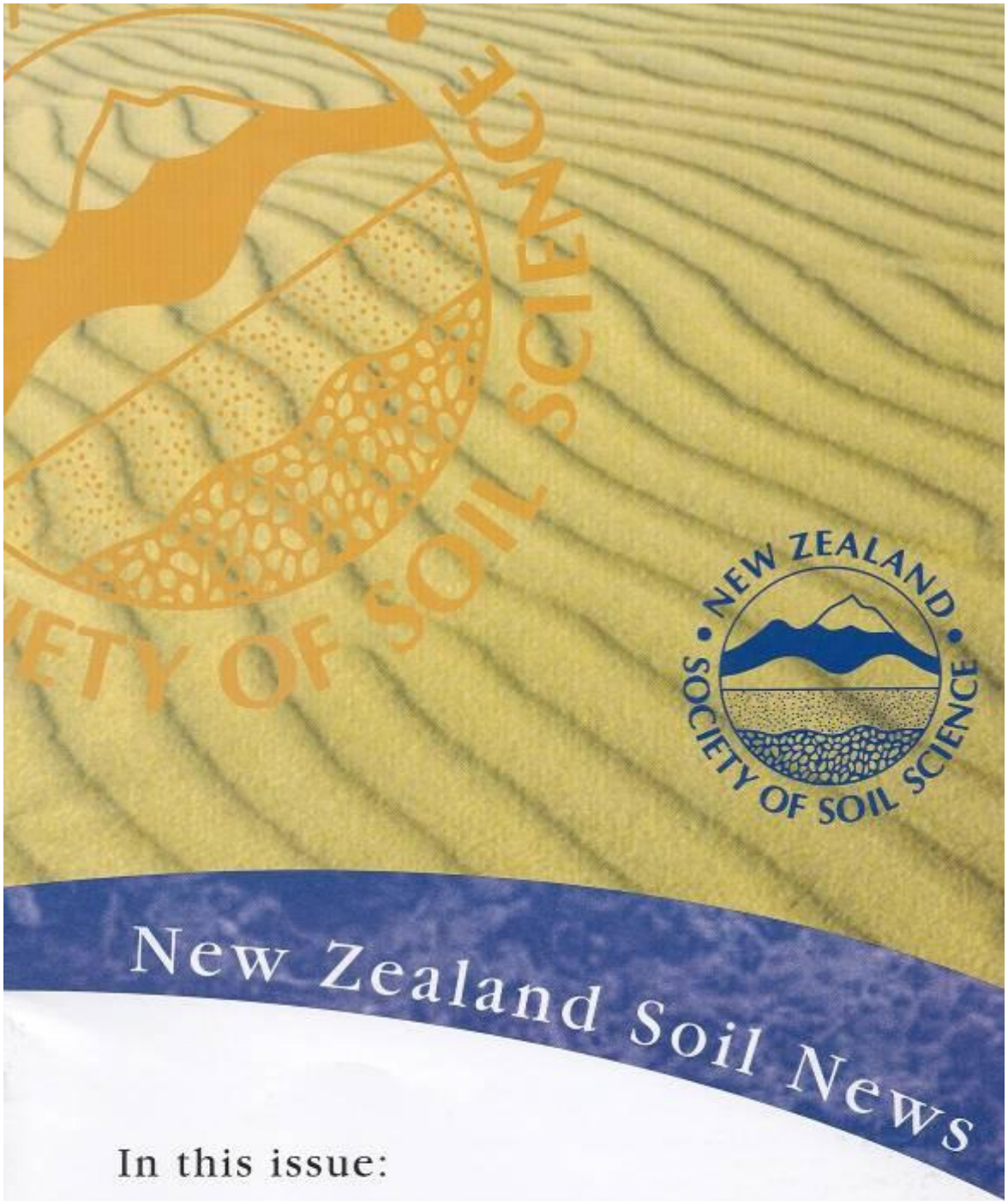


- **Editorial - Soil and Art, by Megan Balks**
- **Obituaries:**
  - **Margaret de Menna**
  - **Ian Baumgart**

Volume 62 No 2 April 2014

New Zealand Soil News

Newsletter of the New Zealand Society of Soil Science

ISSN 0545-7904 (Print)
ISSN 1178-8968(Online)

Volume 62 Number 2 April 2014

Contents

			Page
Editorial	Soil and Art	Megan Balks	64
Obituary	Margaret di Menna	G Francis	66
	Ian Lawrence Baumgart	P. Tonkin and others	68
The Dirt			71
News from the regions			72
Situations Vacant			84
ASA-CSSA-SSSA	Soil science offers way to remove arsenic from irrigation water		85
	Study examines cadmium uptake in New Zealand pastures		86
IUSSS			87
Abstracts:			88
Touna, M *et al*	Links between sulphur oxidation and sulphur oxidizing bacteria abundance and diversity in soil microcosms based on soxB functional gene analysis		
K Muller *et al*	Soil water repellency compromises the filtering function of Andisols		
T Harrison-Kirk *et al*	Soil organic matter and texture affect responses to dry/wet cycles: Changes in soil organic matter fractions and relationships with C and N mineralisation		
CR Anderson *et al*	Biochar does not affect soil N-transformations or microbial community structure under ruminant urine-patches but does alter relative proportions of nitrogen cycling bacteria		
Conferences			91

Your contributions are required - New Zealand Soil News is your newsletter

News, views, letters, articles (serious or otherwise)—send to:
Isabelle Vanderkolk
Climate Land and Environment Section
AgResearch Ltd
Private Bag 11008
Palmerston North
FAX: (06) 351 8032 email: isabelle.vanderkolk@agresearch.co.nz

---

Deadline..... for the **June** issue of Soil News is **Monday 9th June 2014**

Visit our website:
http://nzsss.science.org.nz/

New Zealand Soil News

Editor *D. Houlbrooke- dave.houlbrooke@agresearch.co.nz*
Typing *I Vanderkolk – isabelle.vanderkolk@agresearch.co.nz*
Printing *Massey University Printery*

New Zealand Society of Soil Science Officers 2012–2014

NZSSS subscriptions

NZSSS subscriptions become due on **1 July** each year. Individual members who do not pay their subscription before 31 October in a given year will be asked to pay an additional $NZ10.00 as a penalty for late payment.

	If paid by 31st October:	*After 31st October:*
Member (NZ)	$60.00	$70.00
Student Member	$35.00	$45.00
Member (Overseas)	$60.00	$70.00
Retired Member	$35.00	$45.00
Library	$70.00	

For any subscription queries, please contact nzsss@groundworkassociates.co.nz

Soil and Art

As soil scientists we come to appreciate soil for its contribution to: human welfare through food production; New Zealand's economic welfare through commercial production of saleable food, fibre, and fuel; and also soil's intrinsic complexity, fragility, resilience, and inherent beauty.

We need to reach out to as wide an audience as possible to ensure that an increasingly urbanised population retain their links with, and understanding of, the earth that underpins our very existence. The important underlying messages I like to share with first year students and general lay audiences, as I expressed in Hartemink *et al.,* (2014), are that soils:

> "1. exist, 2. are vital to life on earth, 3. are not all the same and the differences matter, 4. are a response to the environment in which they form, and 5. are fascinating in their complexity, diversity, and aesthetic appeal."

Art is one means by which we can draw soil to the attention of a wider audience, some of whom have become increasingly distanced from, and often untrusting of, science and scientists. There is increasing global interest in using art as a means of engaging people with soil. At the world soils congress in Brisbane I picked up a book entitled "Soil and culture" (Landa and Feller, 2010) which contains over 500 pages of fascinating information relating soils to every form of art and culture from painting, earth sculpture, and cinema, to literature and creation legends. In the draft programme of the 20th World Soils Congress (to be held in Korea in June this year) there is a concurrent session every afternoon devoted to soil art and video. That is more time than any other single topic has in a large and busy scientific conference.

At the New Zealand Society of Soil Science conference in Hamilton, in December this year, we are planning to hold a soil-related art exhibition. *We would like to showcase the widest possible interpretation of soil-related art,* ***produced by you, the New Zealand Soil Science community***. Sculpture from soil/clay/earth materials or with a soil-related theme, paintings related to soils or made using soil materials, poems or short statements that can be displayed on a wall poster, photography, fibre art, computer generated art, soil peels, sand paintings, cartoons – everything is possible.

Ken Van Rees from Canada comments (in Hartemink *et al.,* 2014) on how encouraging pedology students to engage in soil-related art creates a fun and different way of engaging students with soil science. Ken comments that

> "Regrettably, fun and creativity have in many ways been largely removed from learning experiences for science students. Not only have the students gained a different tool for interpreting what they see but I am hoping that this merging of art and soil science will captivate them to explore other possibilities for creativity when they leave, as well as open doors for other disciplines to see what soil scientists do."

Thus, my challenge to you is to get creative. Do something to show off some of your interpretations of soil or soil materials. Get committed, let Peter Singleton (peter.singleton@waikatoregion.co.nz) or me (Megan Balks, m.balks@waikato.ac.nz) know you will contribute so we can ensure we have enough suitable display space. I know we already have the basis of an interesting exhibition. If we all work to contribute we can make it a really great event to showcase New Zealand soils and the creativity of New Zealand's soil scientists. Have some fun - give it a go!

I look forward to seeing you all in Hamilton in December and enjoying some great innovation and creative thinking, in both the science programme and the art exhibition.

