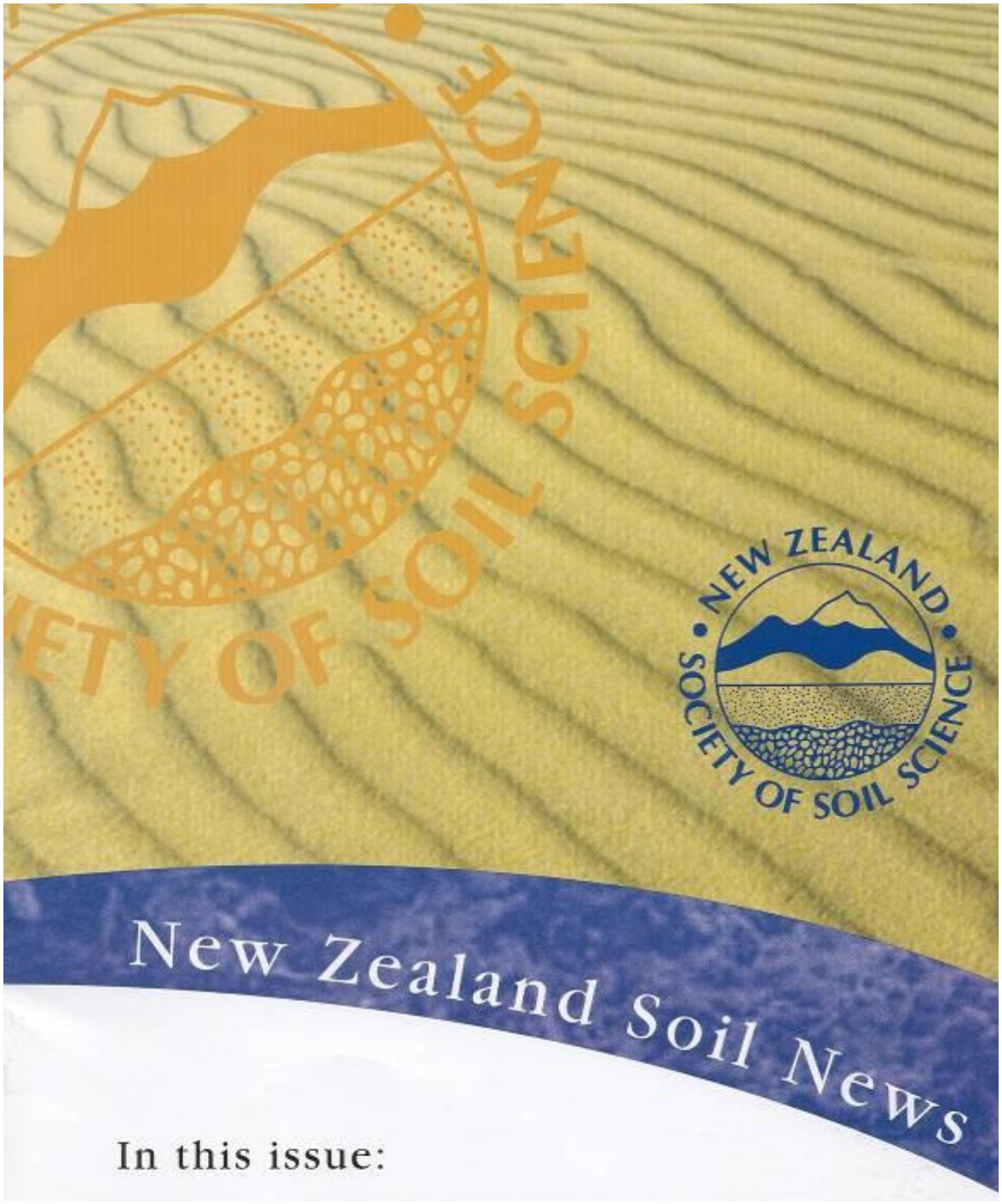

- **Editorial – The Virtues of Science Communication**
- **Obituaries - Prof John McCraw**
  - Dr Jim Pollok
- **Council Members 2014-2016**

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New Zealand Soil News

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Contents

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

News, views, letters, articles (serious or otherwise)—send to:

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Deadline..... for the **April** issue of Soil News is **Friday 17th April 2015**

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New Zealand Soil News

New Zealand Society of Soil Science Officers 2014–2016

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Editorial: The Virtues of Science Communication - Pierre Roudier

The virtues of science communication

Like most of us, I find soil a genuinely fascinating research subject. Being to a degree an outsider – my background is in agronomy and remote sensing – I got captivated some years ago by the diversity and the complexity of soils as my research interests switched to soil. I was also, I suppose, captivated by the "unknown unknowns" of soil science [1]. And I'm sure the Soil News readership shares my views on this.

The (too?) humble soil

But how is it, then, that we struggle to convey the value of soil outside our science community? Unlike other fields of science, soils rarely capture the general public's attention [2]. Even worse, we have similar problems communicating the threats on soils to policy makers – threats that have serious, long-terms implications on food security, for example.

The argument goes that soils would be “boring”. I'm not buying this for a second. After all, some rather abstract fields of science have a very good public exposure. While pure mathematics is at the heart of cosmology, this field of science manages to “package” its findings in a very palatable way for the general public. Cosmologists put their research aims in perspective with the “big questions” that will catch anyone's attention – arguably, in this case, the greatest question of all! Any field of science can be fascinating if it’s being “packaged” correctly.

"If you can't explain it simply, you don't understand it well enough"

The best reason to work on the communication of science is very selfish: it improves one’s own understanding of their science [3]. Communicating science to the general public requires it to be formatted it in an interesting way. This can be a new, and sometimes unsettling exercise. It requires us to take a step – or more – back from the specific details of our daily research routine. This process encourages scientists to think about their research from a different perspective, and to frame it into the “big picture”. Interesting spillovers generally result from this exercise, and can benefit one’s career by opening doors to new collaborations and media coverage, and by increasing impact.

The relation between scientists and the public is changing – and growing

Of course, scientists (whether in soil science or not) have always been communicating, in various forms – talks, scientific articles, posters, funding proposals, etc. What's rather new, however, is the need for scientists to communicate outside their research community and to various and growing audiences. “The scientific endeavour is now more public exercise than ever before” writes Sir Peter Gluckman in a recent blog post [4]. Sir Peter argues that the relationship between science and the public is evolving, and that “science and society [...] are now engaged much more explicitly in an ongoing dialogue and negotiation”. What this means for soil science is that we need to put our research into perspective, and explain its relevance to the big questions, which will justify public support for our science. Engaging with the general public audience is necessary to put specific problems on the agenda, and to reinforce general support for science.

Overall, an increased public exposure to science is better for society (informed, evidence-based policies), and better for science too (better diffusion of ideas, diversity of science, increased impact) [5]. As a science community, we need to develop skills to excel at this communication. Communicating science is becoming part of the increasingly various panel of skills researchers must possess to adapt to the evolutions of policy makers and media.

Integrating soils in the global science infrastructure

But the need to improve the communication of soil science goes further than just public outreach and policy advising, it is also driven by the evolutions of science itself. Science is increasingly inter-disciplinary; this is driven by the global challenges facing our society, and requires a shift from a suite of "siloed" research areas to a more integrated approach [6]. Key questions such as food security or biodiversity conservation can only be addressed by understanding very complex and interrelated systems; and necessitates the blending of ideas, methods, and data from multiple fields of natural and social sciences. An example of this is the success of the ecosystem services framework [7]. There is no doubt that soil plays a central role in all the key global challenges [8], but for soils to be integrated in these key challenges, we need to interact efficiently with other science fields.

So let's talk about soils

The public and policy makers need science more than ever, but we need to deliver this science in a way that can be easily consumed. With the emergence of the internet as our major communication platform, the number of communication streams is increasing: for example, some members of our community are leveraging the micro-blogging service Twitter to spread the good word[1]. Other websites, like the Science Learning Hub[2] and the Science Media Centre[3], can also support soil science communication.

Of course, public communication won't appeal to everyone, and I'm not suggesting here that every member of our research community should open a blog or tweet their science. But as a research field that has been often inwards looking [9], we do need to grow the number of researchers in our community that do just this.

We all know that soil is sustaining many aspects of our livelihood, but there is one area where soil falls short – it lacks a voice. If soil scientists don't bring a voice to soils, who will? As we are now well into the International Year of Soils, there's never been a better time for us as a research community to reach out, educate, and communicate the wonders of soil.

So let's talk about soil.

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1 Here is a list of NZ soil science Tweeter users, which I hope to grow soon: https://twitter.com/pierreroudier/lists/nz-soil-science/members

2 http://sciencelearn.org.nz/

3 http://www.sciencemediacentre.co.nz

New Zealand Society of Soil Science Officers 2014–2016

The new Council was elected in December 2014 for a two-year term. Members are:

President:	Reece Hill	Waikato Regional Council
Vice President:	David Houlbrooke	AgResearch Ruakura
Immediate Past President:	Trish Fraser	Plant & Food Research
Secretary:	Tim Clough	Lincoln University
Treasurer:	Tony van der Weerden	AgResearch, Invermay
Council:	Roger McLenaghen	Lincoln University
	Mike Hedley	Massey University
	Hamish Lowe	Lowe Environmental Impact, PN
	Megan Balks	Waikato University
	Sam Carrick	Landcare Research
	Haydon Jones	Waikato Regional Council

Reece Hill – Waikato Regional Council – (President)

My first major soils experience was gained when I went across the ditch to join a team mapping state forest soils in Tasmania, Australia. Highlights of this work were the chance to co-author a book ("Forest Soils of Tasmania") and the project receiving the National Australian Landcare Research Award in 1997.

