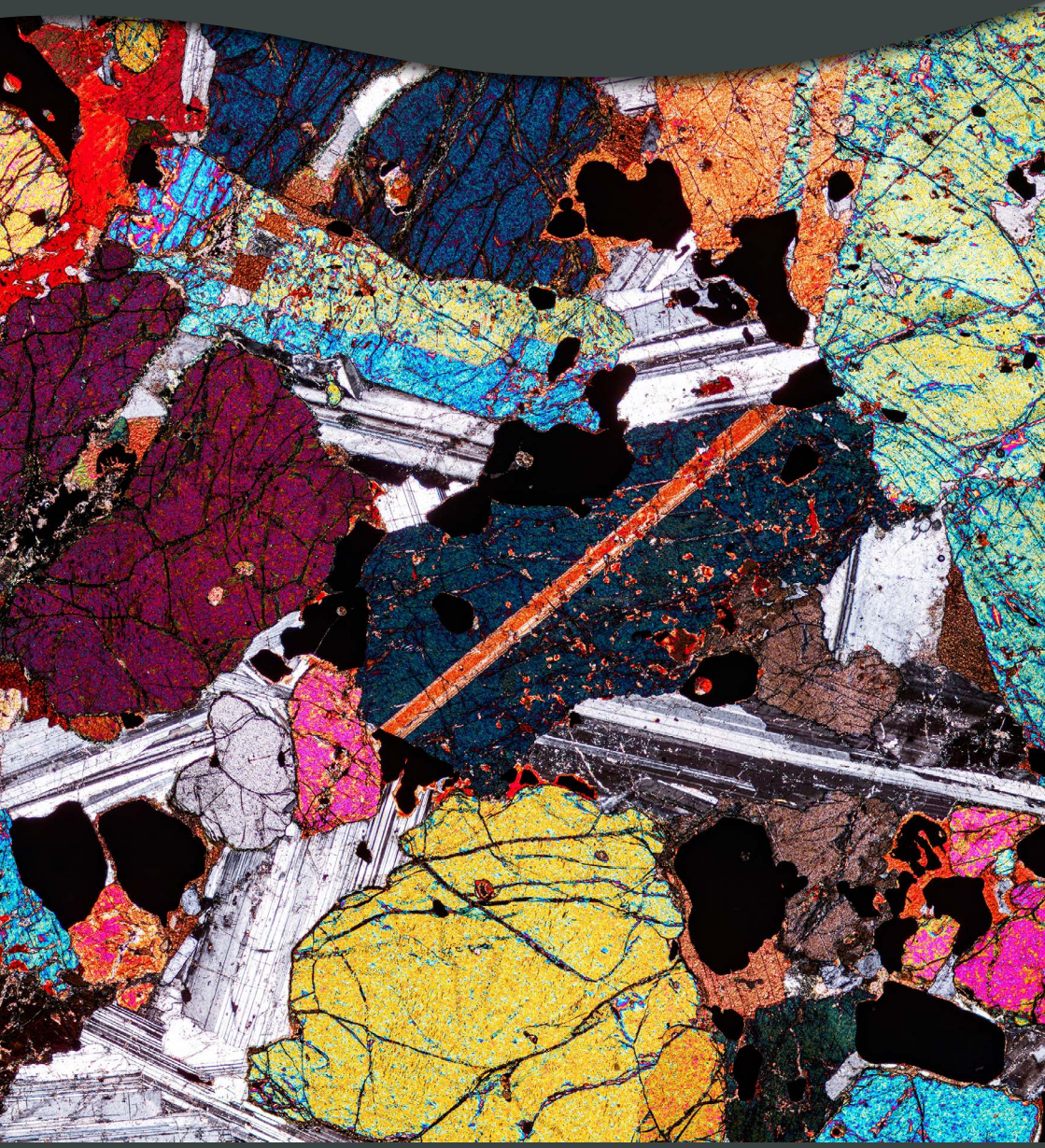
Geoscience Society of New Zealand

NEWSLETTER

ISSUE 35



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Geoscience Society
of
New Zealand

GEOSCIENCE SOCIETY OF NEW ZEALAND

A member body of the Royal Society of New Zealand
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NOTICES, EVENTS, REPORTS

NE tip of Kaikoura Peninsula, 2021 Photo credit: Bruce W Hayward

Geoscience Society of New Zealand Newsletter - Issue 35

James Scott
President

Handley et al. (2020) argue that *"In Australasia, gender is still on the agenda in geosciences".* They provide statistics that show females remain under-represented in geoscience careers in Australasia.

In the department I work in, the teaching staff currently comprise 11 men and 4 women but the undergraduate and postgraduate student balance is much closer to 50:50. This staff imbalance is problematic because females in leadership roles are role models, and they are often required to participate in more curricular and extracurricular activities to provide a better staff gender split. The disparity in staff genders probably reflects the turnover of academic staff being vastly slower than the average student, although it is also important to acknowledge the difficulties in employment parity that women face compared to their male counterparts.

How is the GSNZ committee doing in gender diversity? Following an effort to address the diversity issue, the committee had 6 females and 9 males in 2020, and the current committee comprises 8 men and 8 women.

Handley et al. make the case that 5 GSNZ awards have largely gone to males. They state: *"The five GSNZ awards considered show… 25 women receiving awards out of 136 total awards (18%) but this is still far from equity."*

While that statement is correct, it is more relevant to look at, say, the last 10 years and assess the equity over that period (Table 1). This is because the society has historically been male-dominated and so awards will have proportionally gone to those members. It is evident that even today that some of the awards are not yet close to being evenly distributed – over the last 10 years the Hochstetter and NZ Geophysics Award recipients, for example, remain dominantly given to males, whereas the Kingma Award recipients have mainly been women. It is re-assuring that the top society prize, the McKay Hammer, has had a near 50:50 split over the last 10 years, and it should be expected that, given the quality of research undertaken in NZ (with the implicit assumption that this is the criteria for selecting awardees), this even distribution will be maintained for the future. Awards to students are more evenly split. It is a fair point that all the named GSNZ Awards are after men – although it should be recognized that some of these are significant bequeathments or funds that have come from those people, or the estates of those people, and changing the names is not an easy process. The GSNZ committee will continue to investigate possibilities in this field. What are your responsibilities? It is critical that members nominate worthy female recipients for awards. We encourage more females to indicate their interest in leading (or setting up) Special Interest Groups; currently only the Geoeducation and International Development and Early Career SIG have female leaders. We welcome other suggestions on how to improve the situation, and members volunteering to help the committee address the gender division. Further information has been published by Simon Nathan in previous versions of the Newsletter. ■

Reference:

Handley, H. K., Hillman, J., Finch, M., Ubide, T., Kachovich, S., McLaren, S., Petts, A., Purandare, J., Foote, A., and Tiddy, C.: In Australasia, gender is still on the agenda in geosciences, *Adv. Geosci., 53*, 205–226, https://doi.org/10.5194/adgeo-53-205-2020, 2020

Table 1: GENDER BALANCE FOR GSNZ AWARDS OVER THE LAST 10 YEARS

	Female	Male	
McKay Hammer	5	6	(joint winners, 2017)
Hochstetter Lecturer	1	9	
Wellman Research	4	6	
Kingma	8	2	
NZ Geophysics	2	8	
Giggenbach	3	3	
Pullar-Vucetich	3	1	
Harold Wellman	3	9	(several joint winners)
Wellman Research	4	6	
Student: Jim Ansell	5	4	
Student: John Beavan	1	2	
Student: Hornibrook	1	4	(1 joint winner)
Student: SAGE	4	4	
Total (percent)	**44 (43%)**	**58 (57%)**	

Janis Russell
Editor

Three articles in this issue of the Newsletter link elements of the past and future of geoscience. The president's letter (p10) discusses our historical GSNZ Awards legacy in terms of gender balance, Glenn's article on student retention in Earth Science (p18) tracks the decreasing participation in, and status of, Geocience and the article by Haidee Cadd and Lynda Petherick takes an Australasian perspective on Diversity and Inclusivity (p46).

It is clear from the current discussion space around Covid 19 that people, including scientists, have a tendency overestimate the power of information (facts) and underestimate the power of emotion in decision making, persistence, and learning— about anything. In science communication circles this one way flow of correct information from 'expert' to 'novice' has come to be known as the deficit model of science communication.

This model sees the problem as one of people not knowing enough and if we just fill them up with the right knowledge, taught in the right way, they will know everything they need to know to make the 'correct' decision. This can be in relation to medical decisions, or to environmental problems, or even which courses and major to choose when entering university.

There has been a persistent notion that in order to save the planet we must understand it. Furthermore, to understand it, it must be taught to us in school and taught well. Advocacy continues unabated for all kinds of important scientific and social issues to be added to the school curriculum. Yet, the prevailing political and economic climate along with societal values and those in our social circles have as much, if not more, influence on our beliefs, attitudes and behaviours especially when it comes to 'saving' the planet— or ourselves.

There is also pressure and uncertainty for today's young people who cannot be assured of job security or a compatible career fit. While generalisation is unpopular, characterised as knowing a little about a lot, it does make for an element of flexibility in uncertain world. Is it really necessary to know the details of how the planet works prior to leaving high school? Or would that time be better spent on the learning the basic subjects well and using that time to find out suits your talents and desires best then, later, what satisfies your own curiosity most?

Increasing the appeal and participation of school students in the geosciences is a reasonable goal. But in a world where so much is competing for their attention, would not taking those courses at school really affect their ability to become geoscientists? And, especially, when all it takes is one inspirational person, event or interaction in an unassessed, unpressured environment to spark a curiosity and interest that could burn in them for life.

Beyond student life, positive experiences and an environment that David Mogk describes as "welcoming, inclusive, safe and supportive"[1 p67] also helps with retention and attraction to professional organisations and workplaces. Encouraging diversity will widen the available pool of people's backgrounds, experiences, and preferences and allow us to benefit from the alternative perspectives, talents and approaches that enhance creativity and problem solving. According to Mogk, "It is not too strong a statement to characterize the lack of diversity in the geosciences as an existential threat to the longterm health of the discipline."[1 p70]

So whether it is attempting to rectify gender imbalances at GSNZ, encouraging participation in learning about geosciences, providing an environment conducive to attracting and retaining a diverse range of potential geoscientists or, indeed, creating a pathway for expanding traditional disciplinary boundaries for geoscience related employment, there is much work to be done in the near future. Time to roll our sleeves up. ■

[1]Mogk, D. W. (2021). *The intersection of geoethics and diversity in the geosciences*. Geological Society, London, Special Publications, 508(1), 67-99.

WELCOME TO THE WAITAKI WHITESTONE GEOPARK

Lisa Heinz

Geopark 101

Geoparks are the newest UNESCO designation. A geopark is a defined area that advances the protection and use of geological heritage in a sustainable way, and promotes the economic well-being of the people who live there. Geoparks use that heritage to promote awareness of key issues facing society in the context of our dynamic planet.

Geoparks are not just the preserve of geologists and rock-hounds. They are about telling the stories of how the land (and sea) have and will continue to support our existence, and shape our lives. Geoparks are a unifying platform for the stories of our lives – from how the land has sustained our need for food and shaped the cuisine of our places, to the development of built form and architecture, and (in our case) to the development of irrigation, electricity generation and social support systems for our people.

The Waitaki Whitestone Aspiring Global Geopark

The Waitaki Whitestone Geopark is currently an aspiring Geopark, having applied to UNESCO in November 2019. We are now awaiting the validation mission. As New Zealand borders are still closed and many international travel restrictions are in place, the validation mission will be delayed until it is safe for the evaluators to travel again. Irrespective of the new timeline for the UNESCO validation mission, the work for us in Waitaki as an aspiring Geopark does not stop. We are working with our partners on interpretation and signage, touring routes, education programmes and much more. We are excited to share our new logo with you! The rebrand reflects our drive to look homeward rather than internationally and emphasises the Geopark's deep connection with the land and people of Waitaki and close relationship with Te Rūnanga o Moeraki.

Our beginnings (Vanished World)

The Waitaki Whitestone Geopark had its genesis in the Duntroon area, with marine fossil discoveries made by Professor Ewan Fordyce, his colleagues and students from the University of Otago's Geology Department in the 1980s/90s.

Excited by these discoveries, the local farmers were keen to share the stories of these treasures uncovered in the Otekaike Limestone and Kokoamu Greensand of the Oligocene Epoch. In 2001 Vanished World Inc was formed. This led to the creation of the Vanished World Trail featuring over 15 locations of geological interest spanning from Moeraki to Ōamaru along the coast, and inland through the Waitaki Valley.

▲ Vanished World, Duntroon

Following this, the Vanished World Centre in Duntroon was established – showcasing finds from the local area – including whale, dolphin and penguin fossils/casts. The marine fossil story is explained in the context of the geological formation of Zealandia. It was at this time that the idea of developing a UNESCO Global Geopark focussing on the Duntroon area was initially explored. From these beginnings - the concept of creating a Geopark was extended beyond the Duntroon area, to incorporate the whole Waitaki District. This enabled other geological and cultural treasures to be incorporated, such as the Te Kaihīnaki / Moeraki Boulders. These treasures are called "geosites" - with 42 being identified throughout the Waitaki District.

Our philosophy

Our philosophy is to make earth science accessible and relevant to our communities – in a form and context that is relatable to them. We do this through a variety of mediums including:

- Hands on learning in local schools
- Teaming with the Vanished World Centre in Duntroon
- Talks to local community groups and promoting sites of interest (geosites) they can visit
- Public talks where we host experts who talk about their area of research and experience on topics relating to areas within the Geopark
- Bus tours with stops at sites of interest
- A weekly radio broadcast
- Creating online resources for teachers and families to use

Through each of these we promote the geosites – many of which are accessible to the public to visit and will (with time) have interpretation boards at. So, people can not only learn about the sites from the above methods – but also visit and experience them.

Our aim is to bring to life the stories behind our geosites and to put these into context of the larger story of the formation of the continent that New Zealand is part of — Zealandia. We promote the idea that when you visit a site not only are you in a location geographically... but you are in a location that showcases rock that was formed a long time ago – you are in a particular point of geological time. We want to get people thinking – what was the environment at that time? What do fossils found at this site tell us about life that existed at that time? What happened before and after? Each geosite forms part of the puzzle of the timeline in the formation of Zealandia – and understanding the geological history of individual sites builds our overall knowledge of our land. Using the knowledge gained from understanding our land and its formation, we want to encourage people to think about present day Earth processes – and our interactions with our environment - including our ecosystems and biodiversity within our geopark. These are topics we want to raise and partner with other experts to help to answer these questions. ■

Hands-on geo-learning ▼

REFLECTIONS ON A GEOLOGICAL CAREER IN HONG-KONG

Roderick Sewell: Former Head of the Hong-Kong Geological Survey

After completing a PhD at the University of Canterbury, followed by four and half years working for the then New Zealand Geological Survey (now GNS Science), I was looking at opportunities for some overseas experience. Excluding the seven weeks I spent in Antarctica field mapping during the 1988/89 summer field season, the only other professional experience I had undertaken outside of New Zealand was attending the 1989 IAVCEI International Volcanological Congress in the USA. So, with a young family, it was important for me to complete this chapter early in my career so that I could return to NZ to contribute to the scientific community.

▲ Columnar-jointed crystal-bearing fine ash vitric tuff of the High Island Formation, (c.141 Ma), associated with the High Island "Super-eruption". (Photo: Lloyd Homer)

As a trained igneous petrologist/geochemist, I was inclined towards joining a research group exploring primary igneous rocks. But, when I spotted an advertisement in Business Section of The Christchurch Press, for a "Mapping Geologist" with the Hong Kong Geological Survey, I simply could not resist in applying. In short, I was offered and accepted the job (initially for three years only). Fieldwork in Hong Kong was very different from that which I had experienced in NZ. I was not allowed to drive a vehicle to the field, so had a "driver". I was not allowed to do field work on my own for safety reasons so was accompanied by a full time field assistant, known as a "Technical Officer", or simply "TO". I was immediately immersed into the British Geological Survey modus operandi. "On your horse, six months food supply, a field assistant, and instructions to produce a geological map for your designated field area". Well, not quite like that, but close. I was no longer a specialist petrological researcher, but a "Mapping Geologist", capable of mapping any geological terrain, under any conditions, and across multiple disciplines. Rapidly, I was introduced to applied geology. Tunnels, bridges, highways, landslides, quickly came under the radar, which sent me scrambling to revise my undergraduate engineering geology lecture notes.