Megan Balks

References:

Hartemink A. et al. 2014. The joy of teaching soil science. Geoderma 217–218. 1–9
Landa, E.R., C. Feller (Eds) 2010. Soil and Culture. Springer Dordrecht. ISBN 978-90-481-2960-7.

Obituary – Margaret di Menna: 9.7.23 – 24.3.14

Margaret di Menna was a ground breaking researcher and pioneer for women. Her passing ends a very long association with AgResearch and its predecessors. She started with the Soil Bureau of the DSIR in the late 1950s and has since had a nearly continuous career publishing and researching. Margaret officially retired over 25 years ago but continued to come into work and, until mid-2013 at the age of 90, was still in the office at least two mornings a week.

Margaret was the first woman PhD at Otago University who during her career made significant contributions to work on ryegrass staggers, facial eczema, and pasture fungi.

Her earliest publications appeared while she was still a graduate student and for her whole life she remained an active, highly respected and frequently cited researcher, with a formidable list of publications. To single out a couple only: in 1954 a study of 'Non-pathogenic yeasts of the human skin and alimentary tracts' was published in the Journal of Pathology and Bacteriology: it was reproduced in the online version of the journal in 2005. Her work in McMurdo Sound led to an important article 'Ecological investigation of yeasts in Antarctica soil', in a book she co-edited and which was published by the American Geophysical Union in 1978.

In 1997 she received an ONZM for services to microbiology.

Over the last few years Margaret had reduced her work hours from every weekday morning to one or two mornings a week at Ruakura, yet during this time she was the senior author of two major review papers – one on facial eczema published in 2009 and one on fungal endophytes of ryegrass published in 2012.

"*The depth and breadth of her knowledge on toxin-producing fungi in pastures was second to none*," says Science Team Leader - Biocontrol & Biosecurity Alison Popay. *"She was truly remarkable."*

Margaret was humbled by the 2011 dedication in her name as the first female PhD of a reading room at Abby College in Otago University.

"I am most gratified to have this honour but it was just a matter of me being there," she said at the time. *"Women weren't expected to become doctors and have research careers but we were, and there were others around, so it was a matter of time."*

During her 60 year research career Margaret had seen many changes in both science and farming.

"When we worked with farmers on toxic pastures we had to get them to make their own spore counts *using a haemocytometer slide and a microscope,"* she said in a 2011 article.

"It was the 1960s and this was quite radical at the time, but they did it and in so doing learnt it was up to them to use science to manage their land. Now farmers are using computers to communicate and monitor their farms, and the use of our work has never been so good."

While Margaret's work will live on in science journals and New Zealand farming practice, it is the colleague and friend that will be so greatly missed.

"*The men won't know about this,"* says IFS Administrator at Plant Protection Building Mary Hiron, *"but when Margaret was based in the Tower Block she would bring flowers for the ladies toilet on the third floor. When she moved to her office at Plant Protection the habit of bringing flowers moved with her. Yet she was no push over - she always had 'her' seat in the cafeteria and I'm sure she was the last person in New Zealand who smoked in the workplace! Despite her reputation for being 'scary' she was always available to help scientists with their work."*

Neale Towers worked with Margaret for more than 30 years and, despite the reputation, always found her willing to help.

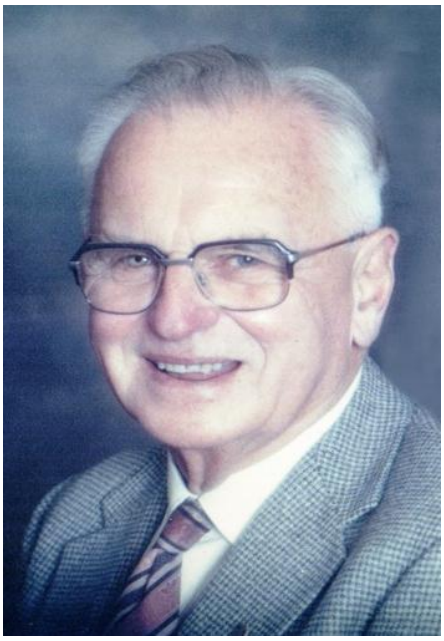
"*It was quite a privilege, and initially rather scary, working with Margaret over the many years I was involved in FE, ryegrass staggers and more recently zearalenone infertility research,"* he says.

"I recall to this day my first meeting Margaret as a new graduate wanting a culture of Pithomyces to use to produce some radio-labelled sporidesmin. I'd heard on the grapevine that she was a bit scary/abrupt and when I entered her laboratory to ask for some harvested spores I was greeted with the vision of Margaret smoking and at the same time inoculating petrie dishes while ash fell around them. A rather short "What do you want" followed by "Do you know how to use them? Can you keep the cultures clean?" seemed to confirm Margret's reputation for not suffering fools gladly.

Fortunately a full explanation as to why I wanted the cultures, what I was going use them for [producing radio-labelled sporidesmin for metabolic studies in rats and guinea pigs] and how I proposed to go about it, led to some very helpful advice and the beginning of an association that last for more than 30 years."

Dr Margaret di Menna (left) with the Deputy Vice Chancellor (Vice Chancellor Elect) Professor Harlene Hayne, University of Otago (right), 2011

Obituary – Ian Lawrence Baumgart, 1920 - 2013



QSO, BA, BSc, FNZIAS, Harkness Fellow at the Brookings Institute, recipient of the Royal Society of New Zealand's Thompson Medal for service to science, Queens Jubilee Medal, Pedologist, Science Administrator and New Zealand's first Parliamentary Commissioner for the Environment.

Ian Baumgart is a name that may not be known to many in today's New Zealand Society of Soil Science but he was an early pedologist in soil survey and an important figure in New Zealand science as a senior and influential science administrator. He was born in Hastings and grew up on the family orchard on the Heretaunga Plains. This was a time of challenges with orchard crop failures in the 1920's and 1930's, the 1931 Napier earthquake followed by the years of the great depression. On the personal side Ian had two health crises as a child with double pneumonia and the loss of vision in his right eye, resulting in some years of home schooling with his mother. He excelled in later years being dux in 1937 and 1938, and head prefect at the Hastings High School.

It was during his time helping on the family orchard that Ian developed a wide range of practical skills and was first introduced to the potential role of science in orchards. In Ian's own words: "In the late 1920's and early 1930's there was considerable concern about the state of New Zealand's primary industries. Returned servicemen from World War 1 were seeking land, unemployment was high and New Zealand was in a serious economic depression. The Heretaunga Plains in Hawke's Bay was an example. Its horticultural industry had been seriously damaged by hail-storms in 1924, 1926 and 1928. Floods and fire-blight had damaged many orchards. In 1931 the earthquake had destroyed property, and killed 250 people. In 1935 a severe late frost had destroyed crops at their most susceptible stage. The confidence of the industry was at a low-ebb. The Plant Diseases Division of DSIR, led by Dr G.H. Cunningham had established a reputation for technical support of the industry in the control of pests and diseases. So there was considerable support and enthusiasm from the industry when it was announced that a soil survey of the Heretaunga Plains was to be undertaken (Hughes, H.A., Hogson, L. Harris, A.C. 1939: Soil Survey of the Heretaunga Plains. Pp 18-43 in Land Utilization Report of the Heretaunga Plains. NZ DSIR Bulletin 70). My first contact with the soil survey was rather an anti-climax. I was driving a tractor cultivating our orchard, when a young man appeared through the hedge, carrying an auger, a note-book, and a land-tenure map of the region, and announced he was Harry Gibbs and he was doing the soil survey of the district. I offered the customary cup of tea and any assistance we could give, but was somewhat deflated when he explained he was following the boundary of a recent alluvial deposit from an 1855 flood and would only be on our property for about 20 minutes. Only when the maps were available and the soil patterns emerged would we realize how contemporary geology was the basis to efficient and profitable land utilization, based on which far-reaching decisions could be made on types of crops, land subdivision, access and the necessary huge investment in storage and processing plants".

Ian's first job was as a clerical cadet in the Department of Agriculture and he undertook part time studies at Victoria University College. He completed his BA degree prior to enlisting in the New Zealand Army at the end of 1940. Because of his eyesight problem Second Lieutenant Baumgart was posted to an artillery unit garrisoning Norfork Island. Again quoting Ian: "My university course was interrupted by three years in the Army in New Zealand and Norfolk Island where I gained training and experience in surveying methods for field and heavy coastal-artillery. This was very useful when,

after discharge from the army and completion of my degree, I joined the Soil Survey Division". He returned to Victoria University College to complete a BSc, majoring in Geology under the pioneer of New Zealand geomorphology Sir Charles Cotton.