I returned to New Zealand to complete my PhD in Soil Science at Lincoln University. Since its completion in November 1999, I have worked for Environment Waikato as a soil scientist and in a variety of management roles (in the Social Science and Economy, Land and Soil and Land Management programmes). I have always maintained a high level of input into the organisation's land and soil projects. In particular, I drove the development of regional soil quality and erosion monitoring within Environment Waikato and its promotion nationally with other councils. Currently, I convene the Land Monitoring Forum, a council-led group which works with research organisations to improve and rationalise land and soil monitoring for regional authorities. Through my role on the NZSSS Council I look forward to building stronger links between soils researchers and developers of land management policy.

In my non-professional life, I carry out important roles as Chief Entertainment Officer for my two young children and Weed and Pest Controller for my challenging Hamilton gully section.

David Houlbrooke - AgResearch Ruakura **– (**Vice President/Editor**)**

I come from an agriculture background having been brought up on family sheep and beef farms in the Wairarapa and the Waikato. I began studying the discipline of soil science in 1991 while completing a B.Sc in Earth Sciences at the University of Waikato followed by M.Sc research investigating the impacts of soil aeration on soil physical properties, root development and pasture growth. I subsequently spent three years working for the Western Australian Dept. of Agriculture looking into soil water-logging, drainage and crop growth. Upon my return to New Zealand in 2001, I undertook a soil science PhD at Massey University investigating the improved management for the land application of farm dairy effluent and the impact of intensive dairy farming on nutrient loss through artificial drainage systems. In 2004, I began employment with AgResearch as a soil scientist at the Invermay campus near Mosgiel where I was until 2011 when I transferred to the Ruakura campus in Hamilton hold the position of Science Team Leader for Nutrient Management and Environmental Footprinting. My current research interests focus on management of

farm dairy effluent, soil and forage response to land use intensification, and best environmental management practices under intensive dairy farming.

As editor of the New Zealand Soil News, I will be inviting fellow soil scientists to write guest editorials on "newsy" articles or a topic that interests you which might initiate discussions. I also would like to encourage you to write letters to the editors about any thoughts or comments you might have. And don't forget contributions are always welcome and can either be sent to me or Isabelle.

Trish Fraser – Plant & Food Lincoln – (Immediate Past President)

I originate from a mixed cropping farm on the Black Isle in Ross-shire in the north of Scotland. I studied Plant and Soil Science at Aberdeen University (Join Honours with Prof Ken Killham) and then came to Lincoln University to study for my PhD on nitrate leaching (with Prof Keith Cameron) in December 1988.

After graduating from Lincoln University in 1992, I joined Crop & Food Research as a soil scientist (based at Lincoln). The first decade or so of my research work with Crop & Food Research had a large emphasis both on soil biology (in particular defining the role of earthworms in the soil) and on cereal crop residue management practices and rates of residue decomposition.

I was first elected onto the Council of the New Zealand Society of Soil Science back in 1992 and took on the role of Secretary in 1996 and continued with this role until becoming President at the end of 2012.

Just over 20 years on I still work at the same place, although Crop & Food Research amalgamated with HortResearch to become Plant and Food Research in December 2008 - and for the last few years I have opted to reduce my workload to only a 75% position.

There are three main reasons why I do not work full time any more... and they are all female! I took three breaks from my work in order to become mother to three fantastic little girls who are now aged 7, 9 and 11 respectively and who in general keep my life very busy!! They currently attend Springston School where I keep a keen interest in their activities by serving as Chair of the Board of Trustees.

My main research interests presently revolve around defining best management practices for minimisation of soil degradation under land use change, which currently includes investigation of the effects of tillage on soil organic matter, nutrients (especially N), plant water use and soil biota.

The opportunity has recently arisen for me to also rekindle my interest in nitrate leaching research and we (at Plant and Food research) are currently building a lysimeter facility (similar to those used by Keith Cameron et al) to further investigate nitrate leaching processes, but with our current particular emphasis on the influence of irrigation on nitrate leaching in the arable sector.

I live with my husband Steve on a small farmlet (20 hectares) near the Selwyn River, where we breed our own beef (Hereford/ Friesian cows crossed with Simmental bull) cattle. Life is busy but a lot of fun too...

Tim Clough – Lincoln University (Secretary)

I completed a BAgSci (Hons) in soil science at Lincoln College and started work at MAF's Ruakura campus and was lucky enough to undertake his PhD while on staff there with Stewart Ledgard, through Lincoln University. I returned to Lincoln University as a Marsden Fellow in 1997, with Rob Sherlock and Keith Cameron, to examine the 'Enigma of 15N balances' and was lucky enough to receive fellowships to study N cycling processes, first with Jim Stevens in Belfast, 1998, and then using a Fulbright Senior Scholarship with Dennis Rolston, 2000, at UC Davis.

I currently hold a position as Prof. in Environmental Biocheochemistry at Lincoln University with interests in nitrogen and carbon cycling in agricultural and aquatic systems, greenhouse gas emissions, and the use of stable isotope techniques.

Editorial duties encompass serving as a section editor for Soil Biology & Biochemistry, as a technical editor on Journal of Environmental Quality, and as the Senior Editor for New Zealand Journal of Agricultural Research.

Tony van der Weerden – AgResearch Invermay (Treasurer)

After studying a B. Hort. Sc. Lincoln University, I spent 3 years at the North Wyke Research Station in Devon, UK (now part of Rothamsted Research) where I focused on ammonia emissions from pastoral systems.

On returning to New Zealand, I completed a PhD in Soil Science at Lincoln Uni, where I studied nitrous oxide and methane fluxes from arable agriculture. This was followed by a 3-year period with Crop & Food, working on indicators of soil quality.

Following a five year period in the Research & Development group at Ravensdown in Christchurch, I joined the Land and Environment group at AgResearch in Invermay in 2008. My research area remains with gaseous N emissions from pastoral systems, primarily focusing on nitrous oxide emissions.

Roger McLenaghen - Lincoln University

I started my career in soil science at Lincoln College, as it was then named, as a Laboratory Technician way back in 1974. At that time I was working for the late Terry Ludecke with Prof Walker as head of Department. My technical training was from Christchurch Polytechnic were I completed an NZCS in chemistry. Some of the Postgraduate students I worked with in those early days were Bill Risk, Phil Hart and Stuart Ledgard.

Once I completed the NZCS I was fortunate to be able to further my studies and completed a number of Lincoln degree papers, cumulating to a PG Dip Agric Sc in 1990. During this period I was appointed Tutor in Soil Science. A role I continue to this day. As tutor I am responsible all of the diploma and undergraduate soil science laboratories. I also lecture to the diploma students.

I consider myself as a generalist as I teach into a wide range of soil science courses, including the Advanced Soil Management course with the Overseer project. Currently my main research focus has been on the use of green manure crops, working with postgraduate students and Leo Condron. Recently I have been looking at changes in soil physical conditions after conversion to irrigated dairying.

Hamish Lowe – LEI Ltd

I hold the qualifications of a Bachelor of Agricultural Science (Honours) and a Master of Agricultural Science (Honours in Agricultural Engineering), as well as a Certificate in Advanced Sustainable Nutrient Management in New Zealand Agriculture. I have over 18 years' experience in managing and undertaking natural resource and infrastructure investigations, with my key expertise being the land treatment of wastewater from agricultural, industrial and municipal sources.

In recent years my expertise has been called on to assist with project management and strategic direction of rural and urban land development and major resource consent processes. This has involved the bringing together and co-ordination of a range of varying technical expertise, with a focus on natural resource management.

My primary focus has been in two related and overlapping areas. Firstly the sustainable management of nutrients, wastes and environmental impacts in agricultural systems. This includes nutrients in farming systems, animal and processing and wastewaters being applied to production agricultural land and their resulting impact on soil and water quality. The second key area of expertise is the design, evaluation and management of small community wastewater and municipal waste systems.

I am actively involved in the waste land treatment industry, having specialised in waste application to land over the last 18 years, working in New Zealand, Australia and the United States. I have completed two elected terms as Technical Committee Chairman of the New Zealand Land Treatment Collective, and have recently stepped down as a committee member. In 2010 I was presented with a service award for contribution to the Collective during my tenure on technical committee. I have assisted with giving direction to research and extension of land treatment in New Zealand and this has contributed to me being appointed to a number of research based teams in an advisory capacity, including being a member of the ESR/Scion Biowaste Advisory Board.

A large portion of my projects have involved managing soils, nutrients and wastes. While not all, a large number deal with farming systems; and relate to managing water supplies, irrigation, wastes, nutrients and general farm environmental awareness.

Mike Hedley – Massey University

I am currently Group Leader of Soil and Earth Sciences and Director of the Fertilizer and Lime Research Centre at Massey University. I have extensive research experience in biogeochemical cycles in grazed pasture systems and led the development of the professional development courses in Sustainable Nutrient Management offered by the FLRC.

Megan Balks – University of Waikato

I teach Earth Sciences at the University of Waikato and am involved in a wide range of soil-related graduate reserach projects. I have a particular interest in cryosols (frozen soils) and permafrost having undertaking 19 fieldtrips to Antarctica.

Haydon Jones – Waikato Regional Council

I was born in Cambridge and grew-up on the family farm at Kaipaki – situated just to the south of Hamilton City, on soils formed in the volcanogenic alluvium of the Hinuera Formation – in the Waipa District.

An interest in physical geography at high school led me to study Earth Sciences at Waikato University. It was there that I discovered a passion for Soil Science and was inspired to pursue a career in the field. I completed an MSc thesis on soil-landscape modelling and soil classification in a planted forest in Southland and followed up with a PhD on the impacts of forest harvesting on the performance of soil-landscape modelling techniques in a planted forest north of Auckland.

