycles" seems to be hinting at climate / environmental change but it needs to be made clearer that it is also about "life on Earth over time". The intent of this aspect of interacting cycles is not clear.

Serious consideration should be made for the support of having Earth Science ***resourced and valued*** *as a stand alone Science at Levels 7 and 8. Until this happens, it is likely that the decline of candidate numbers will continue. There is an increase is numbers gaining credit at curriculum Levels 4 and 5 (40% of all credits gained in Earth science in 2005) at the expense of the higher level AS 90190.*

Additional comments on Earth science education

We are extremely concerned that the since NCEA Level 1 was introduced in 2002 Planet Earth and Beyond (PEB) achievement standards and participation have been steadily decreasing. Why?

We are also aware anecdotally that PEB is being dropped in many schools in favour of topics such as Physics or Chemistry (NB currently only about 5% of candidate results in Earth science are gained from curriculum levels 7 and 8. In short, few schools actually offer t

these for students). Assuming all four strands of the science curriculum have similar status we wonder what the reaction would be if any of the other topics were dropped?

We are also aware anecdotally that in some schools teachers with an Earth science background are being required to teach Physics, Chemistry, Maths or Biology rather than Earth science.

Similarily the resourcing of schools to enable them to effectively teach PEB appears to be poor. If the declining student participation in PEB is real then the biggest single issue is teacher support and resourcing. Students take what courses and modules are taught them by their teachers: thus it is the teachers / schools that are avoiding Earth Science, not the pupils.

In the short to medium term existing physics, chemistry and biology teachers need to given more resources, confidence and interest to teach Earth science. In the medium to long term there must be encouragement for increased numbers of geology graduates to become teachers in Planet Earth and Beyond.

REVIEWS

Charles Fleming's Cape Expedition Diary, Auckland Islands, 1942-43. *Edited by Mary McEwen, 2006, McEwen Associates Ltd, 12 Tisdall St, Karori, Wellington.*

Bruce Hayward, *Geomarine Research, Auckland*
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When I heard that Mary McEwen, one of Sir Charles Fleming's daughters, had edited and self-published Charles' three and a half diaries of his year and one day (25/2/42-25/2/43 Wellington-Wellington) as a coast watcher on the Auckland Islands, I immediately ordered a copy and have been dipping into it ever since. Not so long ago I read Mary's biography of her father (Charles Fleming, Environmental Patriot: A biography, 2005) and I saw this new publication as an opportunity to find out more about exactly how things operated down in those cold, weather-beaten islands during some of the darkest days of the second world war. I knew Charles only in the latter part of his life (1970s-1980s) and periodically one heard mention of the secret Cape Expedition and his coast- watch days on the sub-antarctic islands, but I had never really sat down and quizzed him on what it was like down there. My interest was heightened by a two week visit that I made several years ago to Auckland and Campbell Islands, during which I was fortunate to see the remains of two of the coast-watch huts, at Tagua Bay (Auck. I.) and Tucker Cove (Camp. I.).

The huts were located where they could not be seen by visiting ships. Associated with each was a small shelter high up the slopes, which was manned from dawn to dusk as a lookout for any signs of enemy ships. Each hut had five men and they took it in turns to be on watch. If an enemy ship was seen then their radio operator was to send word back to the mainland, but Charles's diaries make no mention of whether they had a plan of what they would do if their presence was noticed. Because the huts were hidden away I had wondered how the coast watchers kept warm and how they cooked. The diaries tell us that a fire was in use a lot of the time, so obviously they had no concerns about the smoke being seen, which it clearly would have.

Charles' diaries tell us that a good deal of his time was spent on watch, cutting fire wood, cooking (he became an expert bread-maker), corduroying (look that up in the dictionary like I did), carting stores from the landing up to the hut, and scouring the walls and ceiling of the kitchen. By juggling their watches and tasks, various members of the party could get days off, or long periods in a day to explore, or in Charles' case observe and document the natural history. Warren Judd's review of this publication in a recent issue of the NZ Geographic says that Charles was a geologist with interests also in ornithology, but his diaries clearly show that Charles' first love at the time was the study of birds, their identity, ecology and even biology. This publication reproduces Charles' daily diary entries (now typed) and numerous sketches of birds and geomorphology. Most days there are entries about observations about birds and marine mammals. Unfortunately for the non- specialist the birds are mostly referred to by their scientific names (often abbreviated) and I found myself skipping over these sections, though I am sure they would be a major source of interest for modern ornithologists. After his longer excursions, Charles devoted more space to descriptions and sketches of the geology, topography and his inferences about glacial features. Surprisingly during his entire year away, Charles only went on one overnight excursion, all the others were day trips.