On the completion of Ian's university studies he was interviewed by Dr Leslie Grange in Wellington and was offered a job as assistant pedologist with James Raeside in Timaru. "I gratefully accepted and asked when I could start. Grange looked at his watch and replied - there is a ferry sailing in two hours - I will tell Raeside you are coming. I negotiated a twenty-four hour delay to tidy up my Wellington arrangements, and reported in Timaru the following mid-day - much to Raeside's surprise. He had not heard of me or of an assistant for his team!" This was in 1945 and the soil survey of Geraldine County was well underway. This was one of a number of soil surveys in regions where linen flax was grown during the war years. James Raeside was the officer in charge assisted by two Otago University students John McCraw and Douglas Coombs. They were directed to assist with this survey when not occupied with their university studies. John McCraw claims to have instructed 'bouncing Baumgart' in the basics of soil survey and in those days they only had bicycles for transport. Again Ian's words "I was given the less-demanding task of surveying the downlands of Geraldine County to assess the extent and severity of topsoil loss caused by cultivation, cropping and grazing practices, resulting in run-off and soil creep when the soils were thoroughly wet and wind erosion occurred during dry periods (Raeside J.D. and Buamgart I.L. 1947: Erosion on the Downlands of Geraldine County, South Canterbury. NZ Journal of Science and Technology A29: 49-57). The policy of the Soil Survey Division was to work towards a complete coverage of New Zealand soils by a national series of soil maps at 4 miles per inch, with some regions with special characteristics being mapped in more detail at 2 miles per inch. One area selected for 2-mile coverage was the Plains and Downs of Canterbury and North Otago. By this time there were two field teams operating in the region - Raeside's team based in Timaru (Baumgart, McCraw, Coombs, Pullar) and C.S. Harris's team based in Christchurch (Vucetich, Fox, Cutler). The two teams were differently orientated: Raeside's was geologically based, working from broad patterns down to detail: Harris's was agriculturally based, working from detail up to broad patterns. For some reason (perhaps it was my army training?) I was appointed to coordinate the project and to bring a unified result on a common basis. Though the two district pedologists, Raeside and Harris, were very different in their background and approaches to soil surveying, they were both cooperative and the teams worked well together. A time target was set at two years, and field work was substantially achieved by that time - quite an achievement considering the transport facilities available - two cars and several push-bikes." In 1947 Ian was transferred to the central North Island. The final production of the maps and bulletin of the Plains and Downs of Canterbury and North Otago was not published until 1967. Interestingly none of the authors, Kear, Gibbs and Miller, were involved in the original soil survey.

Again in Ian's words: "In late 1947 on completion of the field-work for the Plains and Downs survey I moved from Timaru to begin a soil survey of the pumice lands. It was intended that it should be based in Rotorua, but post-war accommodation was very scarce for both office and housing. I began the Taupo survey living and working in a folding caravan based in Taupo. It was April 1948 before we secured a room in the Rotorua Public Works Department for an office, and a two-room bach at the Rotorua Railway station for the family. Things improved in July with a move to an office in Pukaki Street and a rented PWD cottage on Te Wairoa Road. The western Taupo soil survey was quite a pioneering project to identify and characterize soils of this area that were suitable for settlement of returned servicemen under the rehabilitation scheme. The area was Crown and Maori land which had been inaccessible until the Waikato Hydro scheme required a main transmission line south to Bunnythorpe. A very narrow road was pushed through from Whakamaru to Tokaanu. The soil survey was used by the Department of Lands to plan the subdivision for farming, forestry, and reserves. It was at that stage tough going in scrub between the lake and the Hauhangaroa Range, and we camped for a week at a time. Mike Leamy worked with me in the field in 1948, and Des Cowie took over from him the following summer. Both were staff in training, probably designated as Assistant Pedologists. Ted Stokes was a Lincoln graduate who worked with me for a couple of field seasons and

he decided to return to farming near Kaiapoi. Gordon Gemmell from the Chemistry Section at the Soil Bureau joined us for several months to gain field experience in 1952 and Colin Vucetich took over from me at the end of 1953".

In 1953 saw the first publication of the radiocarbon dates on charcoal from the Taupo eruption. Quoting from Professor David Lowe's 2002 Norman Taylor lecture: "The charcoal sample was collected by Ian Baumgart, who went on to write a pathfinding paper on the history of the Taupo volcano using his new dates. (Baumgart, I.L. 1954: Some ash showers of the Central North Island. N.Z. Journal of Science and Technology B35: 456-67). He also mapped the eruptives using isopachs, or lines of equal thickness, a feature that prompted Alan Pullar to later describe Baumgart as the father of tephrochronology in New Zealand".

In late 1953 Ian Baumgart transferred to the head office of DSIR in Wellington as an assistant to L.W. Tiller the then Assistant Director General of DSIR responsible for the Agricultural and Biological Divisions. During 1962 and 1963 Ian Baumgart had to leave his family for a year to study science administration in the U.S.A. He was awarded a Harkness Fellowship of the Commonwealth Fund at the Brookings Institution, Washington DC, USA. In 1966 he was appointed Assistant Director General of DSIR (Agriculture and Biology). In these roles he played a significant part in determining the shape and direction of agricultural and biological research in New Zealand. In 1974 he became New Zealand's first Parliamentary Commissioner for the Environment. Here he made a big impact in setting up and administering a very important national body. In this role he was New Zealand's representative on the United Nations Environmental body, at that time with its head office in Nairobi. He retired from the Public Service in 1980.

From 1980 to 1983 he was a United Nations consultant and between 1980 and 1986 he was Deputy Chair of the National Research Advisory Council, Chairman of the Toxic Substances Board, and from 1984 to 1989, he was Chairman of the Animal Ethics Committee. Between 1976 and 1984 he was New Zealand representative on the Commonwealth Fund of New York (Harkness Fellowship selector). He was a founding member, Past President and Fellow of the New Zealand Institute of Agricultural Science. He was a founding member of the New Zealand Society of Soil Science and in 1976 the first recipient of the renamed Norman Taylor Lecture. He was awarded the Queens Service Jubilee Medal in 1977, the Queens Service Order in 1980 and the Thompson Medal of the Royal Society of New Zealand for service to science in 1987.

In 1945 Ian married Lesley Grace Thompson his childhood sweetheart to whom he was engaged before the war. They had three sons and a daughter. Sadly Lesley died in 1966. In 1968 he married a family friend Nesta. Ian died on the 27th of September and sadly Nesta died on the 26th of November 2013. They were both aged 93. Ian is survived by, his four children, ten grandchildren and seventeen great-grandchildren. For many years he was an elder of the Presbyterian Church and was President of the Western Hutt Rotary Club.

Sources; Brian Simmons, Biographical notes Hawkes Bay Knowledge Bank, and correspondence with Ian Lawrence Baumgart.

Philip Tonkin

The Dirt

A collection of soil-related oddities from Godzone and around the world

The inspiration for this edition of The Dirt came from Bob Irvine at the Nelson Mail who was inventing words which included this gem:

> **Richmundane:** *A trace element found in soils south of here [Nelson].*
>
> *The mystery is, plenty of clever, creative people live there, yet the town remains as dull as the ditchwater that flows beneath it. We can only conclude there is some toxin in the soil.*

So we've invented a few of our own science & soil-related words:

Carbonundrum -*The mystery of what is the upper limit of soil carbon storage, and how we can manipulate soil processes to reach it.*

Flabbergas –*Another term for nitrous oxide measured in static chambers when the differences between the maximum and minimum N_2O flux on a single sampling occasion are > 50-fold.*

Googlevation -*The process most researchers use when faced with an impossible deadline to put a new, novel research proposal together, involving trawling the internet for ideas.*

Incognitrate -*The ability of nitrate to slip past porous cup samplers when measuring nitrate leaching, but revealed when soil samples are taken and extracted with KCl for mineral nitrogen.*

Uncertaintitis – *A condition where the scientist suffers chronic uncertainty about (a) their results and (b) applicability of said results to the outside world.*

Urinenormous *1. Adjective describing the large amount of nitrogen that is lost from NZ pastoral soils originating from cattle urine. 2. May also refer to the amount of funding invested in estimating this pool.*

If you have any alternative definitions or other words to share, send them in to the editor for inclusion in the next edition.

Waikato/Bay of Plenty

AgResearch Ruakura

Dave Houlbrooke and **Anwar Ghani** (AgResearch) have been collaborating with Paul Johnstone and Matt Norris (Plant and Food) as part of the new *Forages for reduced nitrate leaching* MBIE programme lead by DairyNZ. Their work is looking at N mineralisation and subsequent nutrient supply to crops fertilised with dairy effluent products. An initial incubation study will soon commence to investigate the effect of a range dairy effluent characteristics (liquids, slurries and solids) in determining the N release rate. This is year one of a 6 year programme of work which will ultimately provide a tool for helping farmers supplement growing crops with dairy effluents with some assurance of expected N supply.

Diana Selbie (pictured) participated in DairyNZs Year 13 Science Day (the top Waikato science students in year 13) held at Lye farm. AgResearch's theme was 'pasture to plate' and included activities like identifying N-fixing nodules on lupins, a Wynogradski column to show a diversity of colourful microbes, a comparison of healthy vs eutrophic water, and a map of soil types in NZ. **Angela Schipper** also lent her expertise to convey concepts clearly and simply to students.

Diana was also a judge for the Ballance Farm Environment Awards, which was an inspiring experience. Winning farmers combined passion and innovation to improve their farming systems, for example inventing a wind-powered effluent agitator, or combining income from stock and tourism.

The Overseer team (**David Wheeler**, **Mark Shepherd**, **Mike Freeman** & **Diana Selbie**) spent much of February and March (in between numerous other tasks!) deliberating the question of how long is 'long-term' when it comes to data input to the model.

The result of these deliberations is some tentative recommendations on timescales for matching management data input to climate data. We say 'tentative' because the timescale of the input data has never been categorically stated before. For a more detailed explanation see: OVERSEER® Nutrient Budgets: selecting appropriate timescales for inputting management and climate information (Soon to be on the FLRC website http://flrc.massey.ac.nz/publications.html.) And while there, also check out: Watkins, N. & Shepherd, M. 2014. Compendium of New Zealand pasture farmlet experiments measuring nitrogen leaching.