After completing my PhD, I began employment as a Soil Scientist at Forest Research (now Scion), Rotorua, in early 2005. While at Scion I worked on aspects of soil carbon stock assessment, forest management impacts, soil erosion, and land use capability assessments. In 2012 I returned home to the Waikato (and back to the family farm) to take up a position as a Land and Soil Scientist at Waikato Regional Council (WRC). At WRC, my areas of responsibility include riparian characteristics monitoring & reporting, S-map Waikato (and related work), and the administration of the Land Monitoring Forum (LMF) – a regional authority Special Interest Group. I have also been assigned to lead the Land Project within the Environmental Monitoring and Reporting (EMaR) initiative. EMaR is a joint LGNZ Regional Sector Group-Ministry for the Environment initiative that aims to provide integrated regional/national environmental data collection networks and widely accessible reporting platforms.

I have been a member of the NZSSS since 1994 and now look forward to contributing to the society and the promotion of Soil Science in New Zealand as a member of the NZSSS Council.

Sam Carrick – Landcare Research

Land resources were a defining part of my childhood growing up in the Manawatu. My Grandparents' Pohangina farm was governed by the high erodibility of the sand gullies, whereas down home it was the dense Pallic soils which ran the show. On our Taupo holidays it was the pumice soils that captured my attention, in those long hours waiting to hook the big trout!

Originally I left to study Landscape Architecture at Lincoln Uni, but drifted off to work for a few years. Returning to study in the mid 1990's I stumbled on soil science, and the light bulb clicked on! At last I'd found something that I felt at home with. In the late 1990's I headed first to work on completing the regional lowland soil survey for Southland, then joined Landcare Research to complete the Otago region. In the mid 2000's I returned to Lincoln to complete my PhD in soil water physics, before returning to Landcare in 2009. My work now is split between pedology and soil physics work, across a range of collaborative multi-agency projects. Part of my time is also teaching in the Lincoln University Soil and Physical Sciences Department. Thankfully my soil science light bulb that flicked on 20 years ago is still gaining more energy, as I keep learning each new fascinating aspect of the world under our feet and the great influence it has on human society.

I'm really looking forward my role on the NZSSS and working with society members to keep the soils flag of New Zealand flying strong.

New Zealand Soil Science Society Awards 2015

Award	Presented	Nomination Deadline	Eligibility	Conditions
Bert Quin Award	Annual	31 July 2015	Advanced level in PhD study (not yet completed)	Head of the Soil and Earth Science Groups at New Zealand Universities can nominate one student who is an active member of NZSSS.
The Grange Medal	Bi-annual (conference year)	31 July 2016	Open to non-members, members, fellows, or life members of NZSSS	Any active member of NZSSS can nominate non-members, members, fellows, or life members of NZSSS.
Morice Fieldes Memorial Award	Annual	31 July 2015	PhD thesis submitted within the previous calendar year	Head of the Soil and Earth Science Groups at New Zealand Universities can nominate one thesis from their group.
Sir Theodore Rigg Award	Annual	31 July 2015	MSc thesis submitted within the previous calendar year	Head of the Soil and Earth Science Groups at New Zealand Universities can nominate one thesis from their group.
Undergraduate award	Annual	21 Nov 2015	Best 3rd year student in Soil and Earth Sciences	Head of the Soil and Earth Science Groups from Massey, Lincoln and Waikato Universities should nominate one student.
Leamy award	Bi-annual (conference year)	31 July 2016	Author(s) of most meritorious publications in the last three years	Any active member of NZSSS can nominate active members from Universities, CRIs and other organizations (e.g. Regional Councils).
Blakemore award	Bi-annual (conference year)	31 July 2016	Technician/ support staff	Head of the Soil and Earth Science Groups at New Zealand Universities, CRIs, and other organizations (e.g. Regional Councils) can nominate one active member from their group.

Bert Quin Award

1. The award recognises the efforts and present or likely contribution to New Zealand soil science arising from a Doctorate study.
2. Eligibility: - A postgraduate (Ph.D) student working on the properties, productivity or sustainability of New Zealand's soil and land resources who is about to enter their third year of study.
3. The annual award shall be known as the Bert Quin Award and shall carry a stipend of $5000 for one year.
4. Nominations must be received in writing from the Head of Department or Group, or delegated academic staff member with two other signatories by the **31st of July**. Nominations should include a CV and a supporting statement of not more than two pages. Only one nomination will be accepted from each University Department/Group.
5. The award shall be judged by a subcommittee designated by Council.
6. To be eligible, candidates must be either student or full members of the NZSSS and should not be on the academic or technical staff of the department that nominates them.
7. The Award shall be presented or announced at a General Meeting of the Society.

The Grange Medal

The L.I. Grange Medal for Outstanding Service to New Zealand Soil Science
(Short title: The Grange Medal)

Description
The Grange Medal is for outstanding service to New Zealand soil science. It commemorates Dr Leslie I. Grange's extraordinary leadership and service to New Zealand soil science through his pioneering pedology, his far-sighted and constructive administration, and for his pivotal role in helping establish the discipline in New Zealand*. The Grange Medal is normally made every two years to one or two individuals who have made an extraordinary contribution to the promotion or advocacy of soil science (in its broadest sense) including for the following reasons:

- through outstanding use of the media,
- through outstanding administration or management,
- through outstanding publications including outreach/extension and other ('non-academic') material (e.g. development of a DVD or CDR),
- through outstanding advocacy of soil conservation or sustainable land-use practises,
- through outstanding mentoring.

Nominations are open to both non-members of the Society as well as members, fellows, or life members of NZSSS.

Nominations
Nominations every two years are made by two or more active members of the Society in the form of a statement up to two pages in length that summarises the extraordinary contribution the nominees have made to the promotion of soil science in New Zealand. Nominations are due by **31 July** in the year of the award. The awards are decided by the president, vice-president, and immediate past president on advice from Council. The medal is normally awarded at the Society's biennial conference or at the four-yearly Australia-New Zealand joint soils conference. In special circumstances and at the discretion of the Council the medal may be awarded more frequently.

*A summary of Grange's career is given in *New Zealand Soil News* 55, p.177-180 (2007)

Postgraduate awards (Morice Fieldes Memorial Award and Sir Theodore Rigg Award)

1. To be eligible for the awards, theses must have been presented for a degree which was awarded by a university council in the calendar year immediately prior to its submission to the Society (for the purposes of these rules, "awarding of the degree" implies approval in the previous year, not necessarily actual conferring of the degree at a graduation ceremony).
2. The awards are open to all degree candidates irrespective of their status as full or part-time postgraduate students or as university or research institute staff members.
3. The awards will be judged by a committee of three persons appointed annually by the Council of the New Zealand Society of Soil Science. The committee shall have the power to seek the opinion of others to help decide whether a thesis is of outstanding merit, provided that opinion is not sought from the supervisors or examiners of the thesis.
4. The committee shall normally recommend one award in each category each year, but in exceptional circumstances the committee may recommend up to two awards in each category.

M.L. Leamy Award

This award commemorates the outstanding ability and contributions to New Zealand Soil Science of Mike Leamy, and is made to the author or authors of the most meritorious New Zealand contribution to soil science, published in the last three years. A single paper, a series of papers on a theme, a scientific paper, a map or a lecture series may qualify a person for the award. The results of joint authorship will be considered where the candidate is senior author and has other eligible publications.

Nominations must be received in writing accompanied by a statement of not more than two pages listing the candidate's achievements and publication(s) etc that are to be considered for the award. Nominations must carry signatures. No self-nominations will be accepted. The candidate and both Nominators must be fully paid members of NZSSS.

L.C. Blakemore Award

This award honours the outstanding ability and contributions to New Zealand Soil Science of Les Blakemore and is awarded to the outstanding New Zealand Soil Science Technician or support staff member of the past two years. Eligibility is open to all aspects of technical and support work that assist soil science, for example analyses, field trials, cartography, computing, data storage and manipulation, archiving etc. Candidates shall have been employed in the field of soil science for at least three years, have shown marked ability in their field of employment and have made a notable contribution to the work of their institution, field team etc.

Nominations must be received in writing accompanied by a statement of not more than two pages detailing the candidate's achievements and worthiness for the award. Nominations must carry signatures. No self-nominations will be accepted. The candidate and both Nominators must be fully paid up members of NZSSS.

Nominations should be sent to:

Dr Haydon Jones
Land and Soil Scientist
Waikato Regional Council
Private Bag 3038
Waikato Mail Centre
Hamilton 3240
New Zealand

Ph:+64 7 859 0569

Fellowship of the New Zealand Society of Soil Science

Fellowship of the Society is an honour conferred for distinction in any or all of the following areas; research, technology, teaching, extension and/or the advancement of soil science. **Nominations close on 31 July each year**.

FELLOWSHIP RULES

Rule 1. Nominees must be active members of the Society at the time of nomination.

Rule 2. Nominations must be made by two Full Members, or Life Members of the Society. Nominations cannot be made by members of the Fellowships Committee of Council.

Rule 3. Nominations for the Fellowship must be submitted to the **NZSSS Secretary by 31 July** each year, and should be accompanied by the following documents:

* Fellowship Nomination Form (available from http://nzsss.science.org.nz/awards.html);
* Three copies of the Fellowship Nomination Summary Form (available from the Secretary);
* Three copies of the nominee's curriculum vitae;
* Three copies of the nomination statement prepared by the nominators of up to 500 words, stating why, in the view of the nominators, the candidate is worthy of becoming a Fellow;
* Where applicable, three copies each of up to five of the nominee's most significant publications or other works.

Rule 4. Fellowship nominations will be judged by the Fellowships Committee of Council, consisting of the President, Vice-President, and Past-President. Fellowships will be endorsed by Council.

Rule 5. Normally up to two Fellowships may be awarded in any one year, except in the first two years when up to a total of twelve Fellowships may be awarded.

Rule 6. Fellowships will be announced at an Annual General Meeting of the Society.

Rule 7. Nominations will remain valid for 2 years.

Rule 8. Fellows will be permitted to use the letters FNZSSS after their name and will receive a certificate.