I had always wondered how he got about while at Auckland Is and imagined that the coast watchers were dropped off by ship and picked up 12 months later. This was far from the truth, as a small supply boat (A S Tagua) stayed with the coast watchers and periodically moved between the two Auckland Is base camps. While stationed at Tagua Bay, the Tagua took Charles and other members of the land party, on trips to various parts of wind-swept Carnley Harbour and even on several occasions further afield. At other times, when it was calm, Charles and one of his colleagues rowed around North Harbour and Musgrove Arm in the more sheltered parts of the harbour. By chance the Tagua Bay hut, where Charles was assigned, was close to the most complex geology of the Auckland Islands, and he spent many hours during the early months recording in detail the granites, sediments and basaltic intrusions and flows and puzzling over their relationships and meaning. Despite Charles' later interest in entomology there is hardly a mention of insects, and only a few brief references to molluscs, one of his other early specialist areas. Although the islands were largely volcanic, Charles' found several marine fossil beds to collect from, returning again and again to the one nearest to Tagua Bay.

One of the most startling revelations in the book is the completely different attitude scientists of the time had to the study of birds. Considering Charles' reputation later in life as one of NZ's leading conservationists, I was initially shocked to realise that in the 1940s much of his bird work on the sub-antarctic islands involved searching for good specimens and then shooting them. I should have said that skinning birds for study skins and voucher specimens also took up much of his time while on watch or in the evenings (in the back of one diary he also lists 30 books and all of Shakespeare's plays as having been read during his time away). Isn't it interesting how public perceptions have changed over the years. I guess killing birds as part of the research is not that much different to the currently accepted practice of killing fish, insects, spiders and other invertebrates as a standard part of modern taxonomic research. Other members of the party also used the guns to shoot the odd pig (Auckland Is), sheep (Campbell I) or cow (Enderby I) for fresh meat. Fishing was out, as the local inshore fish were unpalatable as they were riddled with worm parasites, as they still are today.

Another practice that made the year long stay a little more interesting, especially for a naturalist like Charles, was to periodically swap members between the two Auckland Is huts. It was 2-3 days walk between the two, so exchange was always done by boat. Towards the end of his stint, Charles also got to visit Campbell I, as his return to the NZ mainland went via there. They dropped off the replacement team and take off those that had completed their stint. During his week or so at Campbell I, Charles gives accounts of his quick trips around the island's more interesting geological sections led by Jack Sorensen, who had been exploring the island over the past year.

In such isolation, thankfully there seem to have been no real medical emergencies during Charles' year. He complains however on several occasions, of really bad toothache, of tooth abscesses, and remedies to kill the pain. How many of his teeth survived into later life?

So despite its diary entry layout, I found this book intriguing for its historical insights into the exploration of the natural history of several of NZ's most remote places, at a time when the rest of NZ was focused on the advancing Japanese forces in the Pacific. During his entire time away, Charles and his team seem to have seen only one foreign ship, that from an ally country en-route to Melbourne, presumably taking a southern route for greater safety. If you are an ornithologist, have an interest in geology of the sub-antarctic islands, or are curious about the Cape Expedition, then this book is for you. Thank-you Mary for making it available.

Editor's note: Information regarding purchase of this book is shown in an advertisement on page 45 of the November 2006 issue of the Newsletter.
My father,Leo, was leader of the first party to Campell Island the year previous, 1941. His spare time activity was making a topographic map of the island. I have his later narrative and the diary of one of his party if anyone is interested.

NEW ZEALAND GEOLOGY PUBLISHED OVERSEAS

Source of Ni in coal mine acid rock drainage, West Coast, New Zealand.

P A Weber, W.M Skinner, J.B. Hughes, P Lindsay, and T. A. Moore

Paper on NZ Geology Published in "International Journal of Coal Geology" Vol. 67 (2006) 214-220

Nigel Newman, *CRL Energy Ltd, Christchurch (reviewer)* n.newman@crl.co.nz

This paper sets out to identify the source of Ni in acid rock drainage (ARD) from Westland coalmine areas, specifically the Stockton area in the Buller Coalfield, although the results are extrapolated to cover similar areas of Brunner Coal Measures. Ni is one of the metals of concern in the suite of elements impacting ARD-affected areas, and identifying its source is a minor, but interesting study to emerge from research pursued in environmental geochemistry.
The method of investigation chosen is simple and direct, although employing a very complex, state of the art analytical technique. A sample of Kaiata mudstone was prepared as a polished

section, and scanned by a time-of-flight secondary ion mass spectrometer with a resolution of a few micrometres. Scans over areas of framboidal pyrite show a Ni response sympathetic to that of Fe, albeit at much less intensity. This correlation is illustrated by both photographs of element map imagery and distance-intensity plots.