▲ Looking southwest over Kowloon towards Hong Kong Island, which is underlain by the subvolcanic Kowloon Granite pluton (c. 140 Ma). (Photo: Lloyd Homer)

▲ Kink-banding in crystal-bearing fine ash vitric tuff of the High Island Formation (c. 141 Ma), exposed at the High Island East Dam, Hong Kong Geopark. (Photo: Lloyd Homer)

I felt I was thrown into the deep end in my first week. Having spent the previous ten years focused on basaltic igneous petrology, with slight excursions into neotectonics, and economic geology, I was immediately thrust into mapping buried karst landscape and its impacts on new housing development sites. I soon learned what a mazier was, and an SPT! I had never looked at detailed core logs before, but was immediately asked to interpret complex ground conditions from drill core. It was a baptism of fire!

Within two years, I had re-oriented my thinking. Having spent my early career at one end of the field mapping and igneous spectrum (basaltic), I began to learn about the other end (rhyolitic) and in particular, the volcanic and plutonic rocks (granites), which make up 50% of Hong Kong's geology. It was an eye-opener, very challenging, and exciting. During my PhD studies, I had worked in a geochronology laboratory in Lower Hutt. Early whole-rock and mineralogy K-Ar geochronology on Hong Kong granites had been rather imprecise, so we began applying the then cutting edge Rb-Sr whole rock geochronology. We discovered that our igneous rocks (mostly granites and rhyolites) were of late Jurassic to Early Cretaceous age, but the errors were large. Meantime, I was busy producing geological maps at 1:5,000 scale for new infrastructure projects. These included a new town for the planned international airport at Chek Lap Kok and the supporting highway and rail infrastructure. But obtaining more precise ages for Hong Kong igneous rocks was beckoning. Soon an opportunity arose to apply high precision zircon U-Pb dating to Hong Kong rocks, and the results were transformational. In short, we discovered an amazing igneous geological story for Hong Kong, culminating in the discovery of an ancient "super volcano". We produced several published papers, and two books, on these discoveries the latter of which can be downloaded free of charge from the Hong Kong CEDD website.

Aside from the research highlights, everyday duties included screening for natural terrain landslide hazards, scrutinizing planning applications, and attending to routine public enquiries. Sometimes I was requested to serve as an expert witness in court cases. Being cross-examined in the witness box by an aggressive attorney is not a pleasant experience, but I learned so much about forensic geology. Other projects included soil bioengineering, concrete petrography, climate change studies, regional geochemical surveys, and landslide geochronology.

After three years in Hong Kong, I was offered the choice to renew for another three years with the HK Geological Survey. Unfortunately, there was no longer a guarantee of a job back in NZ, so I decided stay and remained for the next 27 years! In 2005, I became Head of Hong Kong Geological Survey until my retirement in 2020.

Our children grew up in Hong Kong and were educated at international schools. All left Hong Kong to attend overseas universities. My wife and I have since returned to NZ, where I hope to reintegrate with the local geological community. ■

EARTH SCIENCE STUDENT NUMBERS FOR NCEA

IN NEW ZEALAND SECONDARY SCHOOLS

Glenn Vallender

Introduction

Recent past President of the UK Earth Science Teachers' Association (ESTA) Prof. Ian Barker issued a call to prevent the extinction of Geoscience (Geology in the UK) in education systems. https://www.iom3.org/resource/get-talking---to-save-the-planet--we-must-understand-it.html.

Although there are differences of view and definitions of what Geology and Geoscience actually are, the key notion is that understanding how the Earth works within an interacting system of the geosphere, biosphere, atmosphere and cryosphere is what students should leave school knowing something about. The current 'socialisation' of the Sciences is an added curriculum burden. Assessment is a key part of education just as curriculum design is a controlling factor on what is actually taught in the classroom, lecture theatre or laboratory.

The following from Prof. Barker highlights a key issue of global geoscience education. New Zealand is not immune from this and recent Science curriculum changes echo the many issues raised by Prof. Barker. Although teaching geoscience at all levels is a minority 'subject', it is hanging in there across the globe, but differently. "Whereas once there were six institutions training Geology teachers, today there are none..... Geology at GCSE level is less favoured since it is not seen as part of the science 'bucket', and so plays a minor role in school league tables. This has reduced the ambition within schools and colleges to offer 'minority subjects'. These changes have brought Geology to a cliff edge – students are less likely to be offered a Geology GCSE, they are unable to take a fourth subject at AS level, and so fewer are studying it at A-level" (Barker, I., 2020).

The data presented has been extracted from public domain online NZQA secondary school statistics sources and shows student numbers for both external and internal standards for assessment. NCEA embodies the National Certificate of Educational Achievement for NZ students at senior High School (15–18-year-old students). Data is presented for student numbers for both internally and externally assessed standards within the national science curriculum. External assessment tasks ('exams') are controlled by NZQA under some direction from the Ministry of Education. External examination data also enables a comparison of student numbers sat under controlled conditions. This eliminates aspects of internal assessment such as the complexity and authentication of including group work and access to actual or potential external assistance for task completion.

It is hoped that the data presented will generate discussion concerning the status of ES in schools (as shown by this dataset) and the future impact on tertiary geoscience education, industry and research. Figure 4 is sobering. It shows the averages of those students at school who were candidates in an externally assessment Science standard, 74% had 'dropped out' of 'science' by their final year of school. Earth Science continues to languish mostly at the bottom. There are about 350 secondary schools (Year 7-15) in NZ. It should be noted that this data does not include those who 'drop out' of an individual course of instruction.

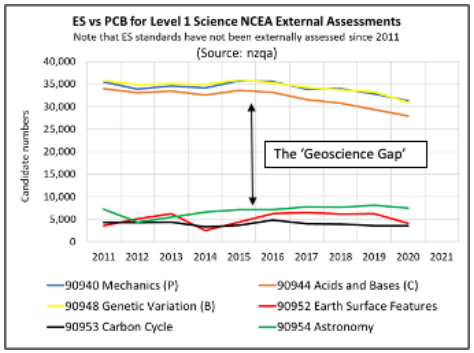


Figure 1. The Geoscience 'gap' between Phys. Chem. and Bio. has never been closed! Code numbers refer to NCEA achievement standards.

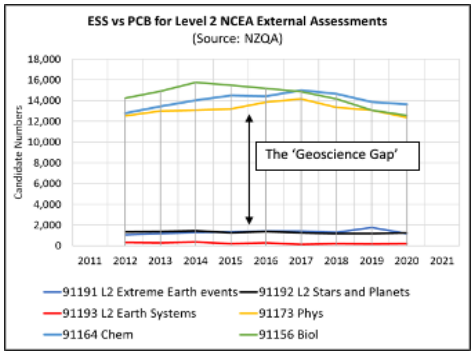


Figure 2. The 'gap' remains at Level 2 NCEA. (ESS = Earth and Space Science).

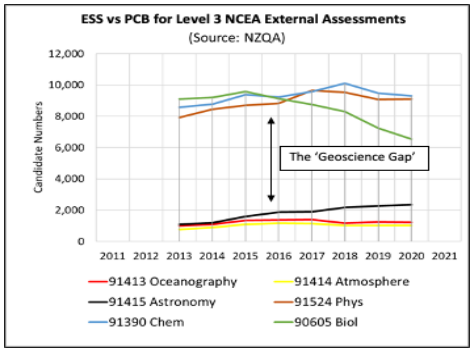


Figure 3. The 'gap' persists at NCEA Level 3 (Last year of secondary school).

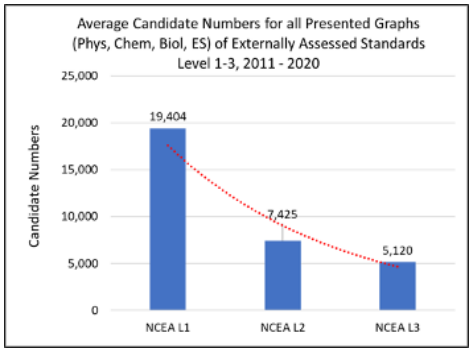


Figure 4. General decline in students 'doing' Science at secondary school.

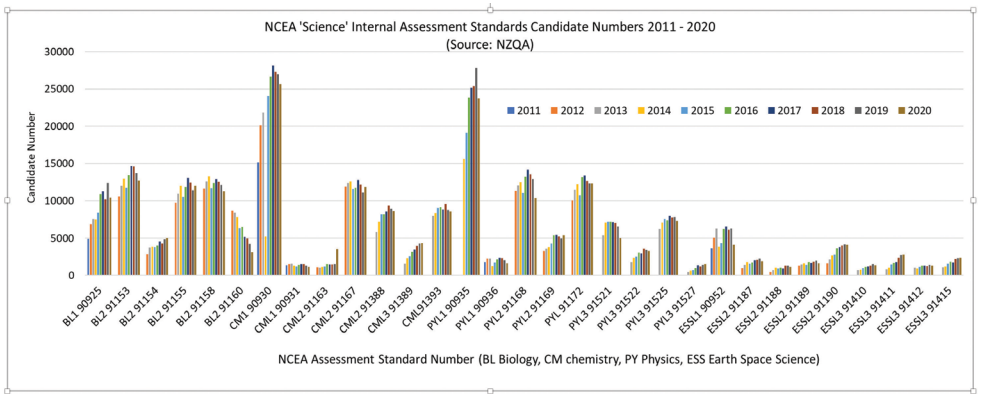


Figure 5. Change in student numbers for key internally assessed standards for NCEA. Achievement standard title descriptions available on table 2 and here: https://www.nzqa.govt.nz/ncea/subjects/earth-and-space-science/levels/

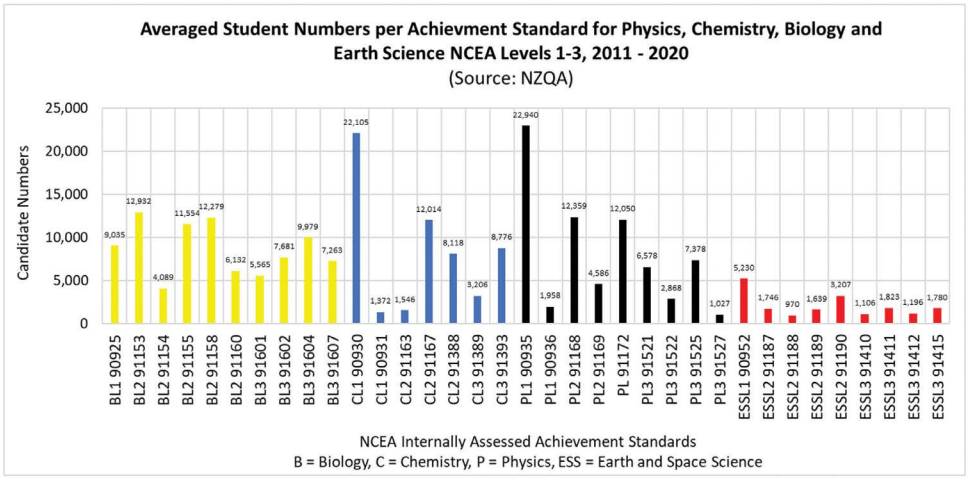


Figure 6. Averaged student numbers 2011 – 2020.

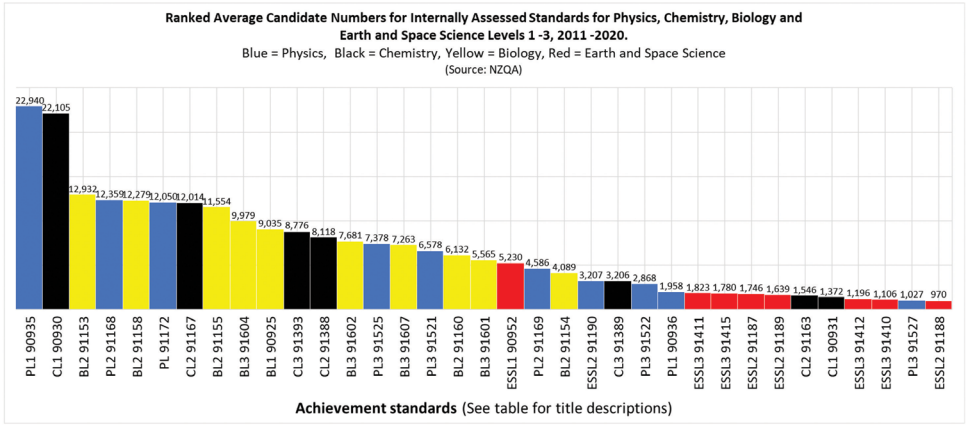


Figure 7. Ranked averages for internally assessed standards 2011 – 2020.

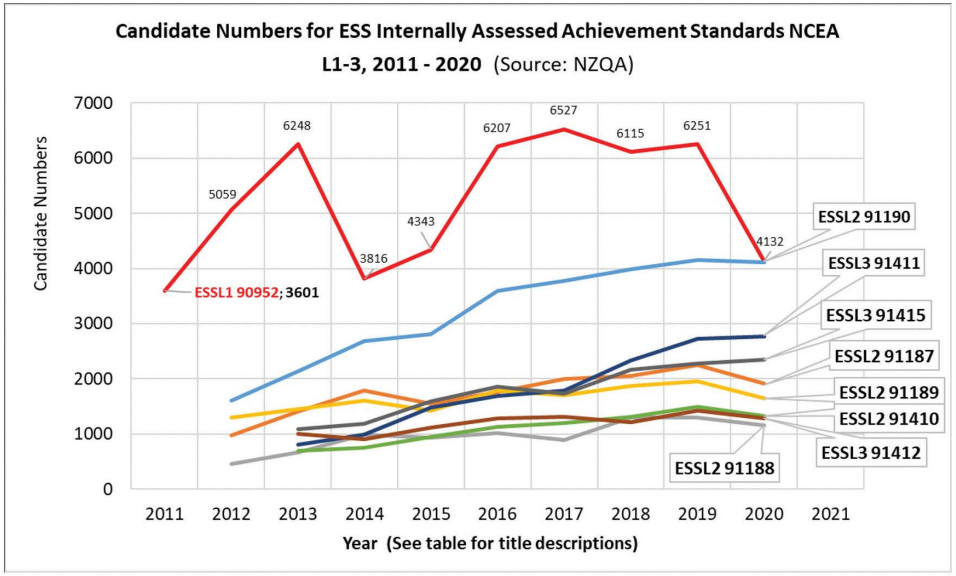


Figure 8. Note: 2020 was the first 'Covid Lockdown' year thus reducing candidate numbers across all achievement standards other than the Astronomy standard ESSL3 91415.

Table 1.

Earth and Space Science Level 1 – 3 Internally Assessed Standard title descriptions
L1 = NCEA Level 1 L2 = NCEA level 2 L3 = NCEA Level 3

AS Number	Title
ESSL1 90952	Demonstrate understanding of the formation of surface features in New Zealand
ESSL2 91187	Carry out a practical Earth and Space Science investigation
ESSL2 91188	Examine an Earth and Space Science issue and the validity of the information communicated to the public
ESSL2 91189	Investigate geological processes in a New Zealand locality
ESSL2 91190	Investigate how organisms survive in an extreme environment
ESSL3 91410	Carry out an independent practical Earth and Space Science investigation
ESSL3 91411	Investigate a socio-scientific issue in an Earth and Space Science context
ESSL3 91412	Investigate the evidence related to dating geological event(s)
ESSL3 91415	Investigate an aspect of astronomy

Table 2.