Antonin Guigue completed four months at Ruakura as part of a one-year joint project between **Stewart Ledgard** and the Institut de l'Elevage examining models for estimating greenhouse gas emissions from dairy farms based on a range of NZ and French case study farms. Antonion is a student from France who is doing this project as part of his agricultural degree.

Jeerasak Chobtang is another student at Ruakura working with **Stewart Ledgard.** He's doing a PhD through Massey University, and will soon be commencing the analysis phase of his work examining the effects of dairy intensification and use of mitigations on environmental emissions.

The 2014 Hamilton based NZSSS conference organising team have been busy advancing the scientific programme, field trips, sponsorship and general logistics. We are excited by the range of key note speakers that we have been able to secure and encourage all to consider putting in an abstract for this event. More details at www.nzsssconference.co.nz. The team is **Dave Houlbrooke, Gina Lucci & Natalie Watkins** (AgResearch), **Sharn Hainsworth** (Landcare), **Megan Balks and Louis Schipper** (University of Waikato), **Reece Hill** and **Haydon Jones** (Waikato Regional Council).

Waikato University

Cake-town races

From 1 April, 2014, the departments of Earth and Ocean Sciences, Biological Sciences, and Chemistry within the Faculty of Science and Engineering at the University of Waikato were amalgamated into a single entity, the School of Science. A new head of school, **Professor Chad Hewitt**, was appointed a few months ago (see http://www.scoop.co.nz/stories/ED1403/S00032/new-head-for-school-of-science-at-waikato-university.htm). The appointment of a deputy head of school is pending. The Department of Earth and Ocean Sciences (previously the Department of Earth Sciences) was formed in 1970 by foundation professor and Head of Department **Professor John McCraw** with support from (now Professor Emeritus) **Michael Selby**. (The late **Harry Gibbs** was appointed soon after.) On 27 March, 2014, the department staff commemorated 44 years of teaching and research since 1970 with an afternoon tea event led by the last chair, **David Lowe** (Fig. 1). A departmental photo was taken of all current staff (Fig. 2).

Fig. 1. Commemorative cake made (by Maria Lowe) for the Department of Earth and Ocean Sciences 'end-of-department' event on 27 March, 2014. *Photo*: Natalie Guest.

Fig. 2. Entire staff (including several former staff) of Department of Earth and Ocean Sciences as at 31 March/1 April 2014. *Photo*: Natalie Guest and Max Oulton.

Fig. 3. Hansen Ihle (left) and David Lowe with Hansen's commemorative Antarctic painting presented to Waikato University on 27 March, 2014.
Photo: Natalie Guest.

At the event, a painting depicting the first-ever Antarctic expedition dedicated to exploring Antarctic soils was gifted to the University of Waikato to celebrate the 44 years of Earth sciences' activities and to commemorate the university's 50th anniversary in 2014 (Fig. 3). The painting features soil scientists **Dr Graeme Claridge** and Professor Emeritus John McCraw. Artist, **Hansen Ihle**, was a part-time Earth sciences student at the Waikato University from 2003-2014. Encouraged by **Megan Balks**, Hansen worked with Prof McCraw to bring the painting to life from a copy of a black and white photo taken during the expedition. Graeme and John are pictured standing outside a makeshift shelter at New Harbour, Taylor Valley, Antarctica, in the summer of 1959/1960 (see also Fig. 4). Undertaken under the auspices of DSIR Soil Bureau, soils were mapped and sampled in Taylor Valley and investigated at sites on the Ross Sea coast. The wooden shelter featured in the painting was a crate in which equipment was transported to Antarctica. It was converted into a shelter, which was mounted on a sledge for transport and towed across the Ross Ice Shelf from Scott Base to New Harbour using Massey Fergusson tractors. There is a strong connection between this pioneering expedition and ongoing Earth sciences research at the university. Many Waikato academic staff members have subsequently travelled to Antarctica to undertake research, with support and encouragement from Prof McCraw. The McCraw Glacier in the Britannia Range of Antarctica was named after him in recognition of that support (see http://www.geographic.org/geographic_names/antname.php?uni=9662&fid=antgeo_115).
Megan Balks also spent three field seasons working in Antarctica with Dr Claridge and her collaboration in publishing Antarctic research with him has spanned more than 20 years. (These notes mainly from a media release prepared by Natalie Guest.)

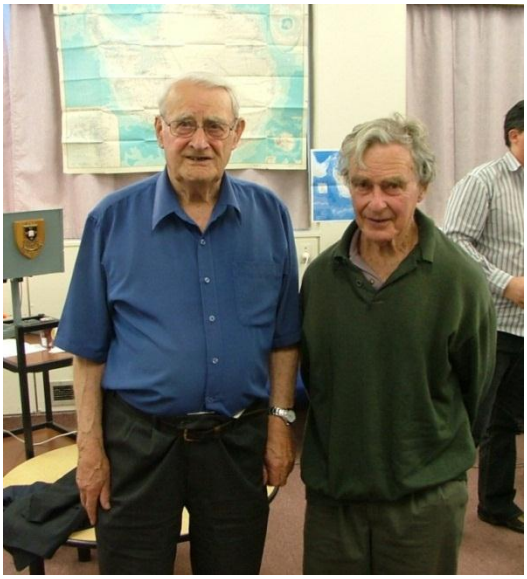


Fig. 4. John McCaw (left) and Graeme Claridge at an earlier 50th anniversary event (17 November, 2009) in the department commemorating 50 years of soil science research in Antarctica.
Photo: David Lowe.

Dr Bethany Fox (standing alongside John McCraw in Fig. 2 at far right in the front row) has arrived to take up a lectureship in the Earth sciences group from 1 April, 2014. She will be teaching mainly in sedimentary geology and first-year classes. Recent PhD graduate **Tanya O'Neill** has been appointed to a one-year teaching fellowship in the Earth sciences group in the School of Science. Tanya is tasked with providing teaching and tutoring support for both second year soils papers and the large first-year environmental science course.

We welcome **Mahdiyeh Salmanzadeh** who has arrived from Iran to undertake a PhD study with **Adam Hartland**, Megan Balks and Louis Schipper on soil cadmium. **Nadia Laubscher** successfully completed her MSc study on soil 'flipping' in the Galatea Basin. Nadia is planning to present her results at the World Congress of Soils in Korea in June. **Josh Scarrow** completed his MSc on soils in the Beardmore Glacier region of Antarctica and has now commenced employment as an environmental scientist with Tonkin and Taylor in Auckland, where he will be undertaking work on contaminated sites. Congratulations are due also to **Katrina Daysh** who successfully completed her MSc on the use of a "Greenroads" international environmental accreditation system for road construction in New Zealand. Katrina is working for the Waikato Regional Council.

Louis Schipper, **Megan Balks, Dean Sandwell**, and **Tanya O'Neill** were recently involved in a "Dairy Science" Year-13 Senior Science Open Day at Lye Farm on the outskirts of Hamilton. The day was successfully run by **Susan Stokes**, Industry Education Facilitator, and her team at DairyNZ, and had 40 students from across the Waikato participate in hands-on displays from Waikato University, AgResearch, DairyNZ, and LIC. The Waikato University team had the students get their hands dirty investigating a soil profile and linking the soil properties with soil development in the Hamilton Basin and land-use changes (Fig. 5). Louis and Dean also gave students a taste of how soil respiration rates can be measured in the field using CO_2 flux chambers (Fig. 6).

Jack Pronger has written up his findings from his BSc(Hons) project for the *Journal of Environmental Quality* (paper now accepted for publication). He measured rates of peat subsidence in the Waikato and collated global rates of subsidence. To celebrate Jack made a "research cake", which are designed to explain one's research in a cake (see http://waiber.com/research-cake/). The cake (Fig. 7) depicts the different land-uses: dairy, blueberries, cropping for maize, and a remnant restiad peat bog (dark green). Notice also that the remnant bog and blueberries site have slightly higher surface elevation while the maize cropping has a lower elevation. This demonstrates how different land uses are likely to alter subsidence rates.

Fig. 6. Louis Schipper explaining how part of the CO_2 flux chambers work. *Photo*: Tanya O'Neill.

Fig. 5. Megan Balks explaining the origin of a topsoil to year-13 students. *Photo*: Tanya O'Neill.

Another cake to finish, this one (Fig. 8) made especially for students in David's pedology class (Fig. 9) to help celebrate the 700th birthday of the **Kaharoa tephra**, an important late Holocene marker bed and soil-forming parent material in eastern North Island (see my earlier notes in the February issue of *Soil News*). **Maria Lowe** made the cake (complete with white chocolate layer of Kaharoa tephra and several dark chocolate buried soil horizons: see Fig. 8).

Fig. 7. Jack's peat-subsidence cake. *Photo*: Louis Schipper/Jack Pronger

Fig. 8. Third-year Earth science student **Anna Eames** displays the septingentenary birthday cake made to celebrate the eruption of the Kaharoa tephra (eruption in winter 1314 AD ± 12 years). The pumiceous Kaharoa tephra in the outcrop is the whiteish layer just above the cake. *Photo*: David Lowe.

Fig. 9. Happy 3rd-year **pedology students** at Brett Rd near Mt Tarawera (on 15 April 2014) celebrate the Kaharoa tephra's 700th birthday in 2014. *Photo*: Tanya O'Neill.