Obituary – Emeritus Professor Dr John Davidson McCraw (1925−2014) MBE, MSc *NZ*, DSc *Well*, CRSNZ, FNZSSS

Philip J. Tonkin[1], David J. Lowe[2], and Campbell S. Nelson[2]

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Summary
John McCraw was an Earth scientist who began working as a pedologist with Soil Bureau, DSIR, then became the Foundation Professor of Earth Sciences at the University of Waikato in Hamilton, inspiring a new generation to study and work in Earth sciences (Fig. 1). In retirement, John McCraw was an author and historian with a special emphasis on Central Otago as well as the Waikato region. Throughout his career, marked especially by exemplary leadership, accomplished administration, and commitment to his staff and students at the University of Waikato, John McCraw also contributed to the communities in which he lived through public service organizations and as a public speaker. He received a number of awards including an MBE, fellowship, and companionship, and, uniquely, is commemorated also with a glacier, a fossil, and a museum-based research room named for him. Emeritus Professor John McCraw passed away on the 14th of December, 2014. An obituary, entitled "Dedicated to earth science and his students", was published in the *Waikato Times* on the 10th of January, 2015.

Fig.1. *Emeritus Professor John McCraw in 2009. Photo: Wendy Peel, University of Waikato.*

Early life and career as pedologist, Soil Bureau, DSIR
Philip Tonkin first met John McCraw when he travelled to Hamilton to look for accommodation prior to starting as a pedologist with the Soil Bureau, DSIR. In the mid-1960s, John was the senior pedologist in the Hamilton office together with John Bruce and Mike Vennard. On this first meeting John's personality shone through as he gave an account of the soil and landform history of the Hamilton Basin (Grange et al., 1939; McCraw, 1967a). Many years later John was to publish updated and extended versions of this story based on subsequent research and numerous field trips with students and others around the district (McCraw, 2002a, 2011). He was a man of great personality who left his mark on those fortunate to share time with him.

John McCraw was born on the 13th of March, 1925, in Dunedin, to Robina and John McCraw and brought up in the bush-clad surroundings of the Leith Valley. His mother fostered John's interest in science, encouraging him to join Dunedin's Junior Branch of the Royal Society of New Zealand at the age of ten. He was educated at Otago Boys' High School where he was at odds with the school's tradition as John was not sports inclined and thought the teachers ruled by fear and sarcasm. In 1943 he went on to Otago University, undertaking a science degree where his interests were fostered in geology by Professor Benson and in 1945 the new lecturer-in-charge of botany, Geoff Baylis. John remembered

that Dr Baylis greeted his first students resplendent in the uniform of a naval lieutenant having recently been demobilized. For his master of science degree John chose geology with a thesis study in the Takitumu Mountains alongside the thesis area of his class-mate, Douglas Coombs.

In the latter part of John's undergraduate training he, like other students, came under the War-time Manpower regulations and was directed into essential work (McCraw, 2002b). James Raeside, himself a graduate of Otago University, contacted Professor Benson with a request for two students to work on a high priority soil survey of Geraldine County. Professor Benson chose his two top students, Doug Coombs and John McCraw. The two worked through the summers of 1943-44 and 1944-45 operating from bicycles, augers strapped to their handlebars. The Geraldine survey was one of a number of soil surveys in Canterbury, eastern Otago, and Southland assessing soils suitable for growing linen flax. Britain had lost its main supply of linen flax when countries such as Belgium were overrun by the Germans. So the call went out for linen flax to be grown in New Zealand. Mosquito aircraft still had a fabric body covering made of linen flax. The New Zealand Government started a crash programme to cultivate linen flax and built some 20 to 25 factories, and a research station at Washdyke outside Timaru, in a remarkably short time. They were harvesting the crops at the same time as they were building the factories. When John was experiencing his first soil survey, the whole of South Canterbury was blue with the colour of the linen flax in flowers. It was during this time working as a student soil surveyor that John first met Ian Baumgart. Ian's university training was interrupted by several years in the New Zealand Army as a gunner surveyor on Norfork Island. After completing his degrees, Baumgart was sent to Timaru to work on the Geraldine County survey. John claims he taught him the rudiments of soil survey and said he had a cheerful personality and they called him 'bouncing Baumgart' (see Tonkin, 2014).

John returned to Otago University to complete his masterate degree and, during this time while working part-time in the Dunedin Botanical Gardens, was again approached by James Raeside to participate in another urgent soil survey project mapping the Maniototo Plains for a proposed irrigation scheme. This survey was so urgent that the soil survey team of Raeside, Cutler, Pullar and two field assistants had to work through the winter months with extreme cold and frozen soils. John declined Raeside's request in favour of completing his masterate and subsequently started in the Timaru office of Soil Bureau in 1948 (McCraw, 2002c). When John joined this office the soil survey of the Plains and Downs of Canterbury was complete and his first job was hand colouring some the draft maps of this and of the Maniototo survey. The hand-coloured draft Maniototo maps were being rushed to urgent meetings in Wellington by James Raeside. At this time Eddie Cutler was finishing his survey of the Lower Clutha and John and Alan (W.A.) Pullar teamed up to survey South Canterbury and North and Central Otago as part of the four-mile reconnaissance survey of the South Island. Central Otago was the big gap and they started at Middlemarch and worked their way up country. John was allowed to come home once a week and he caught the Central Otago train at about 2 o'clock on a Friday afternoon and stepped off that and onto the Express train at Dunedin and got home to Timaru at about two in the morning. He had to leave on the midnight Express on Sunday night to catch the train on Monday morning back up to Central Otago again. This was a great concession. James Raeside worried about how he was going to cover up all these expenses. John and Joan (née Megget) were recently married whereas Alan Pullar was not and so he was quite pleased to stay in a pub because this meant he did not have to pay board. John McCraw noted that "James Raeside taught me how to write a scientific paper and how to present a talk at a conference" (McCraw, 2002c).

At the end of 1948 the Timaru office was closed with James Raeside moving to Washington, USA, as Scientific Liaison Officer, Eddie Cutler eventually moving to Dunedin, and John was to go to Gisborne and Alan to Central Otago. However, Alan Pullar and James Raeside had a deep-seated resentment toward each other emanating from the role of Bomber Command toward the end of the Second World War bombing the German city of Dresden. Flight Lieutenant Pullar had been a navigator in Bomber Command (Vucetich, 1977, 1982; McCraw, 2002c). As a consequence, Raeside decided to send Pullar as far away as possible to Gisborne and by early 1949 McCraw was established in Alexandra in Central Otago. This was a pivotal point in each man's subsequent career, with Alan pioneering the mapping of tephras and their use in soil stratigraphic studies (with colleague Colin Vucetich – see Lowe et al., 2008) and John developing a life-long interest in Central Otago.

Prior to moving to Alexandra, John spent the summer of 1948-49 living at home in Dunedin during which time he completed the reconnaissance four-mile soil mapping of eastern Otago and the Otago Peninsula − working from the kitchen table. The soil surveys in Central Otago were initiated as part of a programme of the Fruit Research Section of Plant Diseases Division of DSIR investigating dieback in orchards (McCraw, 2002d). The first orchard soil survey was done by Alan Pullar in 1947. When John and wife Joan moved to Alexandra, a place to stay was their first problem. This prompted John, in these post-war years of shortages in building materials, to build his own house from sun-dried bricks (a pattern followed by Mike Leamy when he moved to Alexandra). Over the following years anyone who came to stay at the McCraws, including John's Soil Bureau colleagues, was given a task to assist in the building of the house − which went on for years.

The Soil Bureau's Alexandra office had a succession of pedologists working with John, initially on the orchard surveys and subsequently on the land use and irrigation surveys in Central Otago. Des Cowie came down in 1951-52 to help with the Alexandra orchard survey. He started in Soil Bureau as cadet and he had just finished his BSc. Des must have arrived quite early in the piece because he slept for a while in John's unfinished house in what he called the sunroom, which was not plastered, comprising just mud bricks. Shortly after, Bill Ward came and the two of them worked on the orchard soil survey with John and, when Des went off to the Manawatu, Bill stayed on. Shortly after that Michael Leamy arrived and in 1955 they all started on the Ida Valley soil survey. John recalled that this was just after his return from a visit to CSIRO Australia in 1954. The three worked through 1955 then Bill was transferred to Christchurch and Mike returned to university to complete his masterate.

In these years, Alexandra developed a reputation as an intellectual microcosm with agricultural scientists in the Department of Agriculture (Terry Ludecke, John Widdowson, and Brian Molloy), soil conservation staff in the Otago Catchment Board (Graeme Anderson, Alan Mark, Peter Wardle, and Brian Douglas), as well as the DSIR scientists. John was also involved in the local community and locally famous as a member of, and subsequently the Chief of, the local Volunteer Fire Brigade. John and Mike Leamy were involved in the establishment of the now-famous Alexandra Blossom Festival and John was one of the drivers behind the local swimming pool complex. Toward the end of his time in Alexandra, John was elected to the council.

John McCraw was involved in a number of detailed soil surveys, principally the Alexandra survey of the lower Manuherikia and adjacent parts of the Clutha Valleys (McCraw, 1964) and of the Ida Valley (McCraw, 1966a), as well as high country surveys in conjunction with the Otago Catchment Board which included Upper Shotover (McCraw, 1956) and Lower Shotover (McCraw 1966b) catchments, the Arrow Valley, the Nevis Valley, the Frazer River basin, and the Crown Terrace. John had soil scientists on exchange from the UK and Australia working with him in Central Otago. These included Brian Avery, a senior pedologist from the Soil Survey of England and Wales who was on an exchange and spent several weeks on the upper Shotover catchment and the Crown Terrace surveys. On exchange from the CSIRO Australia were Geoff Dimmock from Tasmania, who began the Upper Manuherikia survey in 1958, and in 1961 Cliff Thompson from Queensland who carried on with this survey. This survey was subsequently completed and published by Gary Orbell who arrived in Central Otago in 1963. John also co-authored the "Soils of South Island" review article as part of the three-volume set "Soils of New Zealand" (Raeside et al., 1968).