Descriptions of Key Internally Assessed Achievement Standards (NZQA)
BL = Biology C = Chemistry P = Physics ESS = Earth and Space Science

AS Number	Title
BL1 90925	Carry out a practical investigation in a biological context, with direction
BL2 91153	Carry out a practical investigation in a biology context, with supervision
BL2 91154	Analyse the biological validity of information presented to the public
BL2 91155	Demonstrate understanding of adaptation of plants or animals to their way of life
BL2 91158	Investigate a pattern in an ecological community, with supervision
BL2 91160	Investigate biological material at the microscopic level
BL3 91601	Carry out a practical investigation in a biological context, with guidance
BL3 91602	Integrate biological knowledge to develop an informed response to a socio-scientific issue
BL3 91604	Demonstrate understanding of how an animal maintains a stable internal environment
BL3 91607	Demonstrate understanding of human manipulations of genetic transfer and its biological implication
CL1 90930	Carry out a practical chemistry investigation, with direction
CL1 90931	Demonstrate understanding of the chemistry in a technological application
CL2 91163	Demonstrate understanding of the chemistry used in the development of a current technology
CL2 91167	Demonstrate understanding of oxidation-reduction
CL2 91388	Carry out an investigation in chemistry involving quantitative analysis
CL3 91389	Demonstrate understanding of spectroscopic data in chemistry
CL3 91393	Demonstrate understanding of oxidation-reduction processes
PL1 90935	Carry out a practical physics investigation that leads to a linear mathematical relationship, with direction
PL1 90936	Demonstrate understanding of the physics of an application
PL2 91168	Carry out a practical physics investigation that leads to a non-linear mathematical relationship
PL2 91169	Demonstrate understanding of physics relevant to a selected context
PL2 91172	Demonstrate understanding of atomic and nuclear physics
PL3 91521	Carry out a practical investigation to test a physics theory relating two variables in a non-linear relationship
PL3 91522	Demonstrate understanding of the application of physics to a selected context
PL3 91525	Demonstrate understanding of Modern Physics
PL3 91527	Use physics knowledge to develop an informed response to a socio-scientific issue
ESSL1 90952	Demonstrate understanding of the formation of surface features in New Zealand
ESSL2 91187	Carry out a practical Earth and Space Science investigation
ESSL2 91188	Examine an Earth and Space Science issue and the validity of the information communicated to the public
ESSL2 91189	Investigate geological processes in a New Zealand locality
ESSL2 91190	Investigate how organisms survive in an extreme environment
ESSL3 91410	Carry out an independent practical Earth and Space Science investigation
ESSL3 91411	Investigate a socio-scientific issue in an Earth and Space Science context
ESSL3 91412	Investigate the evidence related to dating geological event(s)
ESSL3 91415	Investigate an aspect of astronomy

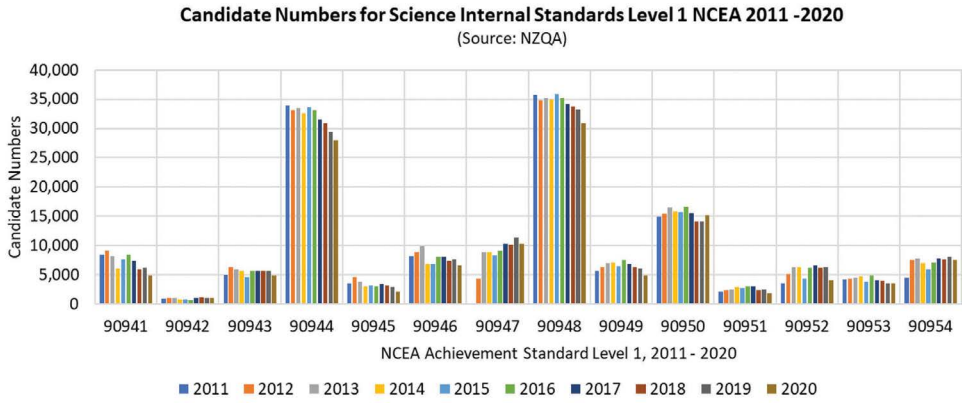


Figure 9. Comparison of candidate numbers for all NCEA Level 1 Core Science internally assessed standards 2011 -2020.

Table 3. Core Science internally assessed standards.

Title Descriptions of Level 1 Core Science Internally Assessed Standards

AS Number	Descriptions
PL1 90941	Investigate implications of electricity and magnetism for everyday life
PL1 90942	Investigate implications of wave behaviour for everyday life
PL1 90943	Investigate implications of heat for everyday life
CL1 90944	Demonstrate understanding of aspects of acids and bases
CL1 90945	Investigate implications of the use of carbon compounds as fuels
CL1 90946	Investigate the implications of the properties of metals for their use in society
CL1 90947	Investigate selected chemical reactions
BL1 90949	Investigate life processes and environmental factors that affect them
BL1 90950	Investigate biological ideas relating to interactions between humans and micro-organisms
BL1 90951	Investigate the biological impact of an event on a New Zealand ecosystem
ESL1 90952	Demonstrate understanding of the formation of surface features in New Zealand
ESL1 90953	Demonstrate understanding of carbon cycling
ESL1 90954	Demonstrate understanding of the effects of astronomical cycles on planet Earth
ESL1 90955	Investigate an astronomical or Earth science event

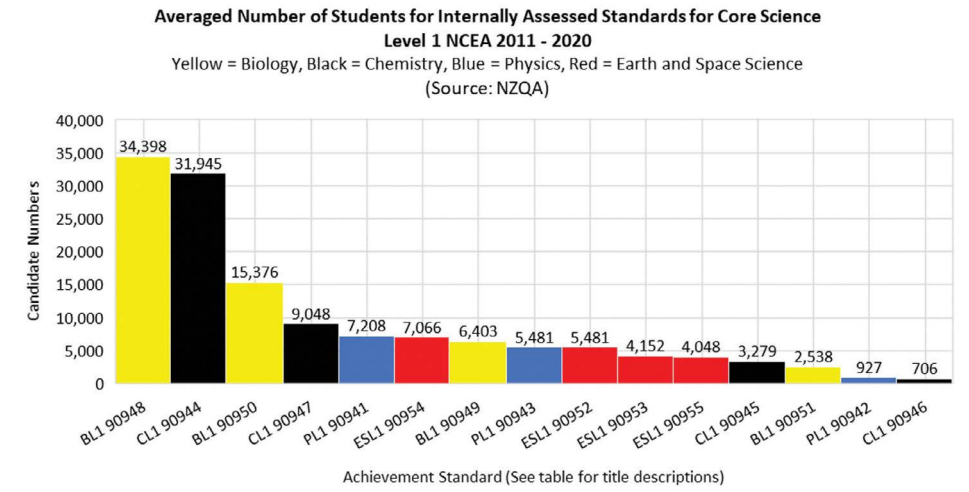


Figure 10. 9 Year averaged student numbers.

Full descriptions and criteria for achievement standards are available here: https://www.nzqa.govt.nz/ncea/subjects/science/levels/

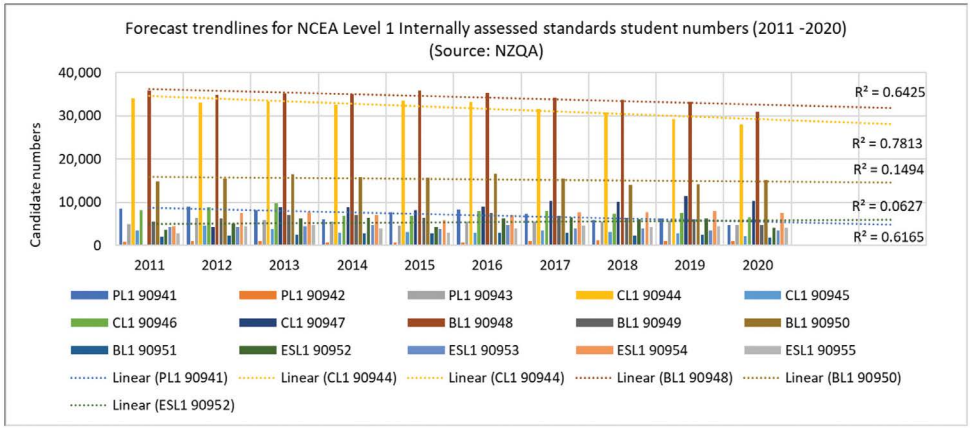
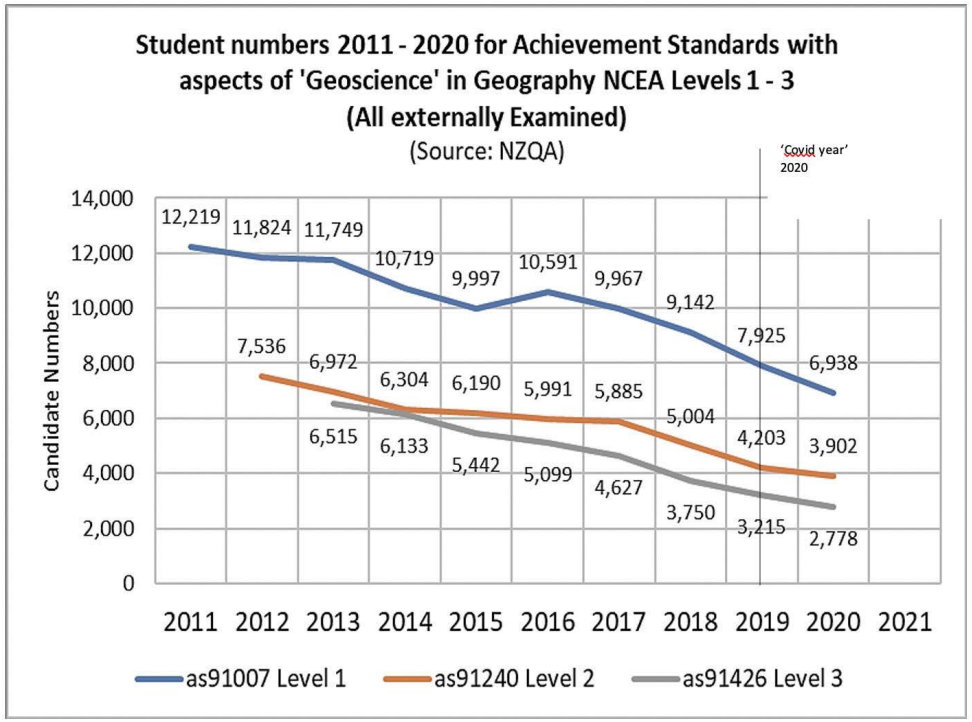


Figure 11. Nine-year averaged student numbers and trendlines for Biology as90948, Chemistry as90944, Physics as90941 and Earth Science as90952.

THE CASE OF EARTH SCIENCE WITHIN GEOGRAPHY



Standard	Description (all externally assessed)
91007	Demonstrate geographic understanding of environments that have been shaped by extreme natural event(s)
91240	Demonstrate geographic understanding of a large natural environment
91426	Demonstrate understanding of how interacting natural processes shape a New Zealand geographic environment

Figure 12. Student candidate numbers for geoscience related content within geography.

THE CASE OF SCHOLARSHIP

Although not part of the NCEA, scholarship exams have high status because of its monetary reward and challenging nature for able students. An international student will pay $102.20 per subject to enter, domestic students are free and about 3% of students per subject are awarded a scholarship (https://www.nzqa.govt.nz/qualifications-standards/awards/new-zealand-scholarship/). Figure 13 shows the 2019 cohort numbers for Physics, Chemistry, Biology, Earth and Space Science (ESS) and Geography. Why is ESS struggling?

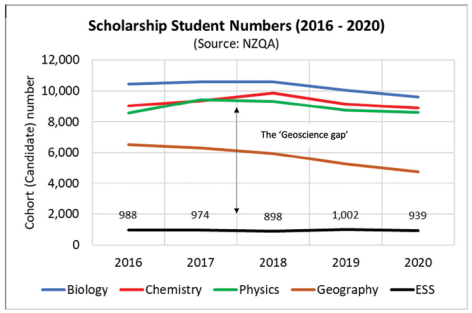


Figure 13. Scholarship student numbers for 2016 - 2020.

A bit about the NZ approach to standards-based assessment

A key conceptual leap and originally encouraged and supported (largely but not universally) by teachers, Standards Based Assessment (SBA) in NZ was always about assessment for student learning rather than assessment of learning. Individuals (and collectives), who were brought up with British hierarchical ranking systems and percentage grade normalised and scaled results-based outcomes (Norm referenced), are speculatively, less able to make this conceptual leap. Achievement of a standard does not equate to a 50% 'pass'. SBA in NZ is expressed through a system called the national certificate of educational achievement (NCEA) and is more about students demonstrating higher level thinking skills, evaluation, justification, understanding and comprehension of aspects of 'subjects' ranging from plumbing to calculus. It was introduced in 1996 as 'criterion referenced assessment' and first examinable in 2002 as SBA. Despite positive influences on pedagogy and the current educational ideology in NZ, SBA is not without significant criticisms (Ormond, B.A., (2019)),

WHAT ABOUT EARTH SCIENCE STUDENT NUMBERS BEFORE 2011?

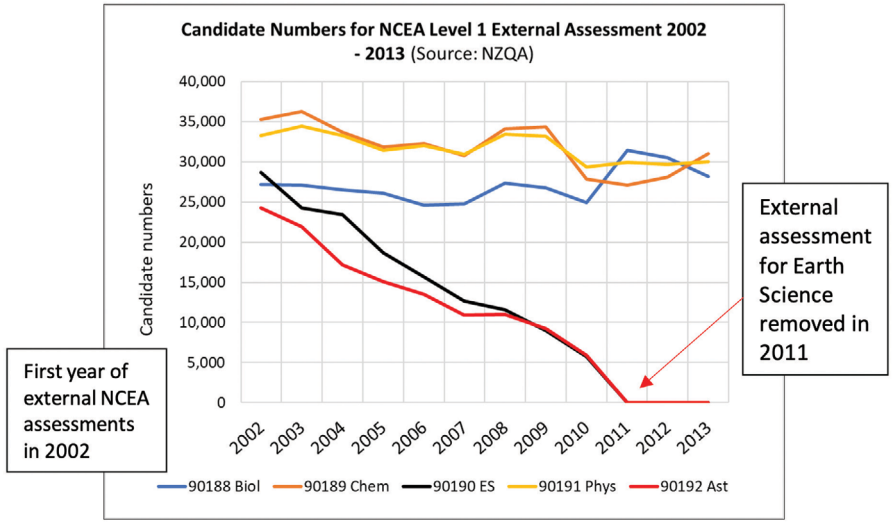


Figure 14. NCEA Level 1 student numbers 2002 – 2011.

(https://www.tandfonline.com/doi/abs/10.1080/0969594X.2018.1432564?journalCode=caie20), and positive support. Politics and national assessment systems are always contentious.

A bit about the data

The presented graphs (NZQA public Domain data) provide a starting point for identifying (in terms of student candidate numbers), the place of Earth (and Space) science within the New Zealand national Science curriculum. NCEA began in 1996 replacing the norm referenced School Certificate but the external examination at level 1 (Year11 student age of 15 Years) was abolished in 2011 along with a change in content in which the 'nuts and bolts 'of 'geology' such as rocks, fossils, minerals and geological time were also removed and replaced with "'Surface features". The reasons for this are complex and beyond the scope of this article but are largely related to political and individual persuasions of the time and an ideological move towards the socialisation of Science and inclusivity of cultures and environmentalism.

Despite recent stabilised, slow and variable candidate number, candidate increases for NCEA ESS at levels 2 and 3, the Earth Sciences continue to struggle for survival within the national Science curriculum. This may have a knock-on effect on tertiary candidate numbers. However, as figure 4 shows, there appears to be a considerable general decline in the number of students 'doing' science across all levels with a 74% loss of student numbers (for this dataset) from NCEA Level 1 to NCEA Level 3. It is somewhat surprising that Level 3 Biology shows the largest decrease in student numbers (Figure 3) even excluding the effects of Covid lockdown in 2020. Nevertheless, the 'gap' between Physics, Chemistry and Biology compared with Earth and Space Science remains the key issue to address. In effect, there are 5 times as many students who study P, C and B than ESS at level3, 9 times more at Level 2 hand nearly 7 times more at Level 1. The key to addressing this is not producing resources for teachers but actually getting the teachers and trained at teacher training Colleges and Schools.

Interestingly, the data shows a general decline since 2015 for the two most popular internally assessed standards but most others remain static with the exception of AS90947 (Investigate selected chemical reactions). However, physics, chemistry and biology retain a clear dominance over Earth and Space Science for student numbers. No research has been carried out that investigates the reasons for schools offering the internal (and external) standards for assessment that they do at any NCEA level.

Another area in which learning Earth Science is involved is within aspects of geography. The curriculum relationship between geography and the geosciences is complex and historical and beyond the scope of this article to address but worthy of further investigation. Figure 12 shows that externally assessed geography with geoscience content has also suffered from a considerable decline in student numbers (probably 'history' also). This suggests that even fewer students (and future teachers) are receiving a grounding in fundamental Earth Science content.

If you have any comments and thoughts on Geoscience education, please put pen to paper or finger to keyboard and start a conversation with GeOID and GSNZ.

Key questions:

1. What role do you see GSNZ could take in supporting Geoscience Education?
2. Why do you think geoscience education in schools (and universities?) is a low priority?
3. Do Tertiary institutions depend on secondary schools for a supply of first year geoscience students?
4. Is there an oversupply of geoscience students? Why?
5. What should all students leaving school know about Geoscience?
6. How can GSNZ better support teacher training for Geoscience?

A bit about the 2019 - 2025 NCEA review

In February 2020 the government introduced reforms for the NCEA qualification system called the NCEA Change Programme, which you can view here:

https://ncea.education.govt.nz/what-ncea-change-programme This of course affects the teaching and learning of science and the place of geoscience within it. One key aspect is that NCEA Level 1 is optional, and by doing so, prevents disadvantaging around 10% of students of whom would be their highest academic attainment.