Plant & Food Research

Weiwen Qiu attended the annual FLRC conference and presented paper entitled: *Long-term influence of management practices on nutrient supply potential of a silt loam soil*.

Mike Beare, Brent Clothier, Paul Johnstone, Steve Thomas and **Derek Wilson** are contributing to the development of the Our Land and Water National Science Challenge proposal lead by AgResearch.

Nimlesh Balaine has been awarded the Morice Fieldes Memorial Award for the Best PhD Thesis in 2013 for her thesis entitled "*Influence of soil bulk density and matric potential on relative gas diffusivity and urea/nitrate-derived N_2O and N_2 losses*". Nimlesh completed her PhD with funding from *Land Use Change and Intensification* (LUCI) programme led by Platn & Food Research. Her research contributed to our understanding of how soil compaction and soil water relations effect emissions of N_2O and N_2 from different sources of nitrogen. Her supervisors were Prof **Tim Clough** (Lincoln University), **Steve Thomas** and **Mike Beare**.

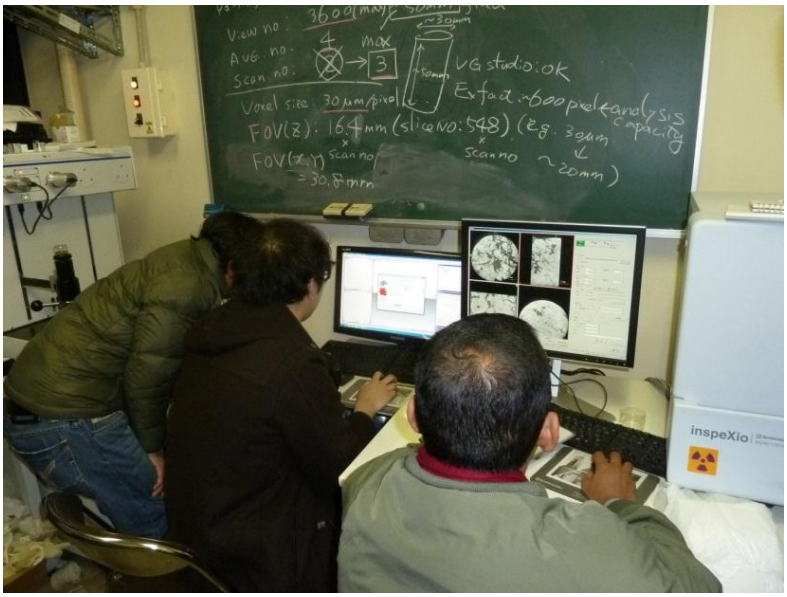
Manawatu/Hawke's Bay

Plant & Food Research – Palmerston North

Karen Mason, summer student Charlotte Robertson and Karin Müller in Tihoi: Final check prior to the start of a runoff event.

Plant & Food Research's Production Footprint team had a very busy summer measuring soil water repellency and its impact on water dynamics and phosphorus runoff in the Lake Taupo Catchment. The team conducted experiments in the field and in the lab with their recently developed runoff measurement apparatus (ROMA). Mitigation strategies were also trialled. **Robert Simpson** started identifying microbiological communities and quantifying extracellular enzyme activities in repellent soils to further our still very limited understanding of the sources of repellency. In February, **Karin Müller** hosted PhD student **Senani Nadeeka Wijewardana** from the Graduate School of Science and Engineering at Saitama University, Japan. Together they started investigating gas fluxes in repellent soils. The repellency work is funded through a bilateral MBIE/JSPS-project and SLURI.

Karin Müller travelled together with 40 kg of New Zealand soil from an apple orchard to Japan and spent ten days at Saitama University. The purpose of her mission was to quantify soil structure of the intact soil cores using 3D-X-Ray Computer Tomography (CT), a new gadget in the lab of our Japanese collaborators.



Collaborative development of protocols for scanning and analysing soil cores with 3D X-ray CT at Saitama University.

Roberta Gentile, **Steve Green** and **Brent Clothier** spent two weeks in the field in Kenya for our New Zealand Aid Programme funded work on avocados. This first field campaign was to put in field equipment and collect soil samples for initial analyses. We installed heat-pulse sap flow and TDR probes to measure current tree water use and soil-water dynamics, put up a meteorological station to record weather data, and collected soil samples for baseline soil health metrics. Our field campaign focused on field sites in the high (2100 m) and low (1600 m) zones of the Kandara Valley, approximately 50 km northeast of Nairobi. We were assisted by the hard working field team at Olivado, who will be maintaining the equipment downloading the field data, and were hosted by very welcoming smallholder farmers.

Roberta collecting Kenyan red soil samples.

Roberta, Steve and Olivado workers putting up the met station.

Steve installing heat-pulse sap flow probes to measure avocado tree water use.

Our field team – eating ugali (a maize flour Kenyan staple food) makes you strong for field work!

Landcare Research, Palmerston North

Benny Theng and wife, Judy have recently returned from an enjoyable and profitable 11 weeks visit to China by invitation from Dr Hongping He, deputy director of the Guangzhou Institute of Geochemistry, Chinese Academy of Sciences (CAS) (see photo). While there Benny gave a series of lectures on the clay-polymer interaction, based on his book: "Formation and Properties of Clay-Polymer Complexes, 2nd edition", published by Elsevier (Amsterdam) in 2012. For the most part of the visit, however, Benny was helping postgraduate students write manuscripts for publication in international journals. Benny and Judy made a brief stop-over in Yantai (Shandong province) to see Dr Guodong Yuan who left Landcare Research, Palmerston North, in July 2013 to take up a professorship at the Institute of Coastal Zone Research, CAS. They also had the opportunity to visit Hefei University of Technology, combined with a 2-day side trip to Huangshan (Yellow Mountain), in Anhui province, to admire and savour the breath-taking scenery of granite peaks, deep gorges, cliffs, and clinging pine trees, depicted in many classical Chinese scroll paintings. Another memorable occasion was the 3-day trip to Xiamen, a port city in Fujian province, from where Benny's great grandfather was presumed to have sailed to Java in the 1840s.

Benny and Judy Theng with Dr Hongping He (second from right), staff, and postgraduate students, in front of the multi-storey apartment building on the campus of the Institute of Geochemistry, Chinese Academy of Sciences in Guangzhou, China (December, 2013)

Canterbury

Lincoln Agritech

Juliet Clague has recently successfully defended her PhD thesis on denitrification in the shallow groundwater systems of two agricultural catchments, namely the Toenepi catchment near Morrinsville and the Waihora well field near Lake Taupo. Her PhD project, which was supervised by Prof. **Tim Clough** at Lincoln University and Dr **Roland Stenger** at Lincoln Agritech, formed part of the MBIE-funded Groundwater Assimilative Capacity Programme. While research into denitrification in groundwater systems is still in its infancy in New Zealand, increasing recognition of its potential role in catchment-scale N management was evident in several presentations made at the recent FLRC workshop.

Fig. 1: Juliet Clague (right) and internship student Maike Rath (left) conducting a push-pull test to investigate groundwater denitrification in the Toenepi catchment.

Lincoln University

Department of Soil and Physical Sciences, Lincoln University

We would like to congratulate **Fiona Shanhun**, **Anne-Maree Hill**, and Juliet Clague, who all successfully defended their PhDs. Fiona investigated "Partitioning biotic and abiotic components of soil CO_2 fluxes using stable carbon isotopes, Taylor Valley, Antarctica", supervised by Prof. Tim Clough and Dr Carol Smith, and Anne-Maree investigated "Nitrate leaching losses and their mitigation in dairy winter forage grazing systems ", supervised by Profs. Hong Di and Keith Cameron. Juliet Clague investigated "Denitrification in the shallow groundwater system of two agricultural catchments in the Waikato, New Zealand" supervised by Professor **Tim Clough** and Dr Roland Stenger (Lincoln Agritech).

Congratulations to **Dharini Paramashivam** in the Department of Soil Science, who won the best "Junior Professional Award" at the recent Land Treatment Collective (LTC) conference in Hamilton (25 – 28 March). This prize was awarded for an outstanding presentation and accompanying paper entitled "Combining biosolids with other waste materials to mitigate nitrate leaching". The cash prize as sponsored by Lowe Environmental Impact.

Soil Science Prize Giving: Prizes are awarded each year to the top 3 students in Soil Science at each level of study at Lincoln University. The 2014 awards were presented on Wednesday 5th March. The prizes are awarded by the Centre for Soil & Environmental Research in recognition of excellence and to encourage top students to continue their high level of performance in Soil Science. The prize winners receive a Certificate and book tokens. Many of the previous prize winners have gone onto study for a post-graduate degree in Soil Science leading to careers in industry, farming, CRIs, regional councils, universities and government ministries.

From left Ms Nicole Mesman, Mr Marc Brakenrig, Dr Jim Moir, Assoc Prof Peter Almond HoD, Assoc Prof Brett Robinson, Dr Nik Lehto, Dr Henry Chau, Ms Judith Van Dijk, Ms Sephrah Rayner, Dr Janet Bertram, Dr Carol Smith, Ms Sarah Hawkins, Ms Brigitte Ravera, Ms Laura Keenan, Ms Tash Barbier, Mr Roger McLenaghen, Prof. Hong Di, Dr Brendon Malcolm, Prof. Keith Cameron.