The point is well made, but here the reader strikes a disappointment. There are no numbers leading to absolute Ni concentrations. From the intensities and scale factors given, we can work out that on a purely count rate basis, the Ni signal is about 0.4% that of Fe. One assumes that standardisation of the output was not possible, and the authors have chosen to neither speculate on this aspect nor explain why not even semi-quantitative results could be offered. Similarly lacking are other numerical data. There is no mention as to the total Ni content of the rock, or any other similar rocks in the coalfield, or even general Ni values for the ARD solutions generated. It is at this point that the question must be posed as to why such a ‘high tech’ investigation was made when simple and readily available chemical methods would have provided better results. Why not a simple gravity separation and direct Ni (and other) analyses of sulphide rich/sulphide poor fractions?

When discussing the results, the authors state that Ni is more enriched in the pyrite grains than in the alumino-silicate matrix. This is well demonstrated, but further claims that pyrite is the most likely source mineral for Ni leached into ARD remain unproved until a quantitative study is made. The chalcophile character of Ni is emphasized in probably every textbook on geochemistry. The reviewed paper presents a study of a mudstone containing 2.11% sulphur, corresponding to less than 4% pyrite. The remaining 96% silicate and organic matrix may yet prove to be a significant contributor of ARD Ni.

There are other shortcomings in this paper. Much of the text is devoted to acid-based accounting and sulphur speciation, which although worthy of mention, are not included in the title or abstract. Ideally, these topics deserve proper treatment in an expanded paper dealing with wider ARD issues. Furthermore, readers familiar with ‘West Coast’ geology might take issue with some of the descriptions and interpretations of stratigraphy and depositional settings. Geochemical data are readily extrapolated between the Brunner Coal Measures and Kaiata Mudstone on the basis of ‘lateral integrity’, without consideration of depositional and post-depositional differences. Liberties are taken with referenced work: The range in sulphur values for the Brunner Coal Measures is quoted as 1.7-5.6 % (Nathan, 1978), yet these values are from coal seams, and will be predominantly organic in contrast to the sulphide-dominated mudstones. The authors have mistakenly used information from Nathan’s (1978) Greymouth publication instead of the Buller map and text (Nathan, 1996). When mentioning the Reefton coals, a description of lacustrine versus estuarine depositional environments is attributed to Herrmann and Baumgartner (1992), when these authors merely mention freshwater versus marine. A post-depositional origin for much of the sulphur in the Brunner Coal Measures at all these localities, as demonstrated by Suggate (1959), should have been mentioned.

This paper does not achieve its stated aim with convincing proof, and gets hijacked by peripheral topics, but it will create interest and promote research into this important field of environmental geochemistry.

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Partitioning behaviour of trace elements in a stoker-fired combustion unit: An example using bituminous coals form the Greymouth coalfield (Cretaceous), New Zealand. ***Z. Li, A.H. Clemens, T.A. Moore, D. Gong, S.D.Weaver, N. Eby***

Paper on NZ geology published in "International Journal of Coal Geology" Vol 63 (2005) 98-116

Nigel Newman, *CRL Energy Ltd, Christchurch (reviewer)*

This paper is a substantial work, with potential relevance to the important fields of industrial and environmental geochemistry. The work is almost entirely based on a PhD project by Li (2002), supported by additional work carried out at CRL Energy Ltd, Lower Hutt.

The published paper is an ambitious work, covering many of the aspects of Li's thesis. The behaviour of more than 30 trace elements is described, together with a discussion of major and minor elements. A wide variety of analytical techniques were used, including atomic emission spectrography, mass spectrometry, scanning electron microscopy, x-ray fluorescence, and neutron activation. Three seam channel samples were not only examined as feedstock and combustion products, but were subject to sink-float separation, sequential leaching, screening of bottom ash into two fractions, and flotation of fly ash, thereby creating a very large set of analytical subsamples. The paper goes beyond a simple study of trace element partitioning into combustion products, presenting an extensive discussion of modes of occurrence of both major and trace elements, a topic central to Li's thesis.

The four principal findings, with particular emphasis on hazardous air pollutants, are as follows:

1. Most trace elements, particularly As, Ba, Co, Cr, Mn, and Ni are partitioned in the glassy and refractory bottom ash.
2. A significant proportion of the As, Se, and Pb is partitioned into fly ash.
3. Some volatile elements (S, Hg, Cl, B, Cd) are substantially partitioned to flue gas.