Four subjects are currently in a trial and pilot process: English, Science, Religious studies and Visual arts. Significantly, geoscience as a discipline has been lumped in with Physics as Physics and Earth and Space Science (PESS). https://ncea.education.govt.nz/science/physics-earth-and-space-science?view=learning. Details about assessment for PESS Level 1 can be found here: https://ncea.education.govt.nz/science/physics-earth-and-space-science?view=assessment.

Note that the geoscience component is internally assessed but given 6 credits. Although complex and fraught with issues such as resourcing and qualified teacher availability, this may enable teaching and learning of earth systems to be expanded. Currently, (as a draft pilot in August 2021) this achievement standard has focussed on human induced changes clearly implying 'climate change', but has little to offer for geoscience processes that make the planet work. Hopefully, strong input can address some of these important issues as it will surely impact on the future workforce in the geosciences. There are three key areas in which GSNZ can play an active and important role:

1. Involvement in professional learning development (PLD) for teachers

2. Involvement in teacher training College/School curriculum development

3. Development of appropriate assessment tasks for Earth Science at NCEA Levels 1-3.

Summary

When the Planet Earth and Beyond strand of the 'new' national science curriculum was pieced together between 1993 and 2000 (https://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum/Science), learning in the Earth sciences finally became an 'equal partner' (in terms of tuition time and credits), to physics, chemistry and biology (once called 'subjects' now called learning areas). In 1993, GSNZ was involved in the content development for assessment standards for external examination in elementary geoscience of rock and mineral identification and geological time, and many teaching resources were developed for this. The external examination and content were abolished in 2011 and replaced with internal assessment of student 'geoexplanations' for 'landforms. External examination in the geosciences remains absent in 2021. Although opportunity to learn aspects of geoscience currently remain in the science curriculum (since 2011), student numbers for geoscience NCEA have remained at very low levels for both internally and externally assessed standards in comparison to the traditional physics, chemistry and biology assessment standards. Indeed, evidence suggests that student numbers involved in the sciences overall, is in decline.

Despite a recognition of the importance of the geosciences (since c1986) in the national Science curriculum, the challenge to increase its teaching and learning (in particular, geological/geosphere science) remains much as it was since the earlier 1968 national science curriculum. Environmentalism, cultural inclusion and natural hazards dominate politico/curriculum thinking and struggles to keep up with the enormous advances in understanding and technological development within the geosciences over the last four decades. Similar in many ways, the place tātai arorangi/astronomy in the curriculum also requires considerable review for resourcing, teacher training and learning development.

In essence, far too few students are leaving school (and tertiary level) with a more desirable deeper understanding and knowledge of how the Earth works, what its structure and composition is and its geological history especially in connection with the evolution of life. This remains a global curriculum challenge.

".....bridging the disturbing gap between the potential of Earth Sciences and its low status in schools requires a genuine teaching culture change in schools and even universities. Geoscientists should pave the way for science education within schools through direct political engagement and negotiation with ministries of education and indirectly through mass/ social media".

Nir Orion in: Earth Science Education: Global perspectives / organizado por Roberto Greco e Leslie Almberg. – Pouso Alegre: IFSULDEMINAS, 2016. 355 p: il. P10. http://www.igeoscied.org/wp-content/uploads/2019/02/Earth-Science-Education-Global-Perspectives.pdf

Further reading:

http://www.igeoscied.org/activities/geoscied/
http://www.igeoscied.org/useful-links/
https://nagt.org/index.html

A COMMENT ON NEW ZEALAND'S ENERGY TRANSITION

Miko Fohrmann: Petroleum SIG convenor

With the release of the Climate Change Commission's (CCC) advice1 to the New Zealand Government on its emissions budgets and direction for its emissions reduction plan end of May this year, a concept is emerging on how the path to net zero emissions in 2050 is envisaged. The country embarked on this path towards 'carbon neutrality' already in April 2018 when the government announced an offshore exploration ban for oil and gas. This step unmistakably signalled the beginning of a fundamental shift on how the country will meet its future energy needs. This shift away from oil and gas will inevitably trigger the probably most ambitious infrastructure-restructuring project that the country has ever seen. With the first step towards net carbon zero in 2050 completed, no one knows yet how this proposed concept will be realised. What is certain though is that this change will affect everyone's life; it will undoubtedly impact on our economy, environment and landscapes and it will change how we live our lives, from our daily commute to how we travel locally and internationally. Today, 60% of New Zealand's primary energy supply is provided by oil, gas and coal2 and most of it will need to be replaced by 2050 to reach net zero emissions (Figure 1). The timeline to get there however, is far more challenging as the year 2050 suggests. Labour pledges 100% renewable electricity generation by 2030[3]. With around 84% of electricity generation currently being produced from renewables[4], this target may appear more readily achievable.

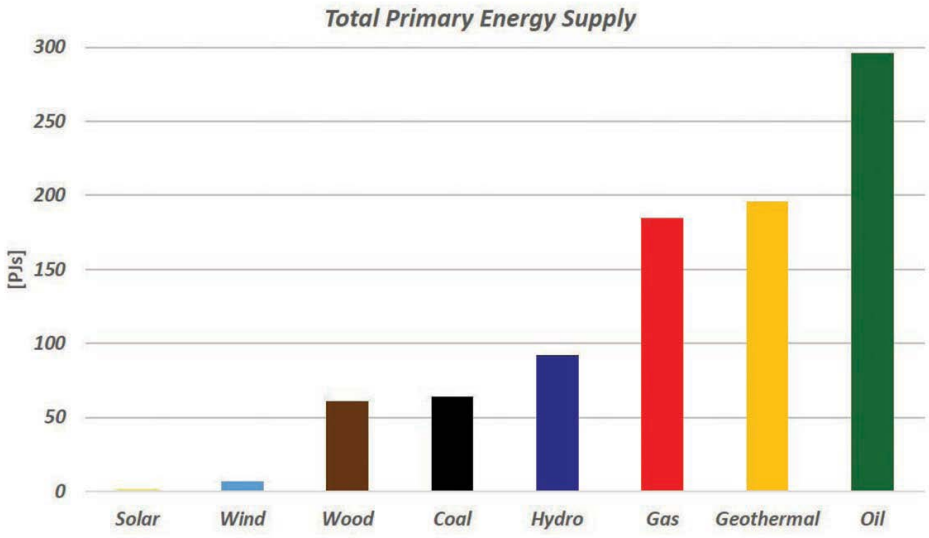


Figure 1: Primary energy sources in New Zealand for 2020[2]

However, this timeline is very challenging as it requires sufficient electricity storage facilities that are capable of guaranteeing baseload as renewables like wind and solar only generate electricity intermittently. Various concepts for storage facilities exist, such as the Lake Onslow pumped hydro scheme and various proposed battery farms. To achieve 100% renewable electricity generation by 2030, New Zealand has only 8 years left to plan, consent and build these facilities and supporting networks.

One additional complication arises from, for example, all the surplus electricity required to power the electric vehicles in order to replace the current, conventional, fleet. The CCC report states that the country would need to stop the import of all internal combustion vehicles (ICV) between 2030 and 2035.

To incentivise the shift to renewables, New Zealand adopted an emissions trading scheme. This policy will not only make fossil fuels more expensive, it will furthermore require massive investments to upgrade the energy infrastructure to reach the 100% renewables target. Those upgrades comprise the expansion of wind, solar, hydro and/or geothermal to increase electricity generation, storage facilities (e.g. Lake Onslow pumped hydro and/or battery farms) to cover times when combined solar and wind power generation is very low. Lake Onslow alone would be an investment of estimated 4 billion dollars[5].

Finally, an upgrade to the network infrastructure to cope with increased and fluctuating electricity generation is essential. The CCC report, however, suggests that this massive investment in restructuring the electricity supply alone is unlikely to increase "household electricity bills" [1, p.165].

Case study Germany

Germany's transition to renewables that commenced 20 years ago displays many striking parallels to the current debate in New Zealand. In 2004, the German Minister for the Environment Jürgen Trittin from the Green Party stated that the promotion of renewable energies would cost the average household as much as one scoop of ice cream (he referred to 1 Euro per month in additional costs). Seventeen years later, this scoop turned into a very expensive ice cream for consumers. Today, Germany has the highest electricity prices in the European Union and it ranks as the most expensive country out of the G20 countries[6] by a long way. Electricity prices have more than doubled; they have risen by a staggering 130% for households and soared by over 200% for industrial users over the past 20 years.

In comparison, New Zealand prices have increased by 42% for residential and 57% for industry users, respectively, over the same timeframe (Figure 2). Responsible for this increase in Germany besides steadily rising taxes on electricity, is the Renewable Energy Sources Act introduced in 2000 that favours renewables over conventional energies. In addition, a newly introduced carbon price has increased consumers' bill for fuels such as petrol and diesel by several Euro cents per litre since the beginning of 20217. A very similar scheme is proposed for New Zealand, in order to replace ICV's by electric vehicles.

In New Zealand, the mere outlook of rising electricity prices already led to debates about the commerciality of the Tiwai Point aluminum smelter. A closer look into the energy transition in Germany gives a very good indication on likely consequences. In 2005, rising electricity prices led to the closure of one of the most modern aluminum smelters in the world as production moved to Qatar that guaranteed low electricity prices. Needless to say that this move did nothing to reduce global emissions but it was a blow to the local economy and community, which is likely to be surpassed in Invercargill due to the sparseness of established industry down south.

The rise of energy hardship

In parallel to rising energy and electricity prices, something else crept up in the German news over the past 10 to 15 years— energy hardship or as it is

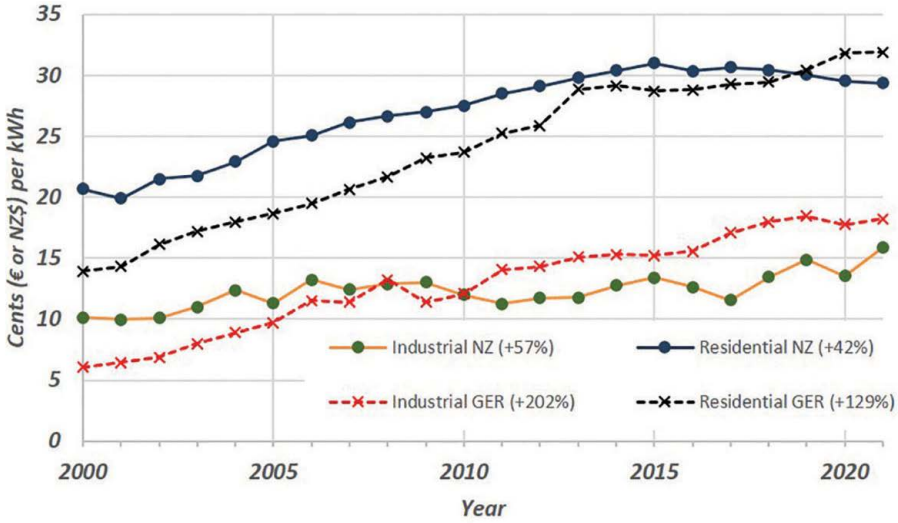


Figure 1: Nominal annual electricity prices in New Zealand (in NZ$ cent[8]) compared to Germany (in EUR cents[9&10]).

coined in Germany energy poverty. Energy hardship in Germany affects mainly elderly who cannot afford rising electricity/energy bills to heat their homes. When I moved to New Zealand in 2004, this was nearly unheard of in Germany and it therefore came as a shock to find out how many people freeze in their own homes in New Zealand. Living in Dunedin back then, cold homes were common for mainly two groups, students and elderly, who often only heated one room in order to cut electricity bills. I experienced this first hand and found such a situation very disturbing for a first world country. What is worse little has changed since then, the 2020 report on housing in New Zealand[11] states that 33 percent of the temperature readings in winter were under the minimum 18°C recommended by the WHO, resulting in one of the highest numbers of respiratory illnesses in OECD countries[12].

The development of electricity prices and the rise of energy hardship in Germany, a country that is often hailed as a front-runner in the energy transition, clearly contradicts the assumptions made in the CCC report that "overall household electricity bills for heating, cooking and lighting are unlikely to increase as a result of our proposed emissions budgets". Whether an increase will happen due to emissions budgets or increased costs due to an upgrade in infrastructure, it becomes apparent when looking abroad that the transition will become expensive. As a consequence, energy poverty is rather likely to increase in New Zealand.

The closure of key industries for the greater good – The urgency behind the change

Last year, the Labour government declared a climate emergency[13], committing to urgent action on reducing emissions in order to limit global warming to 1.5°C compared to pre-industrial times. In order to achieve that goal, the CCC report proposes an emissions reduction of 33% by 2030 and 64% in 2035% compared to 2018[1]. The evidence for this apparently looming crisis that requires immediate action is presented in one of the key figures of the CCC report (Figure 3). Figure 3 highlights New Zealand's contribution to global warming and is used as a justification to cut carbon dioxide originating form fossil fuels. According to this graph, New Zealand's contribution to global warming from carbon dioxide originating from fossil fuels is less than 0.001°C. Just to repeat this number, this is less than a one-thousandth of a degree Celsius, which supposedly signals urgency and justifies immediate action without assessing their impacts on communities and people. A fact that is less often conveyed to the public is that Aotearoa's largest CO_2 contributions originate from a change in land-use. The majority of those contributions, which are attributed to the vast deforestation across the country, occurred already prior to 1840, long before the industrial revolution. Disregarding the CO_2 contributions from a change in land-use for a moment, the remaining contribution equalling around 0.002°C rise in global warming is responsible for the rise of our economy, which undoubtable led to an increase in living standard, health and life expectancy, and overall growth of wealth of the population. This increase of 0.002°C over the past ~150 years is still a high estimate though as it stipulates that humans are solely responsible for this change without allowing for any natural variability in global temperature.

In order to reduce New Zealand's emissions, the CCC panel is prepared to shut down or drastically restrict key industries such as e.g. Tiwai Point, Methanex and farming as stated in the CCC's draft report[14]. However, as it was the case with the aluminium smelter in Germany, these emissions will not disappear but merely move overseas as demand still exists for those products. Forcing industries out of the country for an artificial goal such as limiting an increase in global temperatures by 1.5°C is not a sustainable solution. Even though the final CCC report has weakened some of their initial statements about terminating high carbon-emitting industries due to criticism, hardly anything of this criticism has been widely debated in public and discussed in the media. This lack of debate is exemplified by the decree to ban offshore exploration in April 2018, which was announced without providing any cost-benefit analysis.

The same holds true for the report by the CCC. Instead of substantiating the claim that households are unlikely to face higher electricity bills, the authors state: "However, exactly how they [overall household electricity bills] could change is highly uncertain"[1, p.165]. As scientists, we should not accept such forecasts. Policies are made on such statements whereas a simple view to other countries that have already embarked on this journey would result in a far more substantiated prognosis.

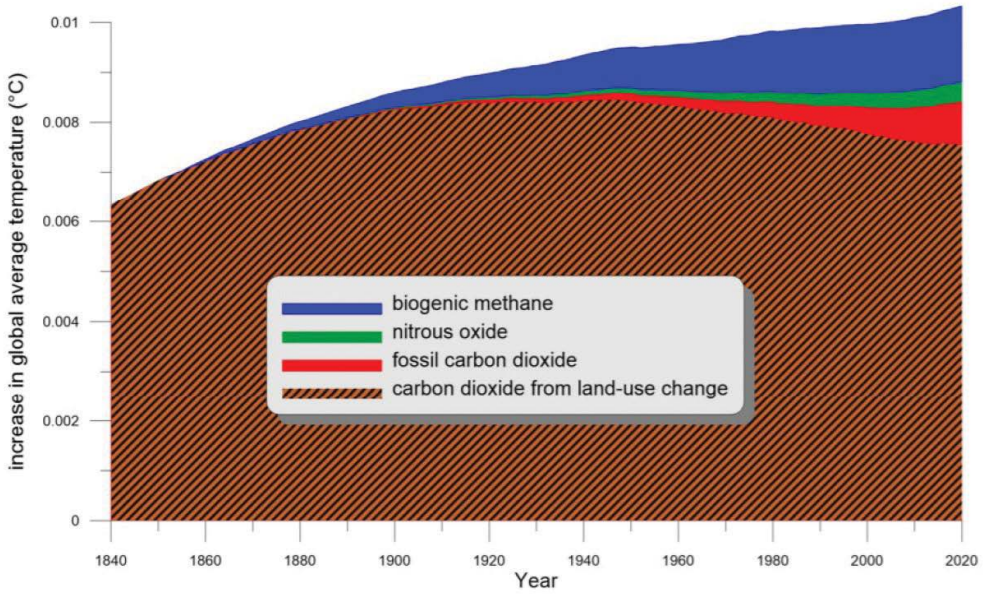


Figure 3: The contribution Aotearoa made to warming since 1840 [1], Figure 9.2, p. 189

But here we are, New Zealand will soon lose its ability to replace any of the gas that is currently produced offshore for the local market. In 2018, when the government announced the exploration ban, 22 oil and gas exploration permits offshore were active. When asked about the exploration ban, Megan Woods stated: "What we know is that there's 100,000 square kilometres of New Zealand that is currently under exploration permits. You'd probably look at a 10 per cent to 15 per cent chance is what the industry would say of actually finding something. That gives you 10,000 to 15,000 square kilometres that would be available for exploration."