Otago/Southland

AgResearch Invermay

The team at Invermay have been busy wrapping up their summer programmes. Field trials relating to nitrous oxide emissions from pastoral systems are still on the go. **Tony van der Weerden** and his team are preparing for a new hill country field trial to determine N2O emissions from sheep and beef excreta deposited onto medium and steep slopes – and those steep slopes, at 25-30^{o} may see the need for crampons. Two other field trials, conducted on safer lowland country, continue. The first relates to quantifying N2O emission factors for FDE, while the second examines the impact of timing of grazing following irrigation on N2O emissions.

Richard McDowell has been busy compiling the National Science Challenge proposal for Our Land and Water – submitted at the end of April.

Ross Monaghan and **Seth Laurenson** have been continuing work at Telford where a restricted grazing regime is being tested as part of a whole farm system. Results thus far look promising with good covers in the restricted grazed farmlet going into autumn. The team are also gearing up to continue their low rate low depth application of winter generated effluent this winter.

Ros Dodd will be leaving AgResearch at the end of the month to take up a postdoc position in the US. She will be working with Professor Andrew Sharpley in the department of crop, soil and environmental sciences at the University of Arkansas and will be utilising the excellent network of research and demonstration farms to develop best management practices to decrease P loss. Ros will be sad to leave AgResearch and New Zealand but she is excited by the new challenge and keen to apply her knowledge to different farming systems and climates. She will be taking up her position mid-July following a trip back to the UK to catch up with friends and family.

Situations Vacant

Senior Scientist- Agricultural Systems Modelling, AgResearch, Lincoln
https://careers.sciencenewzealand.org/jobdetails/ajid/FBLm7/Senior-Scientist-R7-Agricultural-Systems-Modelling,6226.html

Science Team Leader, AgResearch, Lincoln
https://careers.sciencenewzealand.org/jobdetails/ajid/r6Nm7/Science-Team-Leader-Senior-Scientist-Agricultural-Systems-Modelling,6247.html

The above positions close on 11 May 2014.

ASA-CSSA-SSSA

The following two articles have been taken from the ASA-CSSA-SSSA Science Policy Report 04-23-2014

Soil science offers way to remove arsenic from irrigation water

By John P. Morgan

The 20th century's **Green Revolution** is credited with saving hundreds of millions of people from starvation. Modern agricultural practices and improved crops arrived in places like Mexico, Africa, and Asia. Millions of wells were drilled. Millions more irrigation channels began moving well water to crops. But these creative solutions brought unintended problems. Among them is the fact that the water from many irrigation wells contains arsenic, a toxin.

Nobody knew at the time that arsenic existed in the much-needed well water, which people drink and use to irrigate fields. Arsenic, which is odorless and colorless, poisons slowly. Eventually it may cause skin diseases, cancer, and death. It also hurts how well crops—particularly rice—grow. But solutions are in the works. One young soil scientist is investigating a possible fix.

Irrigation water runs through one the modified irrigation channels in Polizzotto's experiment. Photo: Matt Polizzotto

"What we've done is try to figure out what chemical and hydrological properties are influencing arsenic distributions in flowing irrigation water that is derived from contaminated wells," explains **Matt Polizzotto**, an assistant professor of soil science at North Carolina State University. Using that information, the group then studies how to engineer irrigation channels on Bangladesh rice farms to remove arsenic.

The irrigation channels are U-shaped and built of packed dirt, and they can affect how much arsenic is in irrigation water in two ways. First, arsenic is removed by sticking to soil particles as it passes through the soil. Second, other non-toxic chemicals in the water react with air to form minerals. These minerals can then bond with arsenic, removing it from solution. In both instances the arsenic settles, while the water flows on to the crops in the fields.

For example, there's a lot of dissolved iron in the well water, Polizzotto explains. Once the iron is exposed to oxygen (when the well water comes to the surface), the iron oxidizes, forming iron oxide, or rust-like particles. Arsenic sticks to those rust particles very strongly, pulling the toxin out of solution. "So, if those particles can be settled or trapped within the channels," Polizzotto says, "arsenic loading to rice fields can be minimized."

While still early, the results are promising. In a **paper** published in the Nov.-Dec. 2013 issue of the *Journal of Environmental Quality*, Polizzotto and his colleagues found they could affect the amount of arsenic reaching crops by rebuilding the channels. Specifically, channels were rebuilt so the flow of water in them was slowed. This provided more time for the needed chemical reactions to occur that remove arsenic.

"That's what we're doing with these channels. We're engineering them so the amount of time that water spends within a channel is extended," Polizzotto says. "Alternatively, arsenic can also stick to soil and be pulled out of solution by adsorption. So what we do in that case is enhance the ability for the water to be in contact with soil, so the arsenic can accumulate in the soil, not the water."

Doing "relevant science" like this motivates Polizzotto, he says. He hopes eventually he can offer practical solutions to farmers for preventing arsenic from reaching rice fields. But he cautions there's still a lot of work ahead. More research is needed to understand both how to remove arsenic and determine where it goes.

"We don't have a good handle on where the arsenic is ending up within these channels when it is removed," Polizzotto says. "That's an ongoing area of research. And it's important to know [so we can] figure out how to manage the removed arsenic and determine the sustainability of an engineered channel."

Study examines cadmium uptake in New Zealand pastures

By Madeline Fisher

New Zealand's pastoral landscapes are some of the loveliest in the world, but they also contain a hidden threat. Many of the country's pasture soils have become enriched in cadmium—a toxic heavy metal that is readily taken up by grasses and then transferred to the cattle and sheep that graze them.The concern is that if cadmium concentrations rise to unsafe levels in meat and dairy products, human health and New Zealand's agricultural economy could be jeopardized.

That so far hasn't happened. However, because much of the cadmium in the nation's pasture soils originates from mined phosphate fertilizers that farmers continue to use, New Zealand isn't taking any chances. Farmers whose soils test high in the metal are being advised to apply low-cadmium fertilizers, for example. and reduce phosphorus applications overall.

Scientists are trying to figure out which soil factors most strongly affect soil cadmium concentrations in New Zealand pastures. Their goal is to predict where in the landscape pasture grasses are more likely to accumulate the metal. Photo by Chris Ford (www.flickr.com).

Scientists, meanwhile, are trying to determine which soil factors most strongly affect soil cadmium concentrations, with an eye toward predicting where in the landscape pasture grasses are more likely to accumulate the metal. In a new study led by Brett Robinson of New Zealand's Lincoln University, scientists found that soil pH, iron concentrations, and total cadmium levels were all excellent predictors of the potentially bioavailable fraction of soil cadmium. At the same time, they were relatively poor predictors of the *actual* cadmium concentrations measured in pasture grasses.

What this suggests is that the grasses themselves need to be investigated next. Different species of pasture grasses take up cadmium to different degrees. Their roots may also change soil chemistry in ways that affect cadmium's availability. By refining models of soil-to-plant transfer of cadmium, people can better judge where livestock are at greatest risk of cadmium exposure in the future. The new knowledge should also enable the development of tools—such as pasture species selection—to reduce that exposure, the study's authors say.

Their **findings** published online on Mar. 21, 2014 in the *Journal of Environmental Quality*.

How did New Zealand end up with so much cadmium in its soils? For many years, phosphate rock from Nauru Island—a tiny island nation in the South Pacific—was used to produce "single superphosphate" fertilizer for the country's agricultural soils. Only later did people realize the phosphate contained high concentrations of cadmium, or roughly 100 mg per kg. Today, the average cadmium concentration in pasture soil has risen to 0.43 mg/kg, according to previous research—or more than two times background levels.

And in the current study, the average level across 69 sites was even greater: 0.89 mg/kg. (The authors think the higher number may stem from their focus on lands under intensive dairy farming, which tend to receive more fertilizer than grazing lands in general.) It's certainly a troubling finding for a country where pasture covers nearly 40% of the total land area and animal production is a vital industry. But the problem is also not unique to New Zealand. Cadmium enrichment has been reported in soils worldwide, not only through use of cadmium-rich phosphate fertilizers, but also from atmospheric deposition of cadmium and land application of biosolids.

So the question now becomes, how can cadmium be managed? The metal is difficult to remove from soil once it's there, so one important solution is to keep what's already present locked up and unavailable to plants. Robinson's work indicates one way to achieve this. In the study, concentrations of plant-available cadmium rose as pH declined, suggesting that maintaining neutral or high soil pH levels whenever possible will reduce uptake of the metal by grasses—and ultimately by livestock.

Similarly, high iron levels were statistically correlated with lower concentrations of bioavailable cadmium, because iron oxides bind cadmium tightly and hold it in soil. Robinson is now working with the coal-mining company, Solid Energy New Zealand, and the Swiss Federal Institute of Technology to learn whether additions of the compound, lignite, from some coal mining operations, can increase the soil's ability to bind cadmium, as well.

IUSS Paleopedology Newsletter 2014

The Newsletter gives an overview about paleopedological events in 2013 and informs about activities in 2014. In the beginning, it commemorates three great scientists who greatly contributed to our understanding of soils and paleosols and who passed in the past months, namely Donald L. Johnson, Vitaly A. Demkin and Dan H. Yaalon. The newsletter includes reports of ISFWP-XII (XIIth International Symposium and Field Workshop on Paleopedology) in Kursk/Russia; AEOMED and RAISIN Workshops; other activities at international conferences; summer schools in 2013. It provides information and links to websites of upcoming events such as ISFWP-XIII in Torùn/Poland in September 2014, RAISIN and AEOMED Workshops in Oct/Nov 2014; other upcoming international conferences, summer schools and short courses. Finally, it presents the content of the recently published Catena Special Issue "Landscapes & Soils through Time".