4. Although the low ash Greymouth seams generate less combustion ash, the ash residue is more enriched in trace elements than other more clastic-influenced coals. For example, B, S, and Cl have been enriched to undesirable levels of 1100ppm, 4.4%, and 2000ppm respectively, requiring careful management of ash disposal.

This paper is difficult to read in depth, mostly because of the vast amount of data presented, but also due to the recursive nature of the discussion, which frequently refers the reader to Li's thesis and his other published work for details of procedures and additional analytical data. For the reader who is familiar with the research topic, there is a measure of frustration in finding important data omitted. For example, elemental analyses from the coal sink-float separations are simply presented as bar graphs, the actual trace element data, float yield values and ash values being left out. However, the enthusiast who is prepared to go through the tables with a calculator can derive much of the missing data and thereby test some of the hypotheses advanced by the authors.

The work is also marred by numerous typographical mistakes, errors in labels, and excess precision in the tables. It is surprising that these obvious errors can persist to final publication despite the efforts of six authors and two reviewers.

For the combustion experiments, three samples from the now-closed Strongman Mine were burnt in a small underfed stoker to yield large bottom ash (+1.7mm), small bottom ash (-1.7mm), fly ash, and flue gas, all of which were measured and analysed. The discussion of trace element associations with different ash fractions is further explored by separating out samples of silicate glass, ferrosilicate glass, and iron oxide components, which provides an interesting insight to the partitioning process. However, results from sink-float separation of fly ash seem less useful. Neither flotation yields nor ash values are provided for the fractions, although it is stated that the floats largely comprise un-burnt char.

The crux of the paper lies in the discussion of overall partitioning of elements into the four combustion product streams. Reliability of the supporting data can be evaluated by mass balance, that is, a comparison of the feed coal with the sum of the combustion products. The authors must be credited with stating such mass balances (as recovery %) for most trace elements. Recoveries are not given for major elements, but can be calculated. Excessively high recoveries for some components (e.g., P_2O_5 120%; CaO 130%; Na_2O 152%) raise doubts as to the success of the experiments. For the 25 trace elements listed in the combustion experiments, only 7 show recoveries in the range 80-120% for the lowest ash coal, many falling below 30%. The volatile elements Cd, Hg, and Cl fall below 10%. The low recoveries are attributed to problems with the gas sampling equipment, and given this assumption, it is surprising that the subsequent calculations and conclusions were not based on the assignment of all 'missing' analyte to flue gas. Instead, trace element behaviour has been characterised on the basis of *recovered* analyte, which greatly weakens many of the conclusions drawn.

Several problems appear to have contributed to the poor recovery figures. Some of these may be due to miscalculation. For example, in the case of B, Cl, and Cd in the low ash coal 2B, contributions from flue gas appear to have been neglected, approximately halving the recoveries. For S, this error has reduced recovery by 64%. In the case of Rb, a very high value of 536% falls to 265% when recalculated.

Some other analytical values must be regarded with suspicion. Cl values for all three feedstock coals are about sixfold greater than mean values for Greymouth coals analysed by conventional techniques (R. Boyd, pers. comm.). Perchloroethylene-washed coals cannot be analysed for Cl, yet this mistake has been made for the sink-float set and conclusions regarding Cl in sink-float fractions will be largely meaningless in both Li's original (2002) work and the present paper. It is possible that Cl contamination has also affected results from the feedstock coals. Whole coal sulphur values are also suspect: Those analysed by x-ray fluorescence and used as a basis for the calculations are all around 1.5 times the ASTM values, yet both are quoted without comment on the discrepancy.

The discussion would have benefited from a comparison of the Greymouth results with the those from similar overseas coals. In this respect, warnings over the concentration of hazardous elements in ash might have been tempered by a demonstration that the Greymouth seams generally contain much lower trace element concentrations than similar bituminous coals in USA and Europe. Although many of the findings of this paper may be relevant to industrial use of the Greymouth coals, much validation and correction remains to be done. This is important, because the paper currently stands as a benchmark work on the properties of the internationally-marketed Greymouth coals.

Reference cited

Li., Z . 2002. Mineralogy and trace elements of the Cretaceous Greymouth coals and their combustion products. Unpublished PhD thesis, (2 volumes).University of Canterbury.

NOTICES

Call for interest in an excursion to Solid Energy NZ's Stockton operationS

The visit will be a day trip utilizing Outwest Tours.