Three years later, New Zealand has only six active offshore exploration licenses remaining. So much for an accurate prognosis. Unfortunately, exploration is not that simple. Today, gas production is rapidly declining and further investments in exploration and production are difficult to justify in an uncertain political environment.

Society is taking energy and electricity for granted, however, a transition to 100% renewables in 2030 and to net carbon zero in 2050 requires a colossal undertaking. When sun and wind do not produce enough electricity for the market, Germany, is able to import electricity from its neighbour states, many of whom rely on atomic energy. New Zealand does not have that luxury. ■

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GSNZ NEWSLETTER
SUBMISSION DEADLINES

Please note that the GSNZ Newsletter submission deadlines have changed.

- **1ST FEBRUARY (FOR MARCH ISSUE)**
- **1ST JUNE (FOR JULY ISSUE)**
- **1ST OCTOBER (FOR NOVEMBER ISSUE)**

EDITOR'S NOTICE:
A REMINDER FOR CONTRIBUTORS

Please remember that contributions for the Newsletter should adhere to the guidelines set out in the Newsletter section inside the back cover of each issue.

In particular, all images (figures, tables, photos etc) must be supplied separately and not just embedded in a Word document. Pre-formatted (grouped or annotated) images are unnecessary and undesirable as this may hinder page formatting. Similarly please check legibility of text when used as a label on a figure that may need to be be reduced in size to fit an A5 format.

It is the responsibility of the submitter to ensure that these requirements are followed. This is especially so when forwarding articles on behalf of others.

VUW STUDENT FIELD TRIP — ROTORUA

Yaasameen Shalla:
VUW MSc Geology student and VUW Geology Society Postgraduate Representative

Between the 21st – 25th June, the Victoria University of Wellington Geology Society took 21 VUW staff and students on an educational field trip to Rotorua with the support of GSNZ. The trip aimed to educate students on volcanism, geothermal and mineral exploration in the North Island. After the tough year many students had in 2020, due to COVID-19, it was a fantastic opportunity to get the students traversing around some wicked outcrops and help spark that unique community essence geology has embedded into its culture. Day one's itinerary included a hike up Mt Tarawera with VUW's own Jenni Hopkins, Dene Caroll and GNS Science's Cam Asher in attendance to help stimulate discussions. Students were able to use the knowledge of the academics and Kaitiaki Adventure guides to ask questions on the general science, the 1886 volcanic eruption, the Maori legends and the significance of the mountain to Maori culture. In addition, we were able to talk to the guides about the collection of exciting rock samples they had picked up through the years, with many theories of their origin being thrown out by students and staff alike (Figure 1).

Figure 1. Top and bottom: Students and staff talk about samples found around Mt Tarawera

The following day, thanks to Victoria Harimate on behalf of Te Whānau a Tauwhao, we visited Tuhua (Mayor Island). On top of VUW 21 members in attendance, we had an additional 14 members from the University of Auckland and 17 from Waikato University. This enabled the trip to be an educational and bonding experience for students across the three institutes and was the first time the VUW geology society had pulled this off. Using a field guide by C. J. N Wilson, students followed a breakdown of the island's geological history with annotated outcrop sketches, viewed by boat around the island, which Jenni Hopkins helped explain (Figure 2).

Following our long day at sea, the VUW group visited OceaniaGold's, Waihi mine, on day three of activities. With the guidance of Shannon Richards and ex-VUW Geology Society members, Rebecca Hillyard and Leroy Crawford-Flett, gold deposits, the past and the future of gold mining in Waihi was discussed. It was an excellent opportunity for students to gain insight into how gold mining in New Zealand operates as well as learning about the origin of gold deposition within the earth.

Before the long drive back to Wellington, we visited the Waimangu Volcanic Valley and managed to squeeze in another boat trip on Lake Rotomahana.

Figure 2. Top: Group photo. Bottom left and right: Students using the guides to help understand the outcrops with the help of Jenni and Dene

The boat ride helped students understand the scale of the 1886 Tarawera eruption and how this had a wider impact on the surface expression of the geothermal systems during this time. The trip ultimately helped students gain insight into regions of New Zealand geology not covered in detail in a BSc at VUW, we well as giving undergraduate students the chance to talk to staff and fellow students (undergraduate and postgrad) alike about future endeavours.

Figure 3. Students learn about gold deposits using geophysics at Waihi gold mine.

Figure 4. Left: Group photo at Waimangu Volcanic Valley

Acknowledgements

On behalf of the VUW Geology Society, I would like to thank GSNZ. The financial support helped pay for one night's accommodation for each VUW member in attendance. This helped make the trip just that much more affordable for students and was greatly appreciated by everyone in attendance. ■

NEW ZEALAND'S LARGEST VENTIFACTS

Bruce W. Hayward

New Zealand is not well known for its ventifacts, although they are not that uncommon. Ventifacts are wind-faceted stones that have been abraded, pitted, etched, grooved or polished by wind-driven sand or ice crystals (Durand and Bourquin, 2013). Probably the best known are the Waitotara ventifacts that former GSNZ President Vince Neall has been trying for many decades to improve legal protection for. are also found in inland localities by those with an eye for recognising these features. Deserving of greater recognition and perhaps as much celebrity as the large Moeraki or Koutu spherical concretions are the large ventifacts that occur along the Foveaux Strait coast from Colac Bay to Slope Point. The largest I know is on public display outside the Riverton Museum. It is a relatively low

Figures 1-2 .Two views of New Zealand's largest known elongate ventifact or einkanter (2.0 m long) from Colac Bay coast now on display outside Riverton Museum, 2021 and 2012.

The Waitotara ventifacts occur in coastal sand dune country of the Whanganui Bight and most are 1-20 cm long, with many having the classic einkanter (brazil nut) or three-faceted pyramidal (dreikanter) shape. The English translation of "kanter" is edge. Thus a ventifact with one sharp crestal edge or ridge is called an einkanter and a dreikanter is one with three sharp edges meeting in a trihedral corner. There are many other localities where ventifacts occur around New Zealand, usually in coastal sand dune country where the required strong winds, mobile sand and rock substrates co-occur (Bishop and Mildenhall, 1994; Walbrand, 2004). Ventifacts and wind-abraded rock faces einkanter ventifact with a length of 2.0 m, width of 1.3 m and height of 0.7 m (Figs. 1-2). It was shifted to the museum locality from where it was found on the nearby Colac Bay coast. There is a coastal track through farmland and along the beaches between Colac Bay and Howells Pt and although ventifacts are not common, if you know what you are looking for you will recognise wind-blasted rock faces and rare einkanter and pyramidal dreikanter ventifacts (Fig. 3). A second 1-m-long einkanter is also on display outside the Riverton Museum (Figs. 4-5).

The ventifacts are not restricted to this area and occur in a number of places along the Foveaux Strait coast.

Figure 3. A 1 m dreikanter ventifact in a grassed paddock alongside the coastal walkway between Colac Bay and Howells Pt.

Figure 4. A 1-m-long einkanter ventifact, also on display outside Riverton Museum, 2021.

They are particularly common in the private farmland and in the coastal zones around Mokomoko Inlet and Bluff Harbour, east of Invercargill. A few years ago the late Russell Beck led an Auckland Geology Club group across farmland on the north side of Mokomoko Inlet where we saw numerous smaller (10-30 cm), mostly pyramidal, ventifacts exposed in farm drains and track cuttings where they had been unearthed from the soil that had developed beneath forest during the Holocene and had buried them.

Where marine erosion has removed large sections of low-lying land around these sections of coast one often comes across a concentration of similar ventifacts in the intertidal zone (Figs. 6-7). Many are 10-30 cm in size with a low pyramidal shape having three-four faceted sides plus a base.

There are also rare larger einkanter and high vierkanter ventifacts with up to 0.8 m largest

Figure 5. (Top). What one geologist thinks of Riverton Museum, 2016.

Figure 6. (Centre) Einkanter and dreikanter ventifacts on the intertidal flats of Bluff Harbour, 2016. Photo 70 cm wide.

Figure 7. (Bottom)A selection 40-80 cm dreikanter and einkanter eroded by the wind out of igneous lithologies. Photo: Lloyd Esler, 2021.

dimension (Fig. 8). While these ventifacts have not received much attention from geoscientists, they are well known to archaeologists (e.g. Leach, 1990; Jennings, 2009). Ventifacts made from argillite were used as pre-formed blanks for adze manufacture by pre-European Maori, who camped along the coast during warmer months. The Foveaux Strait ventifacts are composed of locally-eroded rock types, many from the volcanic-dominated Permian Brook Street Terrane. Greywacke sandstone and basalt ventifacts are common around Riverton and argillites and basalts are common around Bluff and Mokomoko. It is the ventifacts made from the harder Southland Argillite that were not surprisingly favoured for adze manufacture.

The Foveaux Strait ventifacts are no longer forming and are relict from colder, glacial times when the surrounding region was a wide wind-swept coastal plain with active sand dune areas and little or no vegetation. During glacial periods the climate was colder, drier and gales were more frequent (e.g. Bishop and Mildenhall, 1994). It was in these conditions that numerous blocks and pieces of rock that broke off local outcrops were sculpted by the bombardment of sand grains propelled against their sides by the howling winds. Today most ventifacts are buried or part-buried in soil that developed beneath forest that grew here during the Holocene inter-glacial period and has subsequently been cleared for farming. The ventifacts are best seen where they are eroding out of these soils along the coast.

Currently there is no legal protection for any of the Foveaux Strait ventifacts or the areas in which they are most common. Ventifacts are mentioned six times in the Southland Coastal Plan, but it contains no specific protection for any. I know that locals and some collectors are well aware of their existence and many of the best ventifacts, smaller than 30 cm or so across, have already been transplanted to peoples' mantlepieces or gardens. Even the local council has reportedly removed three beautiful specimens and sent them as a gift to their Chinese sister city, Suqian! Ngai Tahu also gifted a ventifact from Tikore Island, Bluff Harbour, to a Japanese benefactor in 2013. Here we have the same conundrum as Vince Neall has had at Waitotara. If we agitate for some form of legal protection for ventifacts in an area, the publicity will likely result in increased plundering, especially of the more easily transported specimens, even after protection has been put in place. For this same reason, I have held off writing an article on the Foveaux Strait coastal ventifacts for many years. I note however increased information about the location of these ventifacts on the web, with many of the best sites now mentioned or specimens from them shown in photographs and I know that collection of specimens continues. Now at least there are two large ventifacts on display outside Riverton Museum that we geoscientists and others can admire and ponder over without being tempted to further deplete the dwindling number of easily seen ventifacts out in their natural setting.■

Figure 8. An 80 cm-long, four-faced pyramidal ventifact superbly created by the forces of wind-blown sand and ice on the shore of Bluff Harbour. Photo: Lloyd Esler, 2021.

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GEOCRYPTIC CROSSWORD 02

by Cryptonite

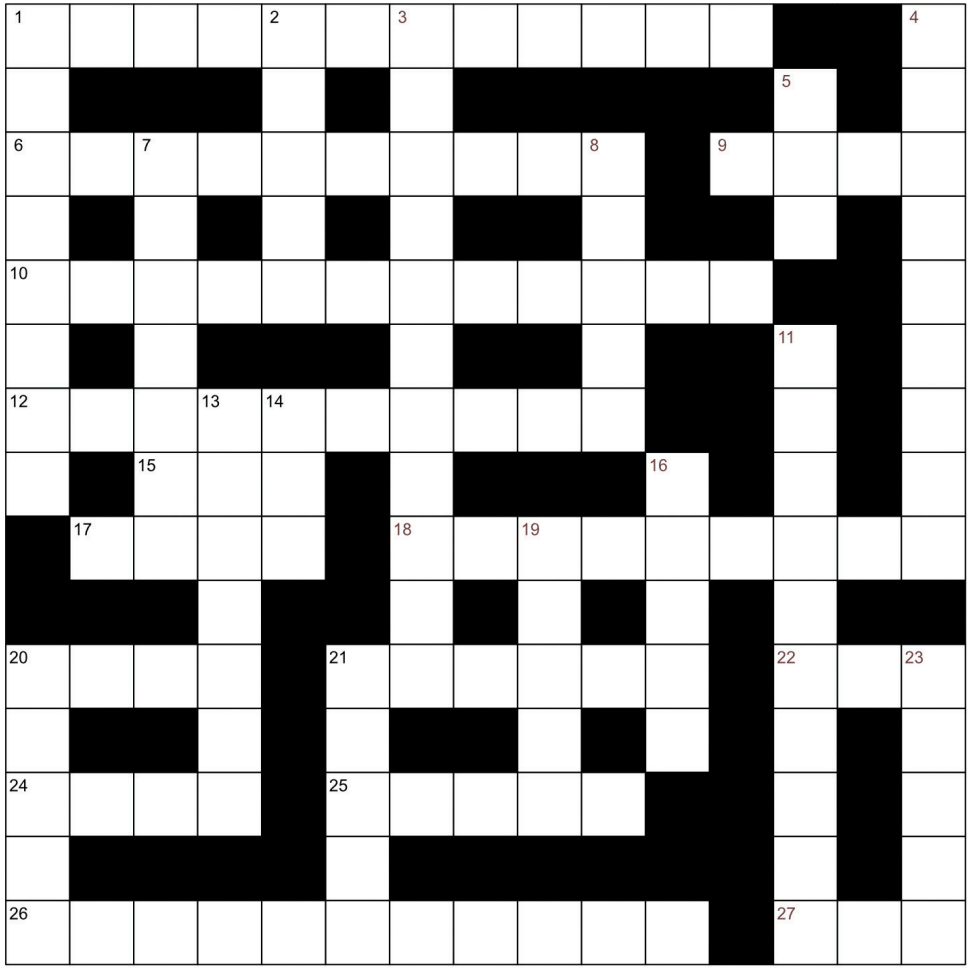
ACROSS

1. I spy a sand ball dispersed after 500 is lost on the deep sea floor (7,5)
6. A cold way to travel and drop stones off (3,7)
9. In short, nothing in renewed unit of resistance denotes the base of the crust (4)
10. To obey rules in harmony will lose time and upset the sequence of things (12)
12. First man opposed to neon shines bright like a diamond (10)
15. In short, scattering 1,000 einsteinium produces high resolution surface images (3)
17. Add heat, liquify, and form magma (4)
18. "Lie to it!" he ordered the mantle derived basalt (9)
20. This precursor to ice is a NZ emblem, we hear (4)
21. Secret Service turns impudent young woman into a foliated rock (6)
22. The French guide evil leader to the drier side of the mountain (3)
24. To drill, and sample, the centre of the Earth (4)
25. This girl used to be a sap (5)
26. Tie up dog before iridescent feldspar (11)
27 Burnt remains of...a tree? No, it's volcanic! (3)

DOWN

1. Needle-shaped, and circular? Yes, if rubidium- and nitrogen-free! (8)
2. I hear Simba's uncle used nitrogen to make a metasomatic rock (5)
3. Carelessly tacit after Greek stone creates pressure (11)
4. Space rock sounds like it was scammed correctly (9)
5. Comprised of eras in palaeontology (3)
7. Jumble sale after cue about a beryllium nesosilicate (7)
8. I hear this plane is powerless to fly a short distance and describes crystal symmetry (5)
11. First sign of life in wireless solo is oceanic organisms (10)
13. Angel and me mixed up a large, chaotic pile of rocks (7)
14. Abbreviated imaging technique upsets mat (3)
16. See 20 down.
19. Die awfully after beast makes hematite, for example (5)
20. & 16. Confused cop had left the starting point of a rupture (5,5)
21. Sulfur precedes tough fragment of tuff (5)
23. Hope returns with 100 for (part of) a period of time (5)

Answers on p59



GEOID FAREWELL & WELCOME

GEOEDUCATION, OUTREACH, AND INTERNATIONAL DEVELOPMENT

Michael Petterson: GeOID convenor (outgoing)

It is with great pleasure that I announce that Jenny Stein will be the new Convenor of GeOID. Jenny is the current Secretary of GSNZ, has previous experience in the exploration and mining industry, alongside teaching experience in Japan, a strong interest in Geoenvironmental issues, and Geoscience and the Sustainable Development Goals. In 2020, Jenny moved into the area of Geoscience and Communication which is vital to the future of the discipline, and its interlinkages with wider society. Jenny is currently spearheading a new initiative engaging school teachers with and through Geoscience. The Geoscience in Schools area is one that has most traction amongst the membership of GSNZ for GeOID related subjects, and it is fitting that Jenny takes on this advocacy role with her background and enthusiasm and her great communication expertise. I wish Jenny every success.