In addition to the soil surveys, John had a keen interest in the landscapes of Central Otago and the interpretation of some of the unique features such as the upland and lowland tors (McCraw, 1965) (Fig. 2), the periglacial patterned ground of the mountain tops (McCraw, 1959) (Fig. 3), the pattern of soils from basin floor to mountain uplands (McCraw, 1962a), and the soil pattern on the alluvial fans of Central Otago (McCraw, 1968a).

Fig. 2. John standing in a depression at the base of a schist tor on the Old Man Range (Obelisk tor is to the left). *Photo taken in 1969 by Philip Tonkin*.

Fig. 3. John in front of a stone-and-earth banked solifluction terrace on the Old Man Range.
Photo taken in 1969 by Philip Tonkin.

In the summer of 1959-60, John McCraw and Graeme Claridge (Fig. 4) conducted the first study of soils and attempted to produce a soil map of the ice-free Taylor Valley in the Ross Dependency, Antarctica, and they documented other local features as well (McCraw, 1960, 1962b, 1967b, 1967c; Claridge, 1965, 2002, 2010). On his return to Alexandra, John had several American visitors just back from the ice and one was Dr A.L. Washburn, an international expert on periglacial landforms.

In the years leading up to 1962, the staff of Soil Bureau were involved in the selection of sites to represent the diversity of New Zealand's soils in preparation for the International Soil Conference to be held at Massey University in November, 1962 (McCraw, 2002e). John was involved in the selection, preparation, and sampling of sites in Central Otago and in Southland and, at Norman Taylor's request, he was sent to Northland to organize the preparation of pre-selected sites accompanied by Harry Woodyer-Smith, a friend of Taylor's from the early soil survey days. The preparation of these sites took John a couple of weeks and some fortuitous good luck, as when a Maori road worker came by as John was labouring to clear a slumped section and offered to get the county grader driver to run his blade along the cutting and do it for him. John did not get to see the prepared Northland sites as he was leading a South Island tour with Professor Tom Walker (Lincoln College). On his return from Northland, John called in on John Bruce in the Hamilton office of Soil Bureau. McCraw had been advised he was to be transferred to Hamilton at the end of the year. Returning to Alexandra there was a rush to tidy up the projects nearing completion, finalize tour arrangements for the 1962 conference, and leave things in good order. Some projects including the Ida Valley work and papers on the Antarctic survey were taken north.

Fig. 4. Painting by former Waikato student Hansen Ihle (left) of an Antarctic scene featuring Graeme Claridge (seated) and John McCraw standing outside a makeshift shelter made from a large packing case at New Harbour, Taylor Valley, Antarctica, in the summer of 1959-60 (see Claridge, 2010). David Lowe at right. The painting was gifted to the University of Waikato by Hansen to celebrate 44 years of Earth sciences' activities by the department, John McCraw's key role in initiating them, and to commemorate the university's 50th anniversary in 2014.
Photo taken on the 27th of March, 2014, by Natalie Guest.

In 1963 John McCraw joined John Bruce in the cramped Frankton office in Hamilton. John Bruce had been working on the soil survey of Raglan County and the field-work was nearing completion. He had previously prepared a soil map for Hamilton City. Time was spent acquainting John McCraw with other Government departments including the Ruakura Agricultural Research Centre, familiarizing himself with the Raglan survey, and gathering background and historical information for the Waikato survey (Fig. 5). Part of the Waipa County in the Hamilton basin had been surveyed by L.I. Grange and N.H. Taylor in the 1930s and H.A. Hughes had begun mapping the Hamilton−Cambridge part of Waikato County in 1939. John's initial task was to bring these maps onto a new map base and prepare to finish that part of Waikato County as yet unmapped. In addition, he had the several outstanding projects from Central Otago and Antarctica to finish. The editing of bulletins was an exhausting process with numerous edits and retyping that went on for several years.

Fig. 5. John McCraw alongside the reference profile of the Hamilton clay loam (NZ Soil Bureau, 1968) at Church Rd, Te Rapa, Hamilton c. 1966. This soil was later re-named the Kainui silt loam (see McCraw, 1967a; Lowe, 1991, 2002c), and has its own special classification 'box' in the New Zealand Soil Classification (Hewitt, 2010). This site no longer exists as Church Rd lies within a housing subdivision in Hamilton. *Photo: Philip Tonkin*.

The Waikato−Hauraki region is noted for its large areas of peat and John was drawn into an interdepartmental committee on peat land development as well as numerous other local matters. He employed Mike Vennard as a technician (later to join him at the University of Waikato) and organized the shifting of the office into larger premises in downtown Hamilton (which, by the way, were demolished in 2014). In 1965 John spent several months on a fact-finding tour visiting soil survey and soil research institutions in the USA, Iceland, UK, Norway, and Germany, and he called in to Malaya to see Mike Leamy on his way back to New Zealand. Time was spent compiling a comprehensive report on this tour and presenting the information to Soil Bureau staff. John was consulted in planning subsequent soil research in Antarctica to be undertaken by Graeme Claridge and Ian Campbell, and by Peter Stephens from Lincoln College.

In 1966 Philip Tonkin arrived to assist with the soil survey of Waikato County and by May an outpost of the Hamilton office was established in Pukekohe with Gary Orbell beginning a soil survey of Franklin County. John Bruce left in 1967 to establish a soil survey office in Gore. In addition to the supervision of the Waikato and Franklin surveys, John had requests from the Department of Lands and Survey for one-mile soil surveys of Ohinemuri County (McCraw, 1968b) and subsequently Coromandel and Thames counties. Initially he thought the one-mile compilation sheets for the four-mile reconnaissance soil survey of the North Island could be updated to provide these soil maps, but John found that further field-work was required. In addition to these surveys, John also undertook a study of the soils on Mayor Island (Tuhua) (McCraw and Whitton, 1971) and began a study of the Alderman Islands in the Bay of Plenty. Over this time John developed a relationship with Michael Selby (at the newly-established University of Waikato that first opened its doors to students in 1964 – Acorn, 2014),

offering lectures on soil classification, others to the local geological group, and talks to service groups and schools on the history of the Hamilton basin (McCraw, 1967a). In July 1968 Soil Bureau was again running field tours through North Island and South Island as part of the International Society of Soil Science Congress held in Adelaide, Australia, and John attended this congress presenting a model of soil distribution on alluvial fans (McCraw, 1968a).

In November 1968 John was selected to go on a two-week live-in administration course run by the Public Service Commission for scientists (McCraw, 2002f). As part of this course he wrote a paper with a plea for better and more relevant training for the growing number of people working in the physical environment such as catchment board officers, soil conservators, planners, pedologists, and civil engineers. This request reflected John's own work experience and the training he had received some twenty years previously. He recalled that on his first meeting with Norman Taylor he knew nothing of the nature or distribution of tephra in the North Island − volcanic ash, as it was then called, had not been mentioned in his geology tuition at Otago University in the 1940s. A revised version of this paper formed the basis of advice John gave to the University of Waikato as it was planning the establishment of a science faculty/school to be implemented from 1970.

At the end of 1968, Tonkin resigned to take up a lectureship at Lincoln College and was replaced by Joe Bell at the beginning of 1969. Joe assisted John in the survey of Coromandel and Thames counties (McCraw and Bell, 1975). In 1968, John McCraw received a DSc from Victoria University of Wellington for his soil surveys in Central Otago and for his pathfinding soil survey work in Antarctica in 1959-60. In October 1969, he resigned from Soil Bureau, DSIR, to take up the position of Foundation Professor in Earth Sciences at the School of Science, University of Waikato, in Hamilton. Technican Mike Vennard, with whom John had designed and built slide-storage and viewing cabinets, which John used until his retirement (McCraw and Vennard, 1971), left the Hamilton office of Soil Bureau soon after and joined John at the university.

University of Waikato years

John McCraw's appointment as Professor and Head of the new Department of Earth Sciences (later called Earth and Ocean Sciences from 2006-2014) at the University of Waikato led to the development of integrated courses (papers) in geology, soil science, climatology, geomorphology, and hydrology that dealt with the physical environment as a whole and which would be especially relevant to New Zealand requirements. The emphasis was on courses and research that dealt with the surface, and near surface, of the Earth, where the bulk of New Zealand's wealth is generated. The integrative concept was entirely novel at the time. In fact, other university geology departments were opposed to 'another geology department' starting up, but such opposition allowed John McCraw to complete his plans because the new department was precisely *not* going to be 'another geology department' (McCraw, 2002f). The idea of a broad geosciences department, rather than a conventional department of geology or soil science, is now widely embraced with (for example) even the University of Auckland (eventually) replacing its 'geology' programme with 'Earth sciences' in 2014.

Immediately upon starting at Waikato, John McCraw commandeered a Land Rover belonging to the university and, with son David, travelled around New Zealand collecting rocks and materials that he sent back to Waikato in sugar bags from railway stations (Acorn, 2014). One such sack, from Westport, took three weeks to get to Hamilton. On another trip south (without David), Phil Tonkin and his wife Jacky and infant son accompanied John and assisted in collecting rock and soil samples as well as monoliths of key soils from Central Otago (Fig. 6). Once home, John spent hours in a boiler suit in the basement of A-block breaking rocks with a sledge hammer and hydraulic wedge made for him by engineering friends in Alexandra (Acorn, 2014). These samples formed the first-year teaching collection and are still in use today. John, with Philip Tonkin's help in the design, colouring, and plaster work, constructed and painted a 3D model in his home garage of the geology and landforms, on which were attached the local soil series, of the Hamilton Basin as a visual teaching aid for his classes – one of the first 'soil-landscape models' (literally). The model (made when John was still with Soil Bureau and prior to his moving to the university) is still used today and, despite the availability of digital diagrams and maps, is always a hit with students and with the public on university open day displays because of its simplicity and clarity as a 3D unit.