09.00 Depart Westport
09.45 Arrive onsite Stockton
Visit points of interest, eg ridgeline, current mining areas, rehab, snail capture and release programme, primary crushing, processing and haulage ......
Time out for lunch.
13.30 Q and A session with Mike Lynn
14.30 Depart for Westport
15.30 Arrive Westport

A packed lunch and drink will be provided.
The trip will cost $10 for members, and $25 for non-members of Minerals West Coast .

Seats will be accepted on a first come first served basis. We already have some 30 confirmed visitors so there is good interest in the excursion.

Outwest Tours have two Unimogs with seating for 16 and 21 respectively, ie Outwest can take 37 people per day.

To make each daily visit a goer we need at least 12 to 15 people

Possible dates are 27 to 29 March. In responding please list 1st, 2nd and 3rd date preferences. Depending upon when you reply you may not get your first choice.

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Call for Papers *NEW ZEALAND JOURNAL OF GEOLOGY AND GEOPHYSICS*

Times to publication for submitted papers have improved recently as a result of the increased use of electronic submission and proofing procedures. Average times during 2006 were 45 weeks for the print journal and 38 weeks for the online version. Unfortunately, the number of submissions to the journal during this period declined below average. Consequently, ***there is now an empty cupboard in the editor's office waiting for more papers to come and line its shelves!***

If you have a paper ready or nearly ready for submission, please do consider NZJGG as a first choice. Not only is the journal the most relevant for research from the New Zealand/Pacific region, but it is also well distributed throughout the world, and is included in a growing number of online journal databases and search engines. This means that the articles are readily available for many other researchers.

The journal is keen to become open access, which means that any reader has free and unobstructed access through the web to articles published in the online version. As part of the move towards open access for all the research journals published by the Royal Society of NZ, authors of accepted papers will now be given the option of paying NZ/US$1500 (incl. GST in NZ) to make their paper immediately available online.

Other articles, including invited papers and book reviews, will also be freely available upon publication. Note that authors who choose the Open Access option will not pay page charges.

Published papers are otherwise available only to journal subscribers for a period of two years following the year of publication.

Send you papers now or let the Editor (rob.lynch@rsnz.org) know if you have one in the pipeline.

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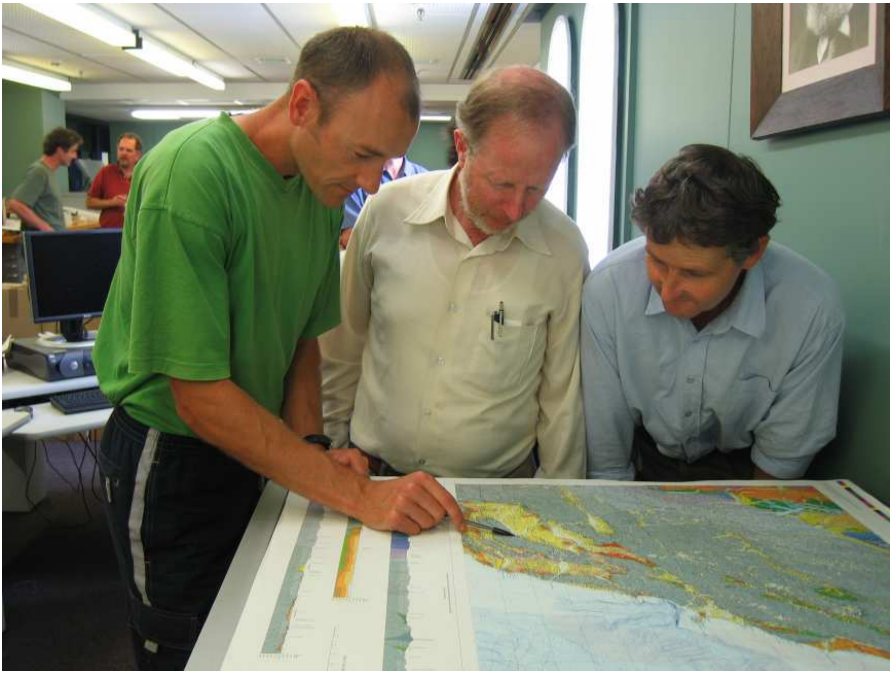
QMAP Kaikoura

Simon Nathan, *Wellington.*
GNS Science has just released the latest map in its QMAP (1:250:000) series. QMAP Kaikoura is the largest sheet so far published, covering most of the Marlborough region (including the Inland and Seaward Kaikoura Ranges), and extending south as far as the Hurunui River. This includes a huge area of greywacke, with considerable new structural information including trend lines mapped over the whole region. It also includes the results of detailed mapping of the major transcurrent faults (including the Awatere, Clarence and Hope Faults).