For personal reasons I am standing down as Convenor, but will continue to support initiatives as best I can, and strongly support Jenny in her new role. I have thoroughly enjoyed being the Convenor of GeOID, following on from the Geo-Education SIG. My main role has been to widen the scope, and help position Geoscience NZ in different territory. Geoscience has a much needed role in development at local to international scales and the manifold issues linked to the Sustainable Development Goals. GeOID also offers a home to the numerous Geoscience Outreach activities, that so many people are involved in, but don't necessarily receive the limelight they deserve.

I would like to thank the people who have helped shape the concept of GeOID, in particular Glenn Vallender (with his enormous legacy), Jenny Stein, and James Scott. I thank the membership for your support, contributions, talks at the last GSNZ annual session, and the emails I have received with many suggestions and comments. ■

Jenny Stein: GeOID convenor (incoming)

I would like to thank Michael Petterson for his dedication and enthusiasm during his time as GeOID convenor. Building on the work of his predecessor, Glenn Vallender, Michael has broadened the scope and ambitions of the SIG beyond Aotearoa New Zealand's shores. These new goals were encapsulated in the GeoEducation SIG's name change to "GeOID" (Geoscience Education, Outreach and International Development) in 2020.

With his passion for geoethics and the United Nations' Sustainable Development Goals (SDGs), Michael has promoted greater awareness and participation in geoscience as a pathway toward positive international development. The COVID-19 global pandemic has been a stark reminder of the interconnectedness and interdependence of countries, cultures and societies around the world, and we must not forget the vital role the geosciences have to play in supporting the wellbeing of us all.

I would also like to thank Michael for his advice and support as we develop plans for hosting a national symposium to bring teachers and geoscientists together to collaborate on ways to engage pre-tertiary students with the geosciences.

While this has shifted our focus back to the "grass roots" level of outreach here in NZ in recent months, as the next convenor of the GeOID SIG, I hope to continue to support and promote a multi-faceted approach to outreach that engages with audiences at all levels and incorporates a range of geographical (local, national and international) and cultural (academic, industry, mātauranga Māori and community) perspectives ■.

PETROLEUM

UPDATE

Miko Fohrmann: Petroleum convenor (incoming)

Kia Ora,

When the GSNZ president asked for volunteers to re-invigorate the Petroleum Special Interest Group (SIG) of our society last year, I was more than happy to offer my support. Since 2004, I have been a silent member of the Geoscience Society, mainly because I decided to pursue a career in industry rather than science. However, I have always been fond of my membership, as the GSNZ newsletter and particularly the presentations hosted by the Wellington Branch kept me informed about the scientific advancements here in Aotearoa.

So when James asked for volunteers, I didn't hesitate to put up my hand, firstly because I value the work of the Society and secondly, because the convenorship of the Petroleum SIG presented itself like an interesting challenge. Many people would probably argue that injecting new life into the previously known Oil & Gas SIG would be like trying to ride a dead horse in the current environment.

I agree that the decision to ban offshore exploration for hydrocarbons and the diversion of funding for the geoscience community that related to understanding and promoting New Zealand's petroleum potential will make this task very challenging but I still see relevance in continuing a lively scientific debate about New Zealand's petroleum potential. My vision for the Petroleum SIG is therefore threefold:

First, oil and gas are still essential to the people and economy of New Zealand and will remain so for the next decade(s), besides an epochal paradigm shift in policy. Because of their relevance, for example gas being fundamental in the transition to a low carbon future, I intend to continue Mac Beggs' initiative to update the geoscience community on the latest industry developments regularly. To start things off, I will present a summary about how the latest two exploration wells in the Taranaki Basin have contributed to our geological knowledge and understanding of the petroleum system at the pre-conference workshop at this year's GSNZ conference.

Secondly, a shift in energy production away from oil and gas will require less geoscientists in the petroleum industry and this will especially be felt by young graduates joining the workforce. I would therefore like to open up the SIG to a broader spectrum of specialists and connect to other SIG groups (e.g. geothermal), to demonstrate that geoscientists and skills obtained in the oil and gas industry will always be relevant and of value to other energy-related industries.

Finally yet importantly, I intend to foster a (scientific) debate around oil & gas, starting with my very own personal view around energy supply in New Zealand (see article p30). In the past few years, I have spoken to many people who were left perplexed and confounded by the lack of debate around the energy transition in this country. I reckon that we as geoscientists should be heavily involved in providing expertise regarding the arguments supporting or dismissing a rapid need to transition away from petroleum and providing possible solutions to this colossal act.

The reason for this is simple, whether we like it or not, the energy transition will affect all of us, as professionals and as humans who deeply care about the wellbeing of our families and the environment. I am looking forward to a lively debate and hopefully many contributions from you, whether as articles in the GSNZ newsletter, on our LinkedIn page or simply as feedback per email.

September 25, 2021. ■

FRIENDS OF THE PLEISTOCENE

UPDATE

Peter Almond: Convenor

AQUA-FoP Pop-up Conference

On July 8th and 9th of 2021 The Australasian Quaternary Association together with the Friends of the Pleistocene SIG held a virtual conference. Nearly 60 oral presentations were given over the two days including keynotes from Amy Prendergast of the School of Geography, Earth, and Atmospheric Sciences at University of Melbourne, and Shaun Eaves of the School of Geography, Environment and Earth Sciences at Victoria University Wellington. The meeting followed on from a previous AQUA pop-up organised by Chris Moy of the University of Otago, and Helen Bostock of the University of Queensland in 2020. One of the important discussions at the meeting was of diversity and inclusivity in the Quaternary Sciences. A report penned by Haidee Cadd (UNSW) and Lynda Petherick (VUW) follows. ■

INCLUSIVITY AND EQUITY

IN THE AUSTRALASIAN QUATERNARY ASSOCIATION (AQUA)

Haidee Cadd and Lynda Petherick

The Australasian Quaternary Association (AQUA) executive committee has started to consolidate previous efforts by facilitating a discussion on how to improve the inclusivity and equity of the association. Building on earlier work by e.g. Barrows (2018) and Reeves (2018), we seek to encourage participation, both across the broader community, but also within the committee, of underrepresented groups.

As a first step towards improving the equity of the association, AQUA wished to understand the demography of the society (Table 1), whether members feel welcome within the society and what improvements they would like to see within the society. The society asked members registering for the recent online AQUA 2021 conference to anonymously answer a series of questions, receiving 194 responses.

The preliminary data from this survey of respondents was presented at the AQUA AGM held during the lunch break of the 2021 online conference. The AGM, and ensuing discussions were well attended (89 members) and began a productive and thought-provoking discussion. At the AGM, several new committee members were nominated and successfully appointed, including Annie Lau (UQ) as a specific representative to actively promote inclusivity and equity. Many other members of our community also raised their hand to be involved. If you are keen, please add your name to the table in this Google doc: https://docs.google.com/document/d/12h9SCEJGFI8IT0phnPQ6ae0uwDkuNcvY3U3V3tkBTRo/edit Thank you to those who already have expressed interest!

Table 1. Number of respondents to the AQUA survey by Country and Identified Gender (note: "Not Answered" indicates participants did not provide an answer). The total number of respondents was 194.

	Male	Female	Not Answered	Total
Australia	67	93	3	163
New Zealand	19	12	0	31

In the following article we will discuss the data that sparked much of the AGM discussions and are helping to contribute to our understanding of the demography of the AQUA community.

The proportion of academic/Senior Scientist and mid-career researchers (MCR: here defined as 5-10 years post-PhD) are dominated by members identifying as male, while early-career researchers (ECR: here defined as 0-5 years post PhD), students and those in other careers (often outside academia) are dominated by members identifying as female (Fig. 1). These data support the qualitative assertions that have previously been suggested within the AQUA community e.g. "I guess this is reflective of the overall scientific demographic (or specifically Earth/Environmental sciences), but it often feels like AQUA is made up of a lot of old men and a lot of younger women." – feedback from a male academic during the survey. In addition to the data that show males make up the largest proportion of academic and MCRs, males dominate the retired members of the community and those who hold permanent positions. Female members however, are more commonly employed outside academia or universities, on fellowships or on short term contracts (1-5 years). The overwhelming disparity between male-dominated senior members and female-dominated early-career researchers (and students) suggests that attraction to the discipline and aptitude are not the issues leading to gender inequity within the Australasian Quaternary sciences, but the retention and promotion of female Quaternarists (Fig. 2).

During the open forum at the AGM, suggestions to aid in the retention of women included recognizing pioneering female Quaternarists, supporting female members through workshops and seminars and providing childcare or family friendly conference options. Many members were supportive of the development of a mentorship program within the broader AQUA community, both for students and ECRs, but also for female MCRs or Academics across the level B – C academic ranges to reduce the loss of females across this career stage. The AQUA executive committee is currently working on developing a mentoring

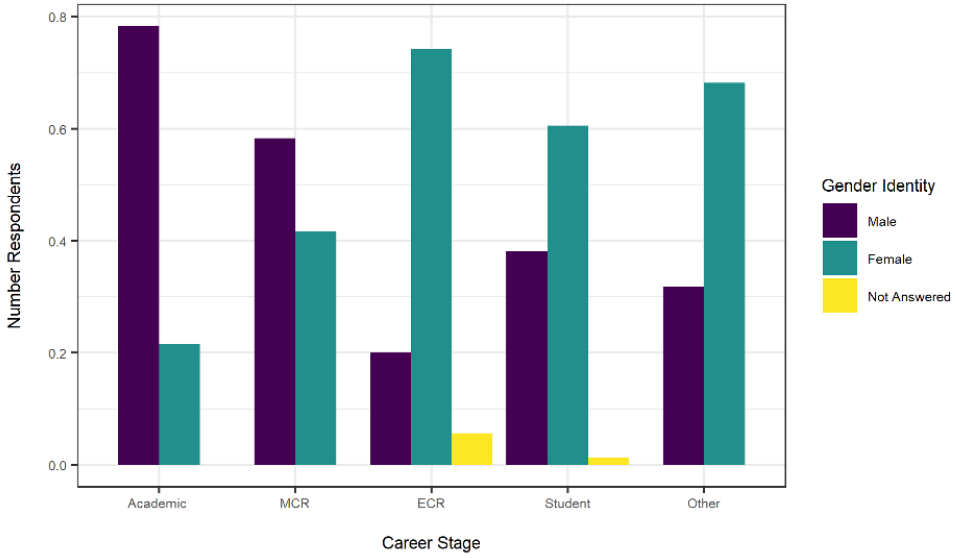


Figure 1. MCR=Mid-career researcher (5-10 years post PhD), ECR=Early-career researcher (0-5 years post PhD), Student = PhD/Masters/Honours/Undergraduate students, Other = those who do not fit within the listed categories.

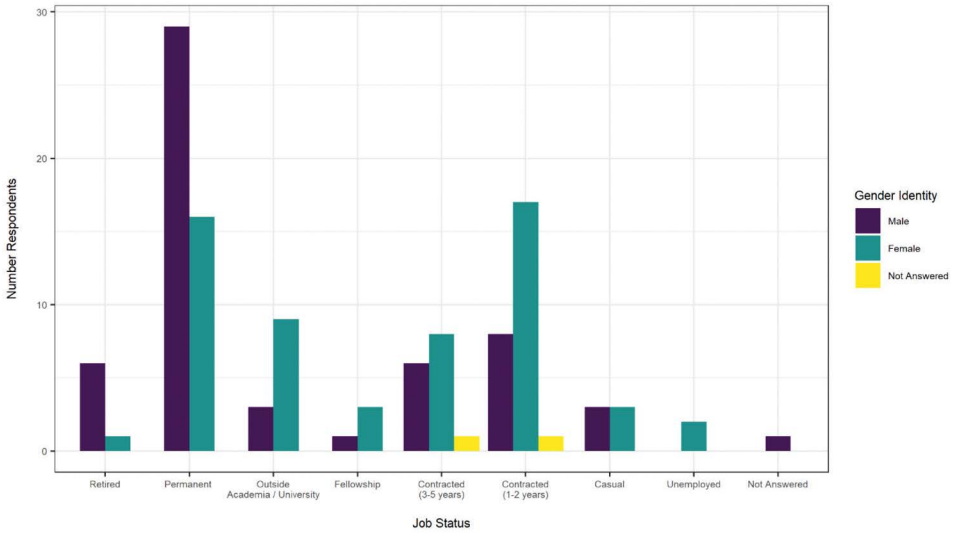


Figure 2: Survey respondent job status (not including students).

program for all members of the community, and would appreciate any feedback suggestions from the community (email lynda.petherick@vuw.ac.nz). The December 2021 Quaternary Australasia edition is a dedicated edition to highlight and celebrate the female members of AQUA, both past and present. In addition to wanting to reach gender parity across all career stages of AQUA, expanding the discussion to improve the levels of all underrepresented groups in our community is an important goal for the society. Of the survey data received, 79% of respondents identify as European/pakeha, while <1% of respondents are of Indigenous Australian or Māori descent (Fig. 3). Further to this, the majority of members in the AQUA community work on Aboriginal, Torres Strait Islander, Māori or Pasifika lands. As suggested in the conference forum, by appropriately engaging with local communities and traditional owners we could outline ways of incorporating communities into our research to build their capacity. This was further emphasized by responses to the survey

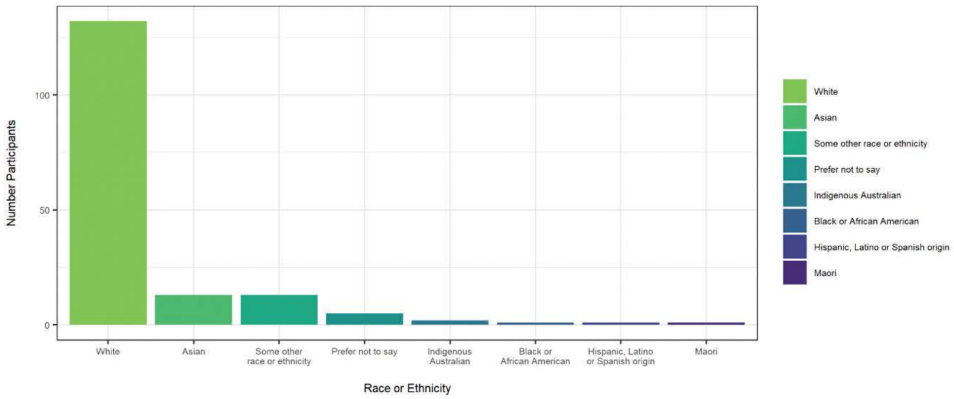
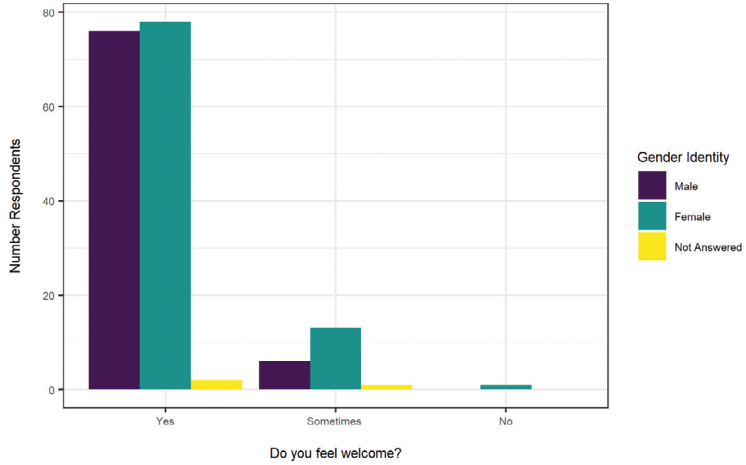


Figure 3: Ethnicity distribution within AQUA.

– "Involving more Indigenous Australians and respecting their knowledge systems would be a progressive way for AQUA to move", "We could do a better job of engaging with indigenous Australians and Māori" and "Perhaps there are still gains to be made on Indigenous recognition (particularly in research practice)." As noted by an Indigenous academic AQUA member during the forum, "There are lots of things we could be doing to advocate better research practice and engagement that both empowers Indigenous people and builds capacity. The long game will see more Indigenous people engaged and involved in science."