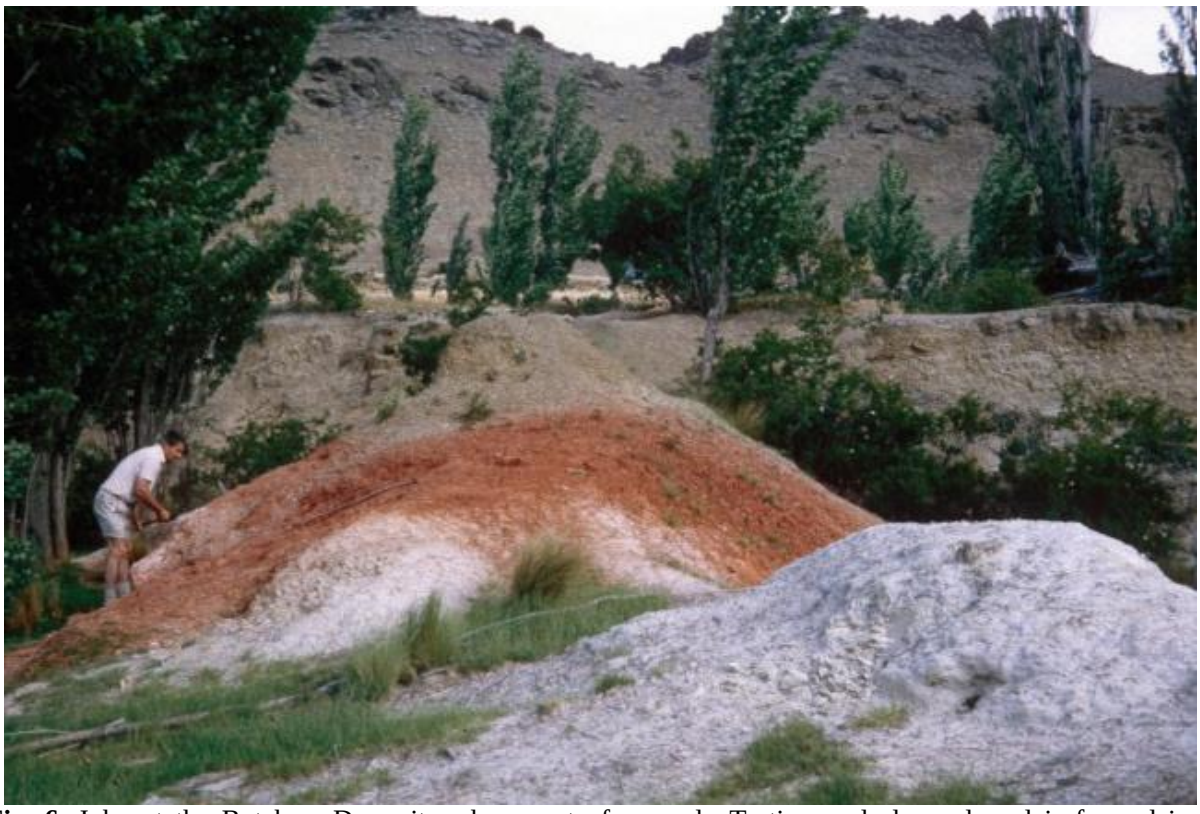

Fig. 6. John at the Butchers Dam site where part of an early Tertiary red clay paleosol is formed in a kaolinised schist regolith of (?)Mesozoic to early Tertiary age. A monolith was taken from this site, which is now a protected area (no digging allowed!). The paleosol was exposed by gold mining and is overlain by Pleistocene to Holocene fan deposits. *Photo taken by Philip Tonkin in 1969*.

In 1970 John McCraw appointed as his assistants firstly physical geographer Michael Selby (originally from Oxford University), who transferred from a lectureship in geography at the University of Waikato after beginning his academic career in 1964 as a junior lecturer for the Waikato Branch of the University of Auckland (Lowe and Kamp, 2002). John then appointed Harry Gibbs (March 1970) from Soil Bureau, DSIR. John wrote (McCraw, 2002f):

"Harry had missed out on the Directorship of Soil Bureau, and previous colleagues thought I was mad to take Harry on in what was a reversal of our previous roles, and with the knowledge that Harry could be rather testy. What a treasure he proved to be with his vast knowledge of soils and his prodigious memory not only of soils, but of students' names. I cannot remember an altercation with Harry, who provided me with much needed support in the difficult task we had taken on."

Michael Selby drew up the course prescriptions as he already had good experience of such procedures in the university, and his status as a recognized author – largely on the basis of his early-career two-volume text book "The Surface of the Earth" (Selby, 1967a, 1967b) – added early and ongoing credibility in helping to develop the research side of the fledgling department. In John McCraw's own words (from an interview in June 2010 with Philip Tonkin):

"It is fair to say that soils were always in the back of our mind in thinking about the make-up of courses with the initial appointment of Harry Gibbs. Then we made appointments to reinforce the soil concept. Cam Nelson [appointed in February 1971] with his strong [knowledge of] stratigraphy of the King Country was asked to develop geology but not traditional geology — only a smattering of palaeontology and economic geology – and then we got Ian Simmers to do climate and water (hydrology). We didn't do biology, as it was taught to all our Earth science students by the Department of Biological Sciences across the corridor. Otherwise we were working our way through the soil-forming factors!

With the core established, and in the face of almost overwhelming numbers, we had to appoint back-ups. [The late] Terry Healy [appointed in May 1973] was supposed to be a geomorphologist but his interest was coastal geomorphology and he immediately began to develop and strengthen this aspect and in so doing

gained the first research contract for the University of Waikato. Then Roger Briggs came in [February 1975] to provide mineralogy and petrology for geology and finally [at this stage of development] Bob Allbrook [was appointed] to provide [soil] chemistry and physics for Harry."

Other staff were appointed as student numbers grew, and courses were modified or evolved according to demand and staff interests to include geochemistry, natural hazards, coastal studies, volcanology, sedimentary geology, Earth materials, soil mechanics and engineering geology, and Quaternary studies (along with soil science, hydrology, and so on – see Balks, 2002; Lowe, 2002a, 2002b). At the time of John's formal retirement in January, 1988, the department comprised 21 staff in total (Earth Sciences Staff, 1987). An important aspect of the establishment of Earth sciences within the School of Science was that it was expected that staff and graduates/postgraduates would collaborate across departments, and in fact a single tea-room for all school staff and graduates/postgraduates was (and remains) central to this ideal. John McCraw (commenting in 2010):

"Don Llewellyn, the [first] VC, was fed up with interdepartmental squabbles and inflexibility in Auckland [where he had been previously] and wanted the School [of Science] to be the paramount unit, and in it would be 'subjects'. So for a start we were 'Earth Sciences' in the School of Science. Nobody, especially outside the university, understood this, so we became departments over Don's opposition."

One example of such interdepartmental collaborative work was the peat survey of New Zealand lead by (former student) Dr Tony Davoren, and initiated/coordinated by John McCraw, which involved students from both Earth Sciences and Biological Sciences (Davoren et al., 1978; McCraw, 1979a).

John McCraw teamed up with the late Dr (later Sir) Don Llewellyn, the university's founding Vice Chancellor, and embarked on a remarkable mission to sell the University of Waikato's School of Science, of which Earth Sciences formed a key part, to the wider community. For more than 10 years this duo spent several weeks each year visiting secondary schools stretching from Northland to East Cape and Taranaki, visiting two schools a day to talk to senior students about current research in the School of Science and in Earth Sciences. They used these opportunities to give talks to people in business and local bodies as well, and to suggest possible collaborative research thereby securing the first research contracts for the university (such contracts now form the life blood of many of the university's research programmes) (Fig. 7).

Fig. 7. Prof John McCraw in characteristic pose, busy at his desk in the department.

Around this time, as well as serving for two terms as Dean of the School of Science (1975-84), John McCraw delivered 26 Vice-Chancellor's invitation lectures to the public in a five-year period (1976-80), each being an illustrated, purpose-written talk at lay-persons' level on the geology and landscape of their local district. An extremely accomplished speaker, John gave numerous popular talks involving Earth sciences to clubs, societies, schools and many other groups. Such talks followed a practice John began in 1948, continuing for more than 60 years. John understandably was therefore tireless in asserting the need for research to be well communicated, and he generously funded a prize, the McCraw Prize, which will continue in perpetuity, for the best oral presentation given at the Earth Sciences' annual graduate/postgraduate conference, which has been held now for 28 years since 1987.

John McCraw, although very heavily involved in administration and mainly undergraduate teaching for much of his time at Waikato, was able to conduct research and publish papers, including articles on soil surveying in the King Country and on land use and planning (e.g. McCraw, 1972, 1973, 1974). He also co-authored a paper on coastal terraces and tephrochonology in western Bay of Plenty (Selby et al., 1971), and wrote a seminal paper on tephra and loess deposits in New Zealand that was published in the proceedings of the INQUA Congress that had been held in Christchurch in 1973 (at which John had been a plenary speaker) (McCraw, 1975). These tephra-based papers led to his supervision of research students who worked on tephras including Associate Professor Alan Hogg (now a radiocarbon dating specialist) (Hogg and McCraw, 1983), Dr Peter Hodder (geochemist, tertiary administrator/manager, and writer/editor), and Professor David J. Lowe (tephrochronologist, pedologist, and Quaternarist) (see Lowe, 2002c), who appreciated and enjoyed John's unqualified support and guidance. John was supportive and intensely dedicated to students (both undergraduate and graduate) and staff, and took a genuine interest in their work and well-being (see appended comments below from colleagues and former students). He always gave sensible advice and, although he could be blunt, any criticism was usually tactful.