Many people have contributed to the map and accompanying text, but the three major compilers are Mark Rattenbury, Dougal Townsend and Mike Johnston. At the launch of the map, Mark Rattenbury paid tribute to Mike Johnston, who is named as author or compiler of 13 published geological maps – and has probably spent more time mapping New Zealand greywacke than anyone else.

Interestingly the map covers much of the huge region mapped by Horace Fyfe in the 1920s and 1930s for the unpublished Kaikoura subdivision, as well as the Murchison subdivision to the north-west, and his work has been incorporated and updated.



Geologist Dougall Townsend (left) discusses features of the new Kaikoura sheet with Mike Johnston (centre) and Mark Rattenbury (right)

2007 Royal Society Medals and Awards

The following medals and awards, of relevance to geoscientists, are being offered in 2007 by the Royal Society of New Zealand. The closing date for all nominations is 30 June 2007. Nominations can be made by any individual but if you would like the Geological Society's backing , I am happy to help write a nomination, and get the National Committee's approval at its next meeting on 8 June.

- **Charles Fleming Award -** for environmental achievement
- **Hamilton Memorial Prize** for beginners in scientific or technological research in New Zealand
- **Hatherton Award** for the best scientific paper by a PhD student at any New Zealand University in physical sciences, earth sciences and mathematical and information sciences
- **Hector Medal** - Physical sciences

- New Zealand Science and Technology Medals - to recognise and honour those who have made exceptional contributions to New Zealand society and culture through activities in the broad fields of science, mathematics, social science, and technology
- Pickering Medal - to recognise excellence and innovation in the practical applications of technology
- **Rutherford Medal** - for exceptional contributions to New Zealand society and culture through activities in the broad fields of science, mathematics, social science, and technology
- Thomson Medal - for outstanding and inspirational leadership in the management of science and outstanding contribution in the development and application of science and/or technology to wealth generation

Electronic copies of the information and application forms are available from awards@rsnz.org; copies are also available on the Society's website http://www.rsnz.org/awards/academy_awards/

Nick Mortimer
GSNZ Awards Subcommittee Convenor
n.mortimer@gns.cri.nz

SOCIETY BUSINESS

THE GEOLOGICAL SOCIETY OF NEW ZEALAND (INC)

Minutes of the 51st Annual General Meeting
Held in Massey University, Palmerston North, at 4.50pm
6th December 2006

President Keith Lewis welcomed 32 members to the meeting.

1 **Apologies:**

Kari Bassett, Peter Ballance, Roger Briggs, Tony Hocken, Helen Neil, Cam Nelson, Alan Palmer, Julie Palmer, David Smale, Richard Smith, Kerry Stanaway.

Moved: Nick Mortimer/Jan Lindsay that these apologies be sustained.

The Chairman asked members to remember the great contribution of Bob Duncan who had died during the year. Bob was the founder of the Geological Society in Taranaki.

2 **Minutes of 2005 AGM**:

Moved: Jack Grant-Mackie/Hugh Grenfell that the Minutes, taken as read, be a true and accurate record of that meeting.

3 **Matters arising from the Minutes**:

There were no matters arising.

4 **Official Reports**:

a. **President's Report**:

The 51st Annual President's Report 2006 is printed in the November Newsletters No. 141.
Keith made special mention of the present Committee who had supported him so well during the year and thanked those who had recently worked to get the submissions about the School Curriculum to the Ministry of Education.

Moved: Keith Lewis/David Skinner that the President's report for 2006 be accepted. Carried.

Hamish Campbell passed a vote of thanks to the President for his leadership during the year and the members responded with acclamation.

b. **Treasurer's report**:

The financial accounts for the year ended 31 Mach 2006 are printed in Newsletter No. 141 November 2006.

David Skinner reported that the present year's finances appeared to be heading for a deficit by April 2007 and moved that the annual subscriptions for full and retired membership of the Society be increased by $5.00 and that the student's subscriptions should remain the same. After lengthy discussion, mainly about reducing costs of the Newsletter, the motion was lost (16/13).

Suggestions about reducing the costs of the printing and distribution of the Newsletter included:

- Send Newsletters out in digital form
- Send some Newsletters in digital form, the rest printed.
- That members be surveyed to ascertain their preference for either for printed or digital format.
- That there be a consistent effort to reduce the costs of printing the Newsletter.
  It was pointed out that matter had been discussed at length at a committee meeting earlier in the year when it was felt then that many members would prefer a Newsletter (of typically 64 pages) to be printed and that a partial printing would save little. Nevertheless, it

was agreed that the incoming committee should investigate the matter further.