Central to improving the equity and diversity of an organization, is ensuring that all members feel welcome to participate and contribute. Of those who responded to the question "Do you feel welcome within the AQUA community?" 88% responded yes, 11% responded sometimes and <1% responded no. Females were twice as likely to answer "Sometimes" or "No". Survey respondents indicate a general sense of welcomeness within the society – "I have always felt the AQUA community has been very inclusive, and aims to be more accommodating every year", "This is a pretty friendly association and I enjoy the fact that students and ECRs are very much involved with the association", "I'm glad to be a part of this wonderful community and continue learning in a very inclusive atmosphere", "I felt included from the very beginning, as a student keen to engage". However as a society we can always strive to achieve better – "I have always felt a home in the AQUA community, but I think we could do better at inclusion and diversity", "Perhaps there are still gains to be made…on inclusivity of different genders and identities (ethnicity, sexuality, etc.)".

The AQUA executive is actively working on ways to improve the inclusivity and diversity of the organization. The committee welcomes feedback and input into these important issues from all members of the community. ■



Further reading:

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GEOHERITAGE

GSNZ SUBMISSION TO THE PARLIAMENTARY SELECT COMMITTEE INQUIRY ON THE NATURAL AND BUILT ENVIRONMENTS BILL

Bruce W Hayward: Geoheritage convenor
James Scott: President GSNZ

The Geoscience Society of NZ represents the professional and avocational geoscientists of New Zealand. It has had a Geoheritage Subcommittee for the past 40 years. It has coordinated the compilation of the NZ Geopreservation Inventory (since 1987) that documents "the geological sites and landforms of New Zealand of international, national and regional significance" with the information freely available to planners and the public through our website https://services.main.net.nz/geopreservation/. There are currently 3200 sites identified and mapped in the inventory.

What we request:

We request that Outstanding Natural Features (ONFs) and Outstanding Natural Landscapes (ONLs) have a definition in the preamble of the Act.

We recommend the following definition for ONFs:

Outstanding Natural Features: Geological sites, landforms and caves of scientific, educational, cultural and/or aesthetic significance.

The reason for our request:

There is currently immense confusion and misunderstanding amongst local authority planners, contract landscape architects, geoheritage consultants and environment court judges about what an ONF is or should be. There are two mutually exclusive concepts of an ONF being used in Regional Policy Statements and District Plans around the country. This has come about because there is no definition of what was meant by an ONF in the RMA when it was drafted. The two concepts being used are:

a. A geoheritage definition of ONFs exclusively as geological sites, landforms and caves, identified using geoheritage criteria (e.g. Auckland Unitary Plan, Northland Regional Policy Statement);

b. A small landscape definition of ONFs. These are often combined with ONLs (as ONFLs) and identified using landscape-restricted criteria (e.g. Canterbury Regional Policy Statement, Wellington Regional Policy Statement).

Providing a definition for an ONF (and an ONL) would greatly clarify these aspects of environmental planning for Council planners, land owners and the Environment Court.

Brief history of confusion:

When the RMA became law there was a general understanding that ONF was the term used for significant geological features and landforms identified for their scientific and educational values (=Geoheritage) and replacing the various protections specified in the Acts the RMA replaced. In the 1990s, most Regional Policy Statements and a number of District Plans accepted this assumed definition and the scheduling of geoheritage features began (e.g. Auckland District Plan, Franklin District Plan, Southland District Plan, Ashburton District Plan).

When these policy statements and district plans came up for review, planners were starting to grapple with how to assess and protect natural landscape. Many planners and landscape architects and even judges overlooked the fact that ONFs were proposed to cover New Zealand's geoheritage and combined the ONL and ONF references in RMA clause 6b to be read together as "outstanding natural features and landscape" meaning small and large landscape features under the notation ONFL. In many revised plans and policy statements objectives were written to identify and map ONFL using purely landscape assessment criteria and as a result geoheritage protection (as ONFs) and even scheduled geoheritage ONFs have been dropped from many, but not all plans and policy statements.

Summary of request:

As we see it, the simplest way to retrieve the original intended provision for protection of New Zealand's outstanding geoheritage features is to provide a geoheritage definition of an ONF in this revised Bill and Act and also a definition of an ONL that accommodates both large and small landscapes. Geoheritage and landscapes are identified and assessed by completely different criteria and specifically re-establishing the intention to provide for both is imperative. We see no conflict if some ONFs also occur within an ONL, indeed we would be surprised if they did not. But the majority of ONFs are stand-alone features that are not part of ONLs and vice versa. Criteria for identifying and assessing both geoheritage ONFs and landscape ONLs are well-developed and in use in different RMA plans and policy statements.

We attach a document published by GSNZ that describes our recommended criteria for assessing Geoheritage ONFs.

Yours sincerely,

James Scott (President, Geoscience Society of New Zealand)
Bruce W Hayward (Convenor, GSNZ Geoheritage Subcommittee)

PROPOSAL TO RAISE MEMBERSHIP FEES — TO BE VOTED UPON AT THE AGM

The costs of maintaining a society have been rising in concert with incremental increases due to inflation, postage, printing, travel, insurance, administrative assistance, compliance fees, and membership and financial software.

Membership enables you to state that you belong to GSNZ and that you adhere to the society's Code of Ethics: https://www.gsnz.org.nz/about-us/code-of-ethics/. The society committee considers member requests to advocate on a national level (e.g., support for Vanished World, sites of preservation), and considers member requests for society change (e.g., introducing support for childcare). The committee also strives to take leadership in the national society (e.g., investigating the declining numbers of Earth Science students at universities).

Membership fees form the backbone of GSNZ's operation and enable:

- Having an administrator who deals with operation of the membership database and subscription services
- Paying fees for being a member constituent of the Royal Society
- Paying for society liability insurance
- Annual financial audit and charity compliance costs
- Maintaining a website and online services
- Providing some financial support to Branches and Special Interest Groups
- Providing NZJGG access to members
- Supporting and underwrites the annual GSNZ conferences, including subsidising student registrations,
- presentation prizes and travel grants
- Supporting the costs of GSNZ publications
- Printing and deliver a newsletter (to those that want a hard copy)
- Covering travel for the Hochstetter Lecturer and President's tours to branches
- Offering small student travel grants and student chapter grants
- Committee travel to GSNZ meetings (now infrequent, and done by virtual meeting).

We have strived to reduce our operational costs by:

- shifting all but one of the national committee meetings to online
- operating within an annual budget
- efficiencies around print and postage charges

And we have sought other types of funding via:

- developing classified ads on the webpage
- building relationships with long-term sponsors
- sponsoring books

However, the society cannot sustain the benefits we currently provide in the long term with the increased operational costs. Unfortunately, the main revenue stream at the present (and for the foreseeable future) remains membership fees.

The last fee increase was in 2012 and was as follows:

	Standard member	Student member	Retired member
2011	$70	$30	$40
2012	**$80**	**$35**	**$45**
	14% increase	17% increase	13% increase

In comparison with fees in similar societies:

	Standard member	Student member	Retired member
GSNZ 2021	$80	$35 (= 44% of std.)	$45 (= 56% of std.)
Geoscience Society of Australia	$183	$40 (22% of std.)	$126 (69% of std.)
Geological Society, London	$432	$30/64/89 (7-21% of std.)	$216/146 (50%/34% of std.)
NZ Ecological Society	$90 (with a three year = $250)	"Unwaged" — includes standard members $55	

— Our Full member fees are therefore substantially less than comparative societies
— Our students and retirees pay a comparatively large % of standard membership fees.

To meet the increasing costs of maintaining an active and fully functional society, we propose to:

- Raise the membership fees from 2022
- Try to maintain lower fees for those that are not in fulltime employment
- Introduce a new class Early Career class to support people in that environment and encourage them to remain with the society after completing university;
- Tie fee increases annually to inflation. This model has been taken up by the GSL, who tie their fee annual increases to the Consumer Price Index, and mitigates large increases being undertaken at range of years. Potentially this could mean a decrease in fees too.

(Proposed fee table overleaf)

	2021	2022 Proposed	% increase	% of standard
Standard member	$80	**$100**	25%	
Student member	$35	**$40**	14%	40%
Early Career member (within 3 years graduation of last degree)		**$50**		50%
Retired member	$45	**$50**	11%	50%

If the proposal is approved at the AGM, then

- The % changes to students and retired members is < than those in 2011
- The main increase is for the standard members, who had a comparatively small increase in 2011.
- Early Career members would have fallen in the standard membership category previously, but now have a reduced membership cost to aid enduring participation in the society upon completion of degrees
- We note that students are already heavily subsidised at the annual conference in terms of both registration and travel support.

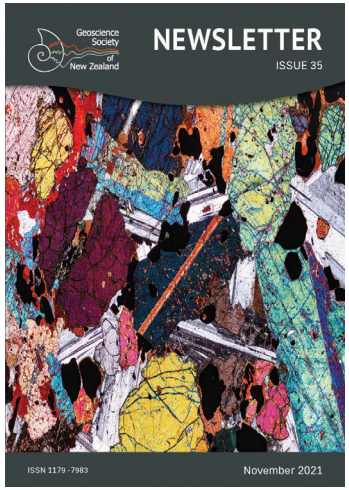
We now seek your views on the matter. Please write to secretary@gsnz.org.nz, by November 15th, who will collate views.

GSNZ AGM AND AWARDS MEETING

2ND DECEMBER 2021

Due to the postponement of this year's GSNZ Conference, to early 2022, we will be hosting a virtual AGM together with announcing our successful Awards recipients via Zoom.

Times and details will be sent to members via email and published on the GSNZ website and social media platforms.



WANTED!

A NEW NAME FOR THE GSNZ 'NEWSLETTER'

We welcome suggestions for a new name for the new-look GSNZ Newsletter.

The Newsletter has grown to become a publication that is more than just a newsletter. The first two GSNZ issues of 2021 had content that stretched to just shy of 100 pages consisting of a variety of interesting contributions of relevance to our members. These include in-depth articles, trip reports, updates from our Special Interest Groups, obituaries, feature articles, quizzes, event notifications and details, news from international organisations, as well as thought-provoking commentary from our president and other contributors.

It would great to build on the changes already made and make the Newsletter recognisable as a uniquely Kiwi publication. Ideally, it should concisely articulate what the publication is about and reflect who we are.

We'd love to hear your thoughts (for or against) and/or suggestions. Email the editor at editor@gsnz.org.nz. All suggestions submitted by 31 January 2022 will go in the draw for a mystery prize valued at $50.

GSNZ MEMBERSHIP SURVEY

ADVANCE NOTICE

Due to the evolving membership makeup of the GSNZ, and the global shifts in geoscience demographics, the National Committee is proposing to undertake a membership survey in the coming months. The intent of the survey will be to gather anonymous statistical information (e.g., age, gender, nationality, languages, location) to inform strategic and monetary decisions at the national level.

The hope is that, if successful, the membership statistics can be collected at regular intervals (annually, or perhaps bi-annually) to make sure that resources and efforts are being directed towards aspects that will most benefit members.

Watch this space.

SOCIAL MEDIA UPDATE

WHAT KIND OF ROCK IS THIS?

GSNZ social media has been enjoying slow but steady success as our numbers of followers increase along with a general trend toward more engagement with our posts across multiple platforms. We have recently invested time (but happily no money!) in free social media scheduling software that enables us to prepare post content in advance and schedule it to appear online even if we ourselves have managed to escape from our desks. While our adoption of this tool is in its early stages and we will continue to post topical content on an ad hoc and as relevant basis, when look forward to the taking advantage of the flexibility and strategic timing of posting that scheduling software offers.

As our online presence and reach has grown, we have begun experiencing more direct engagement from the wider online community. As you might anticipate, this has led to a rise in the number of "What kind of rock is this?" requests from the general public. While our focus is on representation and engagement with geoscience professionals, we recognise the value of broader engagement with the general public and are keen to encourage and support anyone with an interest in rocks. To do this, we need your help!

We are compiling a list of GSNZ members who are willing to be sent "What kind of rock is this?" requests relevant to their area of expertise. To prevent our members being inundated with unsolicited emails we propose the GSNZ Social Media Team act as a go-between, forwarding public enquires to relevant professionals within our membership, and then relaying their feedback anonymously to the enquirer. The key to this system working is compiling a list of willing members from a full range of disciplines and regions, so that we can have all the NZ geoscience bases covered and not have any one person being overwhelmed with requests. If you would be willing to be added to the list, please email your name and areas of expertise (rocky types and regions) to secretary@gsnz.org.nz.

If you do not wish to be added to the contact list but are still interested in providing your opinion on public enquiries, then please consider joining our new Facebook Group "What kind of rock is this?!" where we will post enquiries for moderated public comment and discussion (https://www.facebook.com/groups/210454451030763).

GEOPHOTOGRAPHY

CALL FOR ARTICLES

Each issue of the GSNZ Newsletter will feature a set of articles on a theme.

The theme for this issue was supposed to be Geophotography,, coinciding with the announcement of the winners of the GSNZ Photo Competition 2021. However, this will now be scheduled for the November 2022 issue. Interesting articles on this topic have already been promised for next year but there is still time for you to to prepare another!

Articles on any aspect of geophotography including technical, experiential, artistic, historical, biographical and others, will be welcome.

GSNZ CONFERENCE 2021

30th NOVEMBER- 2nd DECEMBER **MASSEY UNIVERSITY, PALMERSTON NORTH**

POSTPONED UNTIL 2022

Due to the uncertainty caused by COVID around the ability to travel, make bookings and host a face-to-face meeting this year, we have decided to postpone the GSNZ 2021 Annual Conference until 2022.

With over 350 delegates registered, 330 presenters and 12 industry sponsors wishing to connect, there is currently little appetite for holding a virtual meeting at the end of this very long year.

The conference theme, "A Whole New World-From Local to Global" seems even more relevant now.

We are monitoring the situation closely and will be in touch with everyone regarding registrations and accommodation options as soon as a decision can be made.

Vaccine Passport:
The NZ government has recently announced that a vaccine passport will be available at the beginning of November. We are waiting to hear if the vaccine passport will be mandatory for attendees at the GSNZ conference.

Any questions should be referred to the conference organisers gsnz@confer.co.nz

CONFERENCE CAREERS FAIR

As part of the GSNZ 2021 conference this year, Massey University is organising an earth science careers fair to be held the day before the formal conference programme begins. This will be a great opportunity for the GSNZ to showcase the range of research and work avenues available in the geosciences and for our member to engage with high school (Years 7 – 13) and university students. GSNZ will have a booth at the fair where we hope to have several interactive exhibits for students and other visitors to engage with. We invite any interested members to come along and chat to the students, play with our exhibits, and help inspire potential future earth scientists, before we all make our way over to the conference Ice Breaker to celebrate a job well done!

Anyone keen to help out or contribute to any of these events should contact Jenny Stein at secretary@gsnz.org.nz.

OUTREACH SYMPOSIUM – 2023

GEOSCIENCE OUTREACH OPPORTUNITIES ABOUND

As ideas for a GSNZ-led outreach symposium continue to develop, numerous people are being drawn out of the woodwork to contribute ideas and offer support. Initially floated as "Fostering the Future", a comparatively modest 2-day symposium to bring schoolteachers and geoscientists together (~50 people in total) to collaborate and strategically discuss ways to help Kiwi kids engage with earth science, the concept has since snowballed into something more akin to a full-scale conference. This has been driven by the feedback we have received from teachers, earth scientists and potential sponsors, which has been overwhelmingly positive. Everyone we have spoken to has seen great potential in the event and has been keen to contribute ideas to the development of the concept.

In addition to a name change, the current working proposal for a re-envisioned "Engaging Earth" symposium name anticipates bringing 100+ people together for 2 days of professional development presentations and workshops. These would cover all aspects of earth science engagement, from understanding the challenges facing teachers in the modern classroom, to the manifold ways earth science concepts can be used to teach the key competencies prescribed by the New Zealand school curriculum. In addition, the Ministry of Education has responded favourably to an invitation to come and present an update on the current curriculum review. While the overarching aim of the symposium is to get teachers and geoscience professionals all on the same page and working together to maximise student engagement with earth science, emphasis will be placed on:

- showcasing outreach initiatives and activities that have proven successful in the past,
- developing the skills necessary to make earth science concepts educational AND engaging for young learners,
- incorporating mātauranga with western science perspectives on earth processes, and
- enabling attendees to establish professional relationships from which future outreach opportunities, activities and resources may develop.