New Publications

Use of Microbes for the Alleviation of Soil Stress. Volume 2: alleviation of Soil Stress by PGPR and Mycorrhizal Fungi. By M. Miransari. April 30, 2014. IX Springer. ISBN: 978-14-939-0720-5. Hardcover, 304 pages. Price $189.00. Use of Microbes for the Alleviation of Soil Stresses, Volume 2: Alleviation of Soil Stress by PGPR and Mycorrhizal Fungi describes the most important details and advances related to the alleviation of soil stresses by PGPR and mycorrhizal fungi. Comprised of eleven chapters, the book reviews the role of arbuscular mycorrhizal fungi in alleviation of salt stress, the role of AM fungi in alleviating drought stress in plants, the impact of biotic and abiotic stressors and the use of mycorrhizal fungi to alleviate compaction stress on plant growth. Written by experts in their respective fields, Use of Microbes for the Alleviation of Soil Stresses, Volume 2: Alleviation of Soil Stress by PGPR and Mycorrhizal Fungi is a comprehensive and valuable resource for researchers and students interested in the field of microbiology and soil stresses.

The Soil Underfoot. Infinite Possibilities for a Finite Resource. By G.J. Churchman, E.R. Landa. 2014. CRC Press. ISBN: 978-14-665-7156-3. Hardcover, 454 pages. Price $99.95. The largest part of the world's food comes from its soils, either directly from plants, or via animals fed on pastures and crops. Thus, it is necessary to maintain, and if possible, improve the quality—and hence good health—of soils, while enabling them to support the growing world population. The Soil Underfoot: Infinite Possibilities for a Finite Resource arms readers with historical wisdom from various populations around the globe, along with current ideas and approaches for the wise management of soils. It covers the value of soils and their myriad uses viewed within human and societal contexts in the past, present, and supposed futures. In addition to addressing the technical means of maintaining soils, this book presents a culturally and geographically diverse collection of historical attitudes to soils, including philosophical and ethical frameworks, which have either sustained them or led to their degradation. Section I describes major challenges associated with climate change, feeding the increasing world population, chemical pollution and soil degradation, and technology. Section II discusses various ways in which soils are, or have been, valued—including in film and contemporary art as well as in religious and spiritual philosophies, such as Abrahamic religions, Maori traditions, and in Confucianism. Section III provides stories about soil in ancient and historic cultures including the Roman Empire, Greece, India, Japan, Korea, South America, New Zealand, the United States, and France. Section IV describes soil modification technologies, such as polymer membrane barriers, and soil uses outside commercial agriculture including

the importance of soils for recreation and sports grounds. The final section addresses future strategies for more effective sustainable use of soils, emphasizing the biological nature of soils and enhancing the use of "green water" retained from rainfall.

Acid Mine Drainage, Rock Drainage, and Acid Sulfate Soils: Causes, Assessment, Prediction, Prevention, and Remediation. By J.A. Jacobs, J.H. Lehr, and S.M. Testa. May 2014. Wiley. ISBN: 978-04-704-8786-0. Hardcover, 520 pages. Price $149.95. Written to help readers understand the formation of AMD, Acid Mine Drainage addresses the generation of acidic waters usually from both used and abandoned coal or metal mines. Offering the most up-to-date ideas on metals remediation, which makes finding control methods relatively easy, the text provides a section on legal and policy issues and details the causes, control, prediction, prevention, and remediation of AMD formation. Case studies from North America, Europe, Asia, and developing countries highlight various approaches to AMD problems.

Einführung in die Bodenphysik. By Jörg Bachmann; Rainer Horn; Stephan Peth. 2014. 4. Revised and extended edition, 372 p. 978-3-510-65280-8, hardcover, €49.80/~US$ 70 http://schweizerbart.com/9783510652808. This fourth, completely revised (in German) edition is a comprehensive, state-of-the-art introduction to basic physical and chemical soil properties (structure, texture, particle interfaces) and explains how important parameters such as soil productivity are controlled by physical factors (e.g. loading, bulk density, hydraulic conductivity) and time. Fundamentals of water-, gas-, and heat transport in soils and general principles of soil mechanics are introduced and discussed at different scales, pointing out how they affect soil fertility and crop yield. Methods of soil amelioration and soil protection, consequential to these relationships, are discussed. The volume targets students of and researchers in soil science, physical geography, hydrology, civil engineering, agriculture, forestry and all practitioners interested in how soil processes, parameters and plant yield relate.

Abstracts

Links between sulphur oxidation and sulphur oxidizing bacteria abundance and diversity in soil microcosms based on soxB functional gene analysis.

Tourna, M., Maclean, P., Condron, L., O'Callaghan, M and Wakelin, S. (2014)

Abstract available online but a more free version below:

The work describes the development of a DNA-based method to rapidly and inexpensively quantify SOB from agricultural soils. The genetic tool for microbial S-oxidation has significant importance for fundamental science associated with the ecology of sulphur oxidising microorganism in the environment. To date, there has been no method available to specifically target SOB in soil. Using the method, we have established links between diversity and abundance of SOB and sulphur oxidation rates in soil microcosms amended with elemental sulphur. We have shown unpredictable and considerable diversity of SOB in New Zealand soils and we have identified specific SOB that may be the major drivers of inorganic sulphur oxidation in our pasture soils. In the future, this DNA method when coupled with a model linking gene numbers in the environment with soil properties and S-oxidation rates could become a predictive tool that farmers can use when making decisions on S fertiliser use.

FEMS Microbiology Ecology. doi: 10.1111/1574-6941.12323. [Epub ahead of print]

Soil water repellency compromises the filtering function of Andisols.

K. Müller, M. Deurer, K. Kawamoto, T. Kuroda, S. Subedi, S. Hiradate, T. Komatsu & B.E. Clothier (2013)

Soil water repellency (SWR) is known to lead to preferential flow and to degrade the soil's filtering efficiency. However, no method is available to quantify directly how SWR affects the transport of reactive solutes. We propose a new method for conducting solute transport experiments in water-repellent soils. It involves sequentially applying two liquids, one water, the other a reference fully wetting liquid, namely aqueous ethanol, to the same intact soil core with air-drying between liquids. We applied this approach to quantify the impact of SWR on the filtering of the herbicide 2,4-Dichlorophenoxyacetic acid (2,4-D) in two Andosols. In batch experiments conducted prior to the transport experiments, 2,4-D sorption was not influenced by aqueous ethanol for one soil. However, sorption in the second soil followed the co-solvency theory, which predicts decreasing sorption with increasing solvent fractions. Thus, sorption experiments are necessary to complement our new method. Breakthrough curves were characterized by preferential flow with large initial concentrations, tailing and a long prevalence of solutes remaining in the soil. In the soil in which 2,4-D sorption was unaffected by aqueous ethanol, SWR increased 2,4-D losses by four and 50 times in the first 5-mm outflow compared with the 2,4-D losses with water. After 50-mm outflow, the 2,4-D losses were similar for one core, but in the other core they were still about four times greater with water than with aqueous ethanol. This method to quantify the reduction of the soil's filtering efficiency by SWR is needed for assessing the increased risk of groundwater contamination by solutes exogenously applied to water-repellent soils.

European Journal of Soil Science: DOI: 10.1111/ejss.12136.

Soil organic matter and texture affect responses to dry/wet cycles: Changes in soil organic matter fractions and relationships with C and N mineralisation

T. Harrison-Kirk, M.H. Beare, E.D Meenken, L.M Condron

The extent to which SOM content and texture affect C and N dynamics during dry/wet cycles, is poorly understood. A laboratory incubation study was conducted to quantify short-term changes in SOM (C & N) fractions and their relationship to C and N mineralisation in response to dry/wet cycles along a SOM gradient in two soil types of differing texture. The experiment consisted of three phases: pre-incubation, treatment and recovery. Three soil water content (SWC) treatments were established: continuously wet (WW; field capacity (FC)), moderately dry (MD; 120% of SWC at wilting point (WP)) and very dry (VD; 80% of SWC at WP). Each of the two 'dry' treatments were either maintained continuously dry (MD & VD) or subjected to three sequential 20 d-long dry/wet cycles (MDW & VDW) during the experiments treatment phase. All soils were returned to FC at the start of the recovery phase and analyses were carried out at the end of each phase. Overall, the results of this study showed that SOC content and texture are important factors affecting the size of several commonly measured fractions of soil organic matter, but the stability and resilience of these fractions depended on the duration and amplitude of dry/wet cycles. Whereas most of the measured C and N fractions (cold water extractable C [CWEC] and hot water extractable C [HWEC], microbial biomass C [MBC] and N [MBN], inorganic N) were affected by both the duration (e.g. MDW vs MD) and amplitude (e.g. MDW vs VDW) of dry/wet cycles, the response differed between fractions and the effects tended to be much stronger in silt loam than in clay loam soils. The duration and amplitude of dry/wet cycles also suppressed the rate of both C and N mineralisation in both soils compared to continuously wet conditions. There was also strong evidence that the C mineralised from both soils during the recovery phase (i.e. following rewetting of dry soils) compensated for the reduction in C mineralised during the treatment phase. For N mineralisation, the amplitude of dry/wet cycles was at least as important as the duration of the cycles in affecting N mineralisation during the recovery phase.