Hugh Grenfell passed a voted of thanks to David Skinner for his report and for the time and effort he puts into keeping the finances of the Society. The meeting expressed their thanks with acclamation.

David Skinner, who has been Treasurer for the past eight years, indicated to the Meeting that, if for any reason he was unable to continue as Treasurer, the Society should be thinking of someone who could step into his place, if he needed to step down.

c Administrator's Report

Beth Wallace presented her report on the membership of the Society.

Moved: Mike Johnston/David Skinner that the Administrator's Report be accepted. Carried.

d **Subcommittees**:

The reports have been circulated in GSNZ Newsletter No. 141 November 2006.

e **Special Interests Groups**:

Special Interest Groups Reports are printed in GSNZ Newsletter No. 141 November 2006.

f **Branches**:

Branch reports are printed in GSNZ Newsletter No. 141 November 2006.

5 **Election of Officers and Committee for 2007**:

The following members were elected to stand on the National Committee:

Office		**Moved**	**Seconded**
President	Keith Lewis	Murray Gregory	Jack Grant-Mackie
Vice-President	Nick Mortimer	Mike Johnston	David Skinner
Treasurer	David Skinner	Keith Lewis	Jack Grant-Mackie
Secretary	Helen Neil	Scott Nodder	Acclamation
Committee			
	Ursula Cochran	Hamish Campbell	Nick Mortimer
	Jan Lindsay	Mike Johnston	Hugh Grenfell

	Alan Palmer	Jerome Lecointre	Clel Wallace
	Kari Bassett	Jim Cole	David Skinner
	Richard Smith	Keith Lewis	Mike Johnston
	Mike Johnston	(immediate Past-President)	

Moved: Bruce Hayward that nominations be closed.

The new Committee for the year was greeted with acclamation.

6 **Awards Trust – election of Trustees**:

The Rules of the Awards Trust state that one of the members of the Trust should stand down every two years. Ursula Cochran was the member to stand down this year.

Moved: Mike Johnston/David Skinner that Ursula Cochran be re-elected to the Awards Trust Committee. Carried.

7 **Any other business**:

Retirement from National Committee:
Hugh Grenfell has been a member of the National Committee of the Society for the past eight years and he has given notice he wishes to retire from the Committee.

Keith thanked Hugh for his commitment to the Society and for his energetic input into numerous projects over the years. The members thanked Hugh with acclamation

Geo-Education:

Daphne Lee wishes to retire from this Committee, and it is important to seek a new group to sponsor the Geo-Education Committee. Names suggested were Jenny Pollock, Kel Anglesea, Kerry Swanson, Leah Moore (Australia), Jan Lindsay.

The International Year of Planet Earth 2008 (IYOP) .

Society involvement in this was discussed. Vince Neall is the national coordinator for this event. It was agreed that details of society involvement should be discussed at the next National Committee Meeting.

Ian Graham's monographs on the past and future of New Zealand Geology was mentioned as one contribution to IYOP . Because the monograph is to be distributed to secondary schools, it was suggested that the draft be given to secondary-school teachers for perusal before printing.

2007 Conference:

This Conference is to be organized by the Waikato Branch. David Lowe spoke of the planning so far, and the venue is to be Tauranga during the last week of November. David Lowe was assured of the backing and support of the National Committee.

The meeting concluded at 5.30pm

Geological Society NATIONAL AWARDS

- The **McKay Hammer**, the Society's premier award, went to Dr **Tim Naish** of GNS Science for his preface and two first-authored papers on the Plio-Pleistocene marine record of the Wanganui Basin published in a benchmark issue of J. Roy. Soc. NZ 2005.
- The **Hochstetter Lecturer** for 2007 is Professor **Paul Williams** of the School of Geography and Environmental Sciences, Auckland University. A long-time member of the society, he will speak at all branches on his pioneer work in deciphering the high resolution palaeotemperature records of stalactites and stalagmites in Nelson and Fiordland caves. This is a refreshing new look at Quaternary palaeoclimate and landscape evolution in New Zealand.
- The **Kingma Award** for the outstanding science technician of 2006 went to Dr **Ritchie Sims**, of Dept of Geology, Auckland University for exceptional initiative and technical ability in development of an internationally used electron microprobe facility, as well as being a fount of technical advise for staff and students.
- The **Pullar Prize** for meritorious contributions to tephrochronology was awarded to Professor **Brad Pillans** of ANU, Canberra for his masterly work on, and synthesis of, the tephra record in the Wanganui Basin.
- Incredibly, the **Wellman Research Award,** a scholarship of about $4,000, was not awarded this year because there were no applicants! Although there is a "preference for younger applicants", the rules to not preclude retirees if they need the money to pursue a good idea. The only requirement is that you must report your results in the Newsletter!
- The **Harold Wellman Prize** for the most significant recent fossil find, which went to the **Hamilton Junior Naturalist Club** for their discovery and incredibly careful retrieval of a giant Oligocene penguin skeleton from Kawhia Harbour. Two van loads of the club's youngsters arrived from Hamilton to collect their prize.