Based on feedback from schoolteachers it has become clear that the optimal time to hold the symposium is during the first term school holidays (avoiding Easter); at this time teachers do not need to arrange cover for missed classes and will not yet be too overwhelmed by student mid- and end-of-year assessments to be able to attend. This is also a time of year that seems suitable for geoscience professionals as it would come at the end of the summer field season and before end-of-financial-year project round-ups, university examination periods and many other conference commitments. Wellington has generally been favoured as the location of the symposium due to the city's accessibility and nationally central location, as well its diversity of other attractions that would help make the trip for out-of-town attendees even more worthwhile. While upscaling of the scope and size of the symposium has necessarily increased the budget, logistical complexity, and administrative workload, early indicators are that many key players and potential sponsors are keen to be involved and provide support. It is from these sources that many development ideas have come, including the offering travel grants for teachers and organisation of one or more social functions to accompany the formal event programme. Work will continue on the development of the concept, which we hope can be brought to fruition in April, 2023. ■

TAURANGA STEM FESTIVAL

5TH DECEMBER

Members may recall that a request for help organising a booth at Tauranga STEM Festival was put out via a newsflash in August. A small but enthusiastic team of volunteers came forward who have been busy putting together a fantastic collection of interactive resources to take to Tauranga and present at the festival. These include an earthquake simulating "shaker table", a geomorphology sandbox, several microscopic wonders, various intriguing rocks, minerals and fossils, and bubbly and molten geochemistry demonstrations.

Initially scheduled for October 3rd, the Tauranga STEM Festival was postponed until the December 5th. As such—pending amenable COVID-19 Alert Levels—many of us will be making our way up to Tauranga straight after GSNZ conference. We still need people to help man the booth on the day so please let us know if you're keen to help out!

GEOCRYPTIC CROSSWORD ANSWERS (FROM PAGE 42):

Across

1. abyssal plain, 6. ice rafting, 9. MOHO, 10. unconformity, 12. adamantine, 15. SEM, 17. melt, 18. tholeiite, 20. firn, 21. schist, 22. lee, 24. core, 25. amber, 26. labradorite, 27. ash

Down

1. acicular, 2. skarn, 3. lithostatic, 4. chondrite, 5. eon, 7. euclase, 8. glide, 11. radiolaria, 13. melange, 14. AMT, 16. (see 20 down), 19. oxide, 20 & 16. focal depth, 21. shard, 23. epoch

CONGRATULATIONS TO OUR WINNERS!

ADULT INDOOR: Tim Saunderson

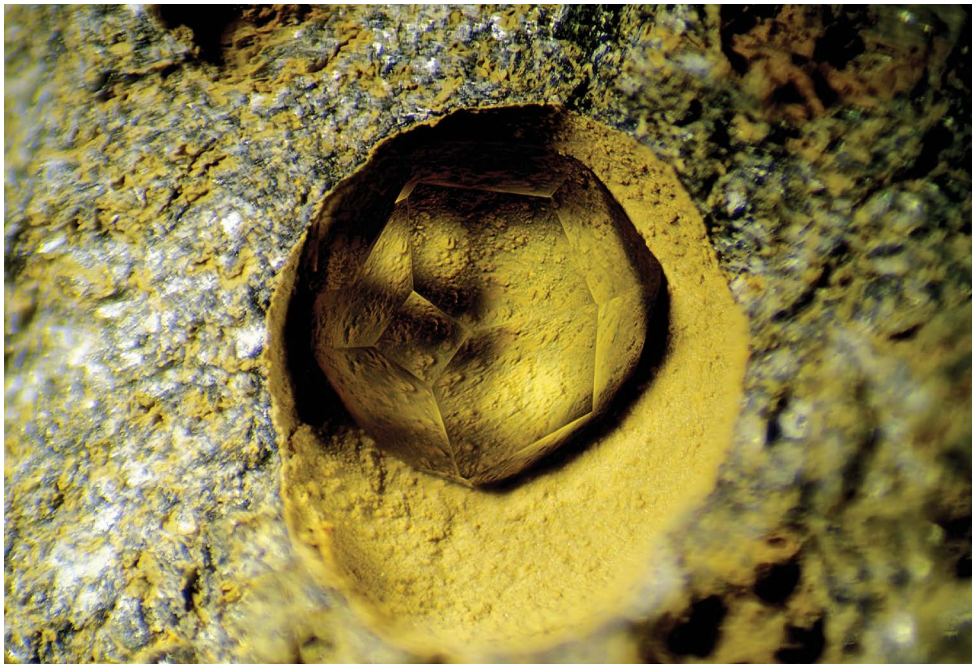
ADULT OUTDOOR: Joseph Baxter

STUDENT INDOOR: Kamen Engel

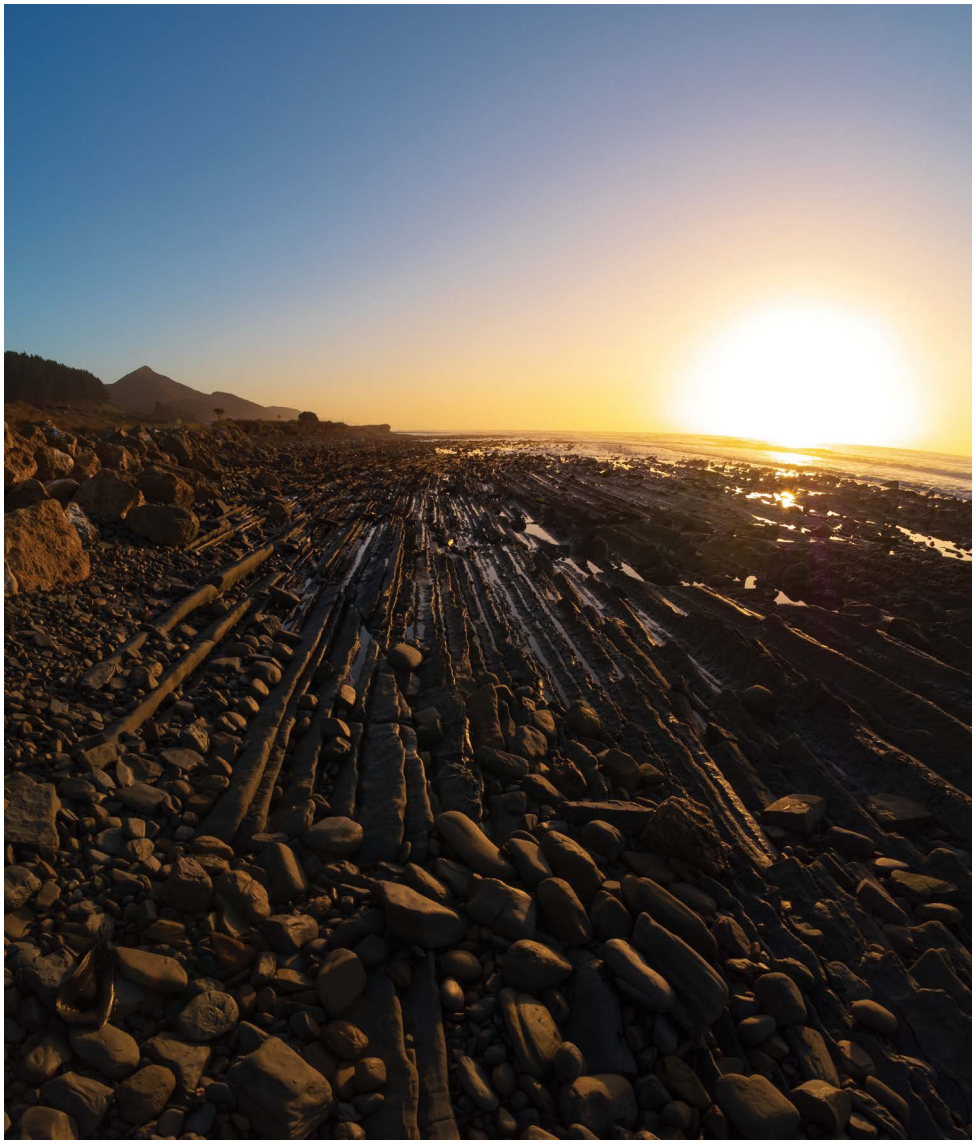
STUDENT OUTOOR: Yarub Alkindi

COMEDY GEOSCIENCE: Skye Naude

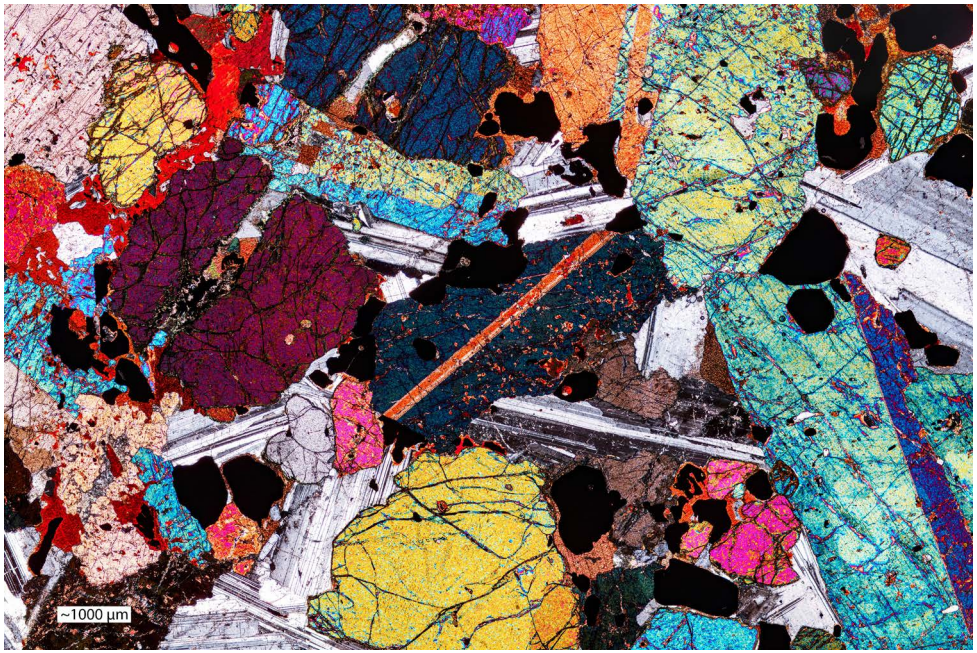
SCHOOL OUTDOOR: Jamie Stockley



▲ ***Analcime Crystal*** by Tim Saunderson —Adult indoor winner



▲ ***Tilted parallel lines of strata*** by Joseph Baxter —Adult outdoor winner



▲ ***Sample XY*** by Kamen Engel — Student indoor winner

Help by Skye Naude — Comedy Geoscience winner ▲

▲ ***A view of Mt Taranaki*** by Yarub Alkindi — Student outdoor winner

◀ ***No kina 4 dinner***
by Jamie Stockley —
School outdoor winner

JUST HOW ON EARTH CAN WE TELL WHAT MARS IS MADE OF?

Janis Russell

A chilly August evening greeted us in Timaru when my partner and I arrived to listen to GSNZ President, James Scott, address an eager crowd of astronomy afficionados at the Timaru District Council Chambers.

The Canterbury branch of the Royal Society Te Apārangi keeps South Canterbury residents, and those from further afield, informed and engaged on a regular basis with a variety of talks and events. If the attendance at James' talk is anything to go by then there appears to be considerable appetite for expanding one's intellectual horizons, there. From pre-schoolers to those well into retirement, it was clear that audience age was no barrier to enjoyment. The hot topic of Mars kept the whole room enthralled throughout the 90 minute presentation and questions time.

▼ James presents several meteorites from Mars at his talk, in Timaru.

▲ One of the attendees, Diane, enjoys a closer look at the Martian meteorites under a microscope.

The talk itself was a great example of science communication. There was something for for everyone. Tidbits of information—some known, some unknown, and some once known but long since forgotten—accompanied wonderful images of the red planet. The science content was well articulated and very accessible. It was aided, in part, by the regular injection of humorous gems delivered in James' characteristic straight-faced manner. And, when it wasn't funny, it downright filled us with awe and wonder. Who wouldn't be fascinated by our planetary differences and how we can use science to find out these things even with 54 M kilometres of distance between us?

This planet, named after the Roman God of War, is only 1/8th the size of ours but it packs an impressive punch. Amazing blue sunsets occur because its fine dust, of just the right sized particles, scatters blue light preferentially. And as if that isn't enough jawdropping enough, the diminutive planet boasts the largest volcano in the solar system, Olympus Mons. At 25km high and 625 km in diameter, it dwarfs our own Mt. Everest. Its massive size is partially attributable to difference between our planets, in crustal mobility. ■

The Geoscience Society of New Zealand gratefully accepts donations and bequests. These can be applied to specific funds or awards (see full list at http://gsnz.org.nz) or can go into the growing Legacy Fund, interest from which is used for general purposes. All donations and bequests will be acknowledged and a receipt sent.

DONATIONS

Donations enable those 'extra' things to be achieved. They are always gratefully received and can be sent upon membership renewals online at www.gsnz.org.nz. Donations of more than NZ$5 can qualify for a 33% tax credit from Inland Revenue (you will need to keep the receipt you get from us and fill in an IRD tax credit claim form at the end of the tax year). See the IRD website for more details.

BEQUESTS

The Society is committed to supporting the geosciences. We are especially keen to encourage young people to pursue a career in the earth sciences and enable them to take advantage of learning opportunities.
Many of our awards and prizes have been made possible by the generosity of family members or friends to commemorate a loved one. We are extremely grateful for their thoughtfulness to assist future generations.

A GIFT IN YOUR WILL

Bequests are a wonderful way to extend your giving and continue to be part of the Society far into the future. Once you have made provision for your loved ones, a gift in your will can be the perfect way to support students, geoeducation and research for generations to come.
All gifts, whether modest or significant, are highly valued. We strongly recommend you discuss your wishes with your loved ones and consult a legal adviser when making provision for a gift to the Society.

SUGGESTED WORDING FOR A BEQUEST:

I give and bequeath to the Geoscience Society of New Zealand (Incorporated)
the residue of my estate

OR _____% of my residuary estate

OR the sum of _____

as an untied gift

OR for the principal purpose of: _____

for which a receipt from the Secretary, Treasurer or Administrator of the Geoscience Society of New Zealand (Incorporated) shall be a full and sufficient discharge to my trustees.
If you are considering a gift in your will please get in touch. We would welcome the chance to speak with you about your gift plans and how you can truly make a difference to the geoscience community. Contact President@gsnz.org.nz in complete confidence.

The Geoscience Society of New Zealand is a registered charity (CC41125).

EDITOR: Janis Russell
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Editor@gsnz.org.nz

DEADLINES:	MARCH ISSUE	FEBRUARY 1
	JULY ISSUE	JUNE 1
	NOVEMBER ISSUE	OCTOBER 1

GSNZ members can choose to receive the Newsletter in electronic form or posted as a hard copy. Electronic form has the advantage of full colour and hyperlinking. Should you wish to change the method by which you receive your Newsletter please contact admin@gsnz.org.nz. All GSNZ members will be sent an electronic version.

This is your newsletter and the editor seeks correspondence, news items, interim or preliminary reports of current research, reviews of books and of recent geological publications and other topical articles. Reviews of New Zealand geology, geochemistry and geophysics published overseas are particularly welcome. This publication is not a peer reviewed academic journal.

The newsletter is formatted for A5. Email copy in any text format is acceptable. We suggest a limit of 1000 words or one to four pages in the current format for most contributions with minimal but key referencing. Depending on space, longer articles suitable as feature articles with illustrations are often published. Attributed images and graphics are encouraged. The editor seeks to provide a high quality publication for our readership. Accompanying photos must be sent as email attachments at the highest resolution possible. Please do not embed images in a Word document as they are often rendered unsuitable for the printing process. Annotation of images (numbering and descriptions on photos) is discouraged. Any images supplied to be considered for front cover use must adhere to the following minimum specifications: For A5 front cover (portrait suits best but landscape can be accommodated) 2551 x 1819 px. For A4 (full cover landscape wraparound) 3579 x 2551 px.

The editor will reserve judgement on whether an image is suitable for A4 wraparound. Unless indicated otherwise, views expressed are those of the authors and are not the official views of the editor or the Geoscience Society of New Zealand. Although encouraging informed debate, the Society moreover gives no guarantee concerning the accuracy, completeness or suitability of any information provided and takes no responsibility for any loss or damage that use of information in this publication may cause to anyone. Use of any information contained in any issues of this publication is the responsibility of the user. Note that names are normally of the format “John Smith” or “Jane Smith”. We prefer not to use titles such as Mr, Dr or Professor, nor to worry about whether we should use Miss, Mrs, or Ms.

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