John McCraw was a vastly entertaining and accomplished lecturer. He excelled at teaching first-year students, which he carried from the outset. Such students are hard work, and John poured enormous effort into them, and he truly did inspire. Large numbers of students 'jumped ship' from the high-school based subjects they had known, such as chemistry, maths, and biology, into the Earth sciences major directly as a result of John's engaging first-year lectures. One thing always remembered was his advice in his opening lecture to first-year students: "To study Earth sciences you need imagination". By this he meant the need to acquire observational and other skills, to envisage in multiple dimensions (including time), to reconstruct past events and environments using fragmentary evidence, to examine a problem from different viewpoints (and disciplines) if necessary, and to communicate in writing and orally in an imaginative and effective way. Another was his advice to fresh graduates embarking on research: "Grasp every opportunity you can to learn. You will never have as much time as now to acquire knowledge and understanding."

John McCraw always remained firmly grounded and practical, and these attributes together with his wide interests meant he was open to unusual requests or projects that did not conform. He could always "find a way" despite regulations. For example, Professor Graeme Spiers, now a professor of geochemistry in Canada, began adulthood as a dairy farmer near Te Awamutu. In Graeme's own words:

> "Prof was responsible for my starting at Waikato in the early 70s. It all began when I went to a talk he gave in the local hall [near Te Awamutu] on "The Waters of the Waikato" [McCraw, 1971], and I have never looked back. Prof even made sure I was awarded a BSc *in spite of not following the rules*, so he has always been a special person in my personal and academic life."

A second example is from Dr Peter de Lange, a botanist with the Department of Conservation (DOC), Auckland. Peter wrote:

> "Prof was the person who convinced me to start university from the sixth form, and he always held high hopes that I would turn from botany to pedology. Instead, it was he who gave me the MSc topic that ended up as a palaeoecological and volcanic ash-related study of Kopouatai peat bog when I had been rejected as an MSc student from Victoria University for a project based on botany."

Peter also commented that:

"Prof will always be remembered by his students for his eschewing of pomposity. He earned the epithet 'Prof' because he was universally respected and loved by his students, not because he expected to be known by it."

A third example is that concerning (now retired) pharmacist and former student, Dr Brian Challinor. With John's prompting and encouragement, Brian published his first paper in 1968 (Challinor, 1968), and went on to become a globally-recognized expert in belemnites for the Southwest Pacific, Indonesian, and Antarctic regions with 26 refereed papers to his name (another just submitted). In appreciation of John's ongoing encouragement, Brian named for him a fossil, *Belemnopsis maccrawi* Challinor (Challinor, 1979a, 1979b). In Brian's words (February 2015):

"I first met John McCraw when he was in charge of the DSIR Soil Bureau at Hamilton in the late 1960s. I had qualified as a pharmacist in 1953 and had been in business in Huntly for 15 years or so, and had developed an interest in geology, particularly in the Jurassic beds between Port Waikato and Kawhia Harbour. I attended Waikato University as a mature student between 1978 and 1980, graduating BSc in Earth Sciences and Biology. At the time of entry I did not have the required educational standard and Prof McCraw arranged a provisional entry during which I was required to demonstrate that I had adequate knowledge to cope with the lectures. Prof McCraw at that time lectured [to] the first-year students on introductory Earth sciences and I will never forget how he made the subject so alive and fascinating. I was able to assist the Earth Sciences Department by supplying a selection of fossils from Kawhia Harbour as teaching specimens.

Prof McCraw had convinced me that I should try my hand at writing up a paper on the fossils I had found. He did so by bringing up the subject every time we met. This led to my first publication [Challinor, 1968]. I later published a series of papers in New Zealand and overseas journals over the next 20 years or so. Prof McCraw assisted in many ways both while I was a student at the university and later.

In 1993 Prof McCraw convinced me (again using the same method as earlier) to submit a body of published work for examination for the degree of Doctor of Science (DSc) and this was duly awarded [by the University of Waikato] in 1994. I was the first student [who had studied] Earth Sciences [at the University of Waikato] to receive the degree. Without Prof McCraw's help and support over the years I would not have been able to produce the work that I did. This was typical of his approach to both students and staff during the years that I knew him."

Similarly, John McCraw's pioneering contributions to Antarctic geoscience, and his support for the research and wellbeing of staff and students of the University of Waikato's Antarctic Research Unit, were commemorated with the naming for him of the McCraw Glacier (at ~80° S) in the northern Britannia Range, Antarctica, following an expedition to the Britannia Range−Darwin Glacier region in the 1978-79 season led by Professor Michael Selby with Peter Kamp, David Lowe and the late Craig Law (Selby, 1979) (Fig. 8). (Both Peter Kamp and David Lowe are current professors in the School of Science, University of Waikato.) Selby's party sledged (by manhauling) on the McCraw Glacier, and mapped exposures in the surrounding area, for six days from the 13th to 18th of December in 1978, as well as discovering iron meteorites on nearby Derrick Peak at the junction of the McCraw and Hatherton glaciers a few days earlier (Kamp and Lowe, 1982).

Retirement: 'fun research'

John McCraw published more than 100 refereed articles on soil science (including survey bulletins), geology, geomorphology, and geo-education in his career. Most recently, in retirement for more than 25 years, he was very productive in undertaking what he called 'fun research', which included gold-mining history, archaeology and the general history of Central Otago, and he published a number of books on these and other topics (e.g. McCraw, 1991, 1992, 1998, 1999, 2000, 2001, 2002g, 2003, 2005, 2007, 2009, 2012) (Fig. 9). In recognition of the books he published about Central Otago, his frequent visits to Alexandra to undertake research for them, and the associated book launches and popular lectures he gave, John was honoured in December 2005 with the naming of a room after him at the Central Stories Museum and Art Gallery in Alexandra: the John McCraw Research Room (see also awards, below). On his temporary return to Alexandra after retiring, John was concerned to see that much of the region's

history was at risk of being lost, and hence he embarked on his Central Otago-based book writing. Happy to share his research and knowledge, John stated: "What is the good of research if it is not shared with others?" John's botanical and historical interests also combined to generate various articles on Herbert Dobbie (McCraw, 1988a, 1989, 2013). John was additionally interested in the physical world of early Maori and wrote a series of articles relating Maori legends to Earth sciences (McCraw, 1990, 1993a, 1993b, 1994, 1995; Lowe et al., 2002) as well as a chapter on early Maori use of natural resources (Campbell and McCraw, 2008).

Fig. 8. The McCraw Glacier, northern Britannia Range, descending from the Polar Plateau (top). *Photo taken from Derrick Peak in December 1978 by David Lowe.*

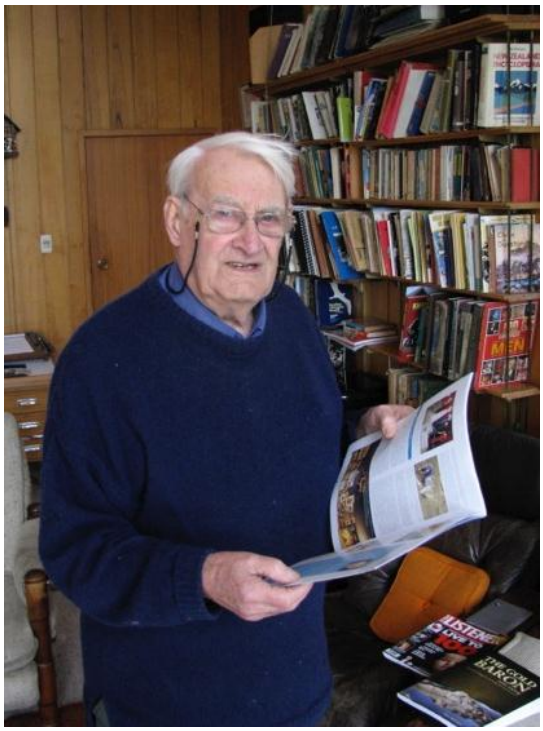

Fig. 9. John in his home in 2010 with some of the books he wrote. *Photo: Philip Tonkin.*

In 2011, John McCraw published one of his final books entitled *The Wandering River* (McCraw, 2011) (Fig. 10). Profusely illustrated, the guide book displays his masterly ability to write simply yet accurately and with clarity, and in an engaging style.

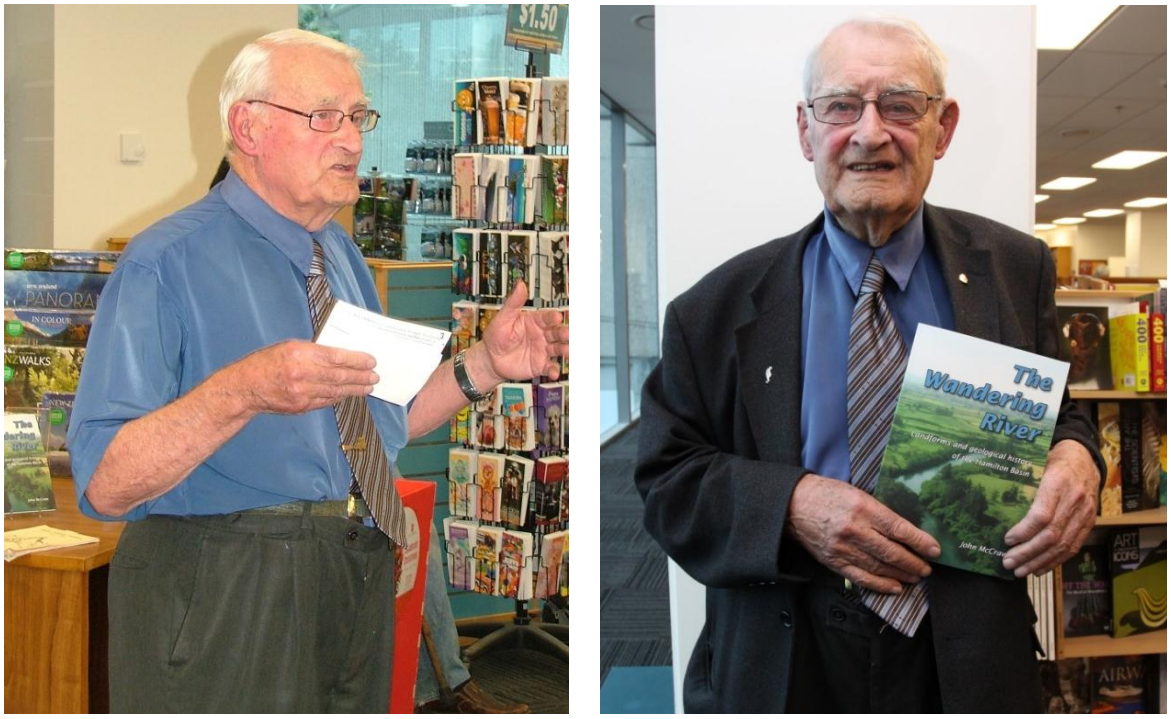

Fig. 10. John McCraw in full flight speaking at the launch of his book at Bennetts Campus Bookshop, University of Waikato, on the 12th of December, 2011. *Photos: David Lowe*.

Service and awards

John had a 70 year association with the Royal Society of New Zealand (RSNZ), beginning as a member of the Junior Group of the Otago Branch from 1935. He was an active member of the early Waikato Branch, was president of that branch from 1965-66, and was a member of the separate RSNZ Geology and Quaternary national committees during the years 1975-82. John was a foundation member of the New Zealand Society of Soil Science, and co-founder and chairman of the newly formed Waikato Branch of the Geological Society of New Zealand in 1968. Other membership and office-holding positions held by John include the National Water and Soil Authority (1976-85), the UNESCO Man and Biosphere Programme (1971-76), the Abbotsford Landslide Commission of Inquiry (1979-80) (Gallen et al., 1980), the Friends of Waikato Museum, the Friends of Hamilton Gardens, Patron of the Waikato Geological and Lapidary Society, and Advisor to the David Johnston Science Scholarship Trust. He was chairperson of the Rabbit and Land Management Task Force (1988) (McCraw, 1988b), and of the Public Consultation Committee of the Hamilton City Council Pollution Control Scheme (1994-96).

John McCraw served on the Council of the New Zealand Society of Soil Science from 1965 to 1968 and was given the Norman Taylor Memorial Lecture Award in 1978, presenting his views on an aspect of Earth sciences, namely the regolith that was generally overlooked, in his lecture entitled "No Man's Land" (McCraw, 1979b). Following his retirement, John was appointed an Emeritus Professor of the University of Waikato (1988), and his wider service to Earth sciences was recognized by the award of Member of the Order of the British Empire (MBE) in the Queen's Birthday Honours of 1992. He was elected one of the inaugural Fellows of the New Zealand Society of Soil Science (FNZSSS) in 1995.

Elected a Companion of the Royal Society of New Zealand (CRSNZ) in 2005, an award which recognizes "achievement at a high level of eminence in the promotion and encouragement of science and technology", John was, without doubt, a most deserving recipient (Nelson, 2005). In 2008, John received a special Otago Community Award from the Central Otago District Council for his essential

role in the preservation of knowledge and understanding of the history of Alexandra and the surrounding districts.

Legacy

The Earth sciences programme today as an integral part of the School of Science at the University of Waikato is stronger than ever. In the past few years we have appointed new staff, both academic and technical, and now have our largest-ever Earth sciences team (around 30 staff). As well as research-led teaching, we have strong research groups, at the cores of which are doctoral and masterate students, to carry on the work envisaged by John McCraw all those years ago. This thriving continuation of our discipline, which has always had strong multidisciplinary linkages with other sciences, is − alongside the countless students he has taught and inspired − surely his greatest legacy. As aptly observed by Professor Rewi Newnham (Victoria University of Wellington) at the news of John McCraw's passing: *Kua hinga he totara i te wao nui a Taane* − "a mighty totara has fallen in the forest".

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Appendix: A collection of comments received by the obituary authors from colleagues and former students about John McCraw. Some have been lightly edited or abridged.

John McCraw as a scientist had a strong belief that the information obtained should be handed on and understood by possible users. He spent a lot of time talking to farmers. He also listened, and both sides learned a lot. In the same vein he wrote local booklets and these were quite numerous. There was at times concern that his local-body work would impinge on his real job. However, he was in fact pretty productive. We were not concerned about staff doing their bit as citizens and a number were involved in one way or another. They deserved our support. John made a large contribution to the Council in Alexandra, both in the general running of things and in special projects. When he moved to Hamilton he maintained his wider interests and became involved in the setting up of the University of Waikato.

Dr Bruce Miller (former Director of Soil Bureau, DSIR, and a student colleague of McCraw's at the University of Otago)

I remember J.D. well from my days with the Research Division of the Department of Agriculture working in Central Otago. J.D. belonged to just about every committee in Alexandra (c. 30) and among other things was responsible for the building of a swimming pool there. We went into the field often and I remember his pillaging of the native plants on the Old Man Range for his garden. Yes, he was an awful driver as I recall when he took off down the Old Man Range, not on a 4WD track but straight through the tussocks down-hill. While on a soil survey in the Ida Valley he "cored" some steel at depth which turned out to be a buried vintage car. He had it dug up, restored it, and took it to Hamilton on a trailer when he shifted there. He had an entertaining lecturing style, much like his colleague Colin Vucetich. When I was on the organising committee of the International Quaternary Research Conference in Christchurch years ago [1973], I chose him to give the lecture on airfall deposits (loess and ash) much to the displeasure of his colleague the late Mike Leamy, who also did a stint in Central Otago. He wrote several books on various Central topics during his time in Hamilton, returning to Central often to research this and that. He also asked me to apply for a new position in botany at Waikato as I recall. He had a good productive life, was a stalwart of Soil Bureau, and I hope someone will write his story for, say, Soil News.

Dr Brian Molloy (ecologist with Department of agriculture, Botany Division DSIR, and Landcare Research)

The passing of a great man and wonderful mentor.

Professor Rewi Newnham (HOS, School of Geography, Environment and Earth Sciences, Victoria University of Wellington)

In the spring of 1959 I was assigned to accompany John McCraw and work in Antarctica with the task of producing a soil map of Antarctica. We had no concept of Antarctica, but neither did anyone else at that time. We did find some objects which could be considered soils and spent a month mapping them in the Taylor Valley and elsewhere. I was merely the spade and sample carrier as my part came later in the laboratory. John and I got on well together and spent a lot of our time in the field discussing the significance of what we saw. John and I published our findings and became the experts in this narrow field of science for a short time. John was the ideal field companion, especially in instructing someone like me who at that time had had little field experience. We remained friends ever since and I will miss him very much.

Dr Graeme Claridge (retired, Soil Bureau, DSIR)

I met him only a couple of times. Colin Vucetich always spoke very highly of him for his mapping and landscape models on the fans of Central Otago, and used his work when trying to educate me. Once

during my PhD at Victoria, I hitchhiked to Rotorua and met Colin. We spent two glorious days with Alan Pullar in Rotorua and Whakatane followed by a day in the Waikato with J.D. McCraw.

Dr Alan Palmer (senior lecturer in pedology, Massey University)

J.D. or 'Prof' as he was affectionately known by his students was a vastly entertaining lecturer from whom I learned much, and at least initially my MSc co-supervisor (main supervisor was David Lowe). Prof did much to bring a new perspective on what had been regarded as a 'dry' subject − soils – as he eschewed traditional geology and preferred that his new department focus on the Quaternary sciences, and he specialized in studying 'regolith' (the 'stuff' you find above the hard rocks that geologists ignore: so said J.D.). A Dunedin lad, he started out wanting to be a botanist but got side-tracked into Earth sciences. Despite his love of soils and Quaternary geology, he retained an interest in botany and he had a spectacular garden at his house in Silverdale, Hamilton, specialising in irises, rhododendrons, camelias, alpine plants and ferns (he was proud that he had *Leptopteris superba* growing); he also collected books − his house was a trap for a bibliophile, and a visit there usually involved him having to clear a path through his numerous, unstable book towers. J.D. also collected cars...

J.D. will always be remembered by his students for his loathing of pomposity. He wore suits out of a sense of obligation but often in a way that looked like he had slept in them. He loved to dramatize his lectures with prancing about and shouting and flourishes. On his retirement he surprised us all by sporting the loudest Hawaiian shirts he could find, and also by purchasing his first ever computer (an Apple Mac) from which he wrote a series of books…

Dr Peter de Lange (senior botanist/principal science advisor, DOC, Auckland, and adjunct professor, Università degli Studi di Sassari, Italy)

This is sad news indeed. I was one of the first to study Earth sciences [at Waikato]. John and Harry Gibbs played an important part not only in my university study but also John kick-started my career. He supervised and guided me through the peat survey of New Zealand [Davoren et al., 1978], and I still get asked for copies of the report.

Dr Tony Davoren (HydroServices, Christchurch)

Thank you, Prof McCraw, for enthusing me in first year Earth sciences all those years ago. The photographs of all the different geomorphic features brought Earth sciences alive for me. Ultimately it lead to me swapping from Biology to Earth sciences in my masterate years. Today, I still remember the landforms and have now visited a number of sites [in Central Otago]. The periglacial landscapes on the southern side of the Old Man and Old Woman and Garvie Ranges in Central Otago are still present and untouched. One day I hope these magnificent landforms are permanently protected by becoming part of