STUDENT AWARDS

The **Hastie Scholarships** are awarded to one person from each university each year to support their research on the recommendation of their HOD.

Auckland: **Alison Kirkby** (Kaimai Ranges structure from gravity/mag)Waikato:**Alison Graettinger** (Pre-1995 Ruapehu lahar deposits)Massey: **Anja Moebis** (Pyroclastic eruptions from Tongariro)Victoria: **Aidan Allan** (Miocene-Recent tephras in ODP cores)Canterbury: **Brendan Duffy** (Internal structure of fault zones)Otago: **Bridgette Lewis** (Tephra provenance in the Wanganui Basin)

Student Conference Presentations

Verne Pere (Canterbury) – Antiscarp formation modeling

Anke Zernack (Massey) – K2O enrichment at Mt Taranaki

2006 GSNZ Waikato branch report

Kyle Bland,

Kyle Bland and Penny Cooke began the year as branch contacts for 2006, with Richard Smith continuing his role as branch treasurer. Towards the end of the year Kyle and Richard moved to Wellington, and Penny left for England. Steve Hood and Rochelle Hansen have stepped into the role of branch contacts.

11th April: Terry Leach, in his presentation "The BRE-X Files", talked about the geological setting of the Busang gold project, Kalimantan Indonesia, and the history, disclosure and fallout from the largest fraud ever in the mining industry in which 6 billion dollars were lost overnight on the Toronto Stock exchange.

29-30th April: In conjunction with the Taranaki Branch of the GSNZ, a weekend fieldtrip was run to the area around Waitomo, Marakopa and Kiritehere. The excursion began at the Wairere serpentinite quarry near Piopio, before traveling to Ruakuri Cave and Ruakuri Bush at Waitomo, the Mangapohue Natural Bridge, Marakopa Falls, and our overnight accommodation at Kiritehere. Participants survived a monsoonal-like downpour during the afternoon, and an enjoyable BBQ dinner washed down with plenty of liquid refreshments. The second day saw the fieldtrip visit Kiritehere Beach before heading south to Waikawau Beach, Taumatamaire Road, and the Awakino Gorge.

9th May: In association with Café Scientifique, Professor David Hamilton led a discussion on lake restoration.

17th May: Gegar Prasetya gave an eye-opening presentation on the two earthquakes and tsunamis that happened on 26th December 2004 (Sumatra-Andaman) and 28th March, 2005 (Nias in Indonesia). It covered the results of the field survey that had been conducted for both events (including the controversy of the 28th March events):

- Tsunami wave height and flow depth characteristic,
- Subsidence and uplift following the earthquake and how they influence the tsunami characteristic and perception of the local people based on their local 'knowledge'
- Tsunami impact on the coastal landscape and structure
- Recent tsunami deposit and paleo-tsunami deposit

- Using coastal geology and numerical models of tsunami dynamics to reduce the future hazards and risks.

19th July: Bruce Hayward delivered his Hochstetter lecture, “deciphering New Zealand’s geological and environmental history using foraminiferal microfossils – ocean currents, human impacts, sea level rise, and earthquakes. The talk was well attended thanks to good publicity in the local Hamilton newspapers. His supporting lecture, “The last global extinction in the deep sea, during the mid-Pleistocene climate transition”, was presented the next day in the Department of Earth and Ocean Sciences.
17th October: The Waikato Branch again sponsored a prize for an oral paper in the Department of Earth and Ocean Sciences annual Student Conference.

2007 JOINT GEOLOGICAL SOCIETY AND GEOPHYSICAL SOCIETY CONFERENCE

Will definitely be held in Tauranga. Co-convenors are Keith Lewis and Susan Ellis.
Talks and posters will be held on Tues 27 to Thurs 29 Nov 2007 inclusive. There will be an icebreaker function on the Monday night, and pre- and post-conference fieldtrips will be offered. The first, and only, circular will appear in the July newsletter and the GSNZ website.

Tauranga Meeting Site

ENJOYING THE MASSEY CONFERECE DINNER

Hamilton Junior Naturalists awarded for their Penguin Find

Inspector Jerome ---"Watties eet ma petite can-can?"

Ursula you have some odd French friends !