Much higher rates of N mineralisation were observed in soils that had previously been exposed to very dry conditions, particularly in the silt loam soil. There was some evidence that HWEC was the primary source of the C made available during the rewetting of dry soil and that it contributed to the increased availability of CWEC and supported an increase in MBC and C mineralisation in both soils during the recovery phase. In contrast, there was no evidence that differences in availability of C and N fractions affected the rate of N mineralisation following the return of dry soils to continuously wet conditions. Further research is need to resolve the primary factors that regulate N mineralisation response to the recovery from dry soil conditions.

Soil Biology and Biochemistry
http://dx.doi.org/10.1016/j.soilbio.2014.02.021

Biochar does not affect soil N-transformations or microbial community structure under ruminant urine patches but does alter relative proportions of nitrogen cycling bacteria

C.R. Anderson, K. Hamonts, T.J. Clough, L.M. Condron

Nitrogen (N) cycling, especially denitrification, can be significantly altered when biochar is used as a soil conditioner. These alterations in N-cycling have been attributed to a combination of physicochemical change, alterations in microbial community ecology and pervading climatic conditions. This study investigated seasonal bacterial community change over two years in combination with a short-term winter study of N-transformations under bovine urine patches. A silt-loam pastoral soil in Canterbury, New Zealand was amended with either 0, 15 or 30 t ha−1 of Pinus radiata biochar (pyrolysed at ∼450 ◦C) and bovine urine was added to patches within the 0 and 30 t ha−1 biochar amended plots (designated as 0U and 30U treatments, where U indicates 'urine').
No discernible differences in bacterial community structure were observed during the two year study or the short term N-transformation study when comparing non-amended and biochar-amended soil. Differences in bacterial community structure were only evident when comparing seasons, with data pertaining to each season from successive years clustering together. During the short-term N-transformation study, bacterial communities formed 3 distinct clusters corresponding to elevated levels of urine derived NH4+-N (days 0–10), increases in NO3−-N and N2O (days 10–22) and a decline in NO3−-N and N2O (day 20 onward). Biochar amendment did increase the relative abundance of up to 50% of individual operational taxonomic units (OTUs or 'species'), including key nitrite oxidisers and nitrate reducers. Biochar amendment did not affect the concentrations of inorganic-N compounds. The nirS (nitrite reductase) gene became elevated in the 30U treatment relative to the 0U treatment ∼10 days after the initial urine application. The nosZ (nitrous oxide reductase) gene became elevated in the 30U plots during the latter part of the experiment.
Conclusions:

- Biochar did not have a significant impact on the microbial community structure in pastoral soil over the course of two years.
- The relative proportion of nitrifiers and denitrifiers increased in biochar amended soils subjected to large influxes of urine derived N.
- Differences in N-transformation dynamics in the presence of biochar during the winter months were not statistically significant.

Conferences:

June 2014

20th World Congress of Soil Science Soils Embrace Life and Universe. June 8-13 2014 Jeju Korea **http://www.20wcss.org**

5th International Conference on Sustainable Irrigation and Drainage: Management, Technologies and Policies 17 - 19 June, 2014
http://www.wessex.ac.uk/14-conferences/sustainable-irrigation-2014.html

International Conference on Biogeochemical Processes at Air-Soil-Water Interfaces and Environmental Protection, June 23-26, 2014, Imola, Italy
http://aswep-essc.unibo.it

6th World Congress on Conservation Agriculture (WCCA) in Winnipeg, Manitoba, will promote the practical application of conservation practices to improve agricultural sustainability. For more information, visit **www.wcca6.org**

July 2014

XVII Conference of the International Soil Conservation Organisation 8-13 July 2013 Medellin Columbia **http://iscocolombia2013.com/ingles/index.html**

XI International Symposium on Enchytraeidae Georgsmarienhütte near Osnabrück, Germany, July 25-27, 2014. More information see: **www.ect.de**

Phytoremediation of Polluted Soils – current research and main aspects of usual pollution. Vigo Spain 29-30 July 2014 **phytorem.congress@uvigo.es**

"3rd International Conference on Earth Science & Climate Change" (Earth Science-2014) July 28-30, 2014 San Francisco, USA hosted by OMICS Group Conferences.
http://www.omicsgroup.com/earth-science-climate-change-conference-2014/index.php

August 2014

9th International Symposium AgroEnviron, 3-7 August 2014 in Goiânia, Brazil. "Impacts of Agrosystems on the Environment: challenges and opportunities. Abstracts submission is open at **www.agroenviron2014.com**

II Curso latinoamericano – Micromorfologia de suelos y técnicas complementarias (CLMSTC) Bogota (Colombia) from 04 to 10 August 2014. The Objectives are to extend the knowledge of micromorphology to the Spanish-speaking audiences in Latin America (it is a course taught in Spanish). This course is part of IUSS Commission 1.1 Soil Morphology & Micromorphology activities Information: **jcloaiza@unal.edu.co; willyposada@yahoo.es**

Phosphorus in Soils and Plants 5th International Symposium 26-29 August 2014 Le Corum Montpellier France **http://psp5-2014.cirad.fr**

September 2014

British Society of Soil Science Annual Meeting 2014: Delving into the dark - emerging techniques, approaches and tools for soils research **3rd and 4th September 2014** at the University of Manchester, Manchester, United Kingdom.
http://www.soils.org.uk/events/event-204/

XIII International Symposium and Field Workshop on Paleopedology, Poland,
1-6 September 2014. The meeting is organized by the 'Paleopedology Comission IUSS and Polish Society of Soil Science. The meeting will be held in Northern Poland, the historical town Torun (famous astronomer Nicolaus Copernicus birth place) and its vicinity. All aspects of paleosols studies are welcome to be presented during thematically focused scientific sessions. Evolution of typical postglacial landscapes (moraine, outwash, melt-ice, inland dune) and soils of that area during the Late Pleistocene and Holocene is the main subject presented during two two-days field sessions (1-2 and 5-6 September).
www.home.umk.pl/~paleopedology2014

21st General Meeting of the International Mineralogical Association (IMA 2014) 1-5 September South Africa

ELS 2014 - the Earth Living Skin: Soil, Life and Climate Changes, under the auspices of the Soil System Sciences Division of the European Geosciences Union, 21 – 25 September 2014 in Nova Yardinia, Italy (**www.els2014.eu**).

XII Congress of the Croatian Society of Soil Science Dubrovnik, in the independent Republic of Croatia, the 28th EU member, from September 22-26, 2014. More information see: **www.congress-csss.org**

October 2014

Biogeochemical Interfaces in Soil – Towards a Comprehensive and Mechanistic Understanding of Soil Functions. 6-8 October 2014, Germany. www.spp1315.uni-jena.de

9th International Soil Science Congress on "The Soul of Soil and Civilization"
14 – 16 October 2014. **http://soil2014.com**

EcoForum Conference and Exhibition. 29-31 October 2014. The Abstract Submission Deadline is 15th March 2014.
http://www.ecoforum.net.au/program.html

November 2014

Latin America Soil Science Congress, Cuzco Peru 9-15 November 2014
http://www.slcs.org.mx/img/XX_Latinamerican_Soil_Science_Congress_Cusco_Peru.pdf

6th Global Workshop on Digital Soil Mapping, 11-14 November, 2014, Nanjing, China.
http://dsm2014.csp.escience.cn

National Soil Science Conference MCG Melbourne Victoria Australia 23-27 November 2014. **www.soilscience2014.com**

December 2014

http://www.nzssconference.co.nz

From 1 – 4 December 2014 visitors will descend on Hamilton to attend the New Zealand Society of Soil Science (NZSSS) Conference with the theme: **"Soil Science for future generations".**

The four day conference will incorporate the full range of oral presentations and poster sessions similar to the Society's pervious conferences. However this conference will be a notable event for the soil science profession in New Zealand, being the first hosted conference since 2008. The previous conference was attended by more than 200 of NZ's leading soil scientists, students and practitioners. The intervening period has presented many primary production and environmental challenges that have seen the discipline of soil science (and its practitioners) play a vital role in finding solutions and answers. As New Zealand rises to the challenge of increasing its primary industry exports whilst improving its environmental footprint, it is becoming clear to policy makers, industry bodies, and stakeholders that our country's soil resources will be a critical component to be understood and managed going forward. This conference offers an excellent opportunity to take stock of our progress to date and to define future needs while raising the awareness of the wider community to soil science. Furthermore, this conference also presents a timely opportunity to focus on our need to foster and support the development of the next generation of soil scientists who will continue the progress made by those who have gone before them.

The aim of the conference is to bring the New Zealand soil community together across a wide range of soil science disciplines and institutes covering research, education, policy, and extension to present their latest science and discuss its implications for our environment, now and into the future. In-line with the theme of the conference, we seek to attract and encourage the involvement of the next generation of soil scientists by making the event highly accessible and relevant to our student population.
The programme will include an opportunity to present and learn across a wide range of soil related topics such as nutrient management, water quality, soil fertility & plant nutrition, soil quality & function, greenhouse gases, pedology, land application of wastes, microbial biology and soil carbon.
On behalf of the Organising Committee, we look forward to welcoming you to Hamilton this December.

David Houlbrooke – AgResearch
Conference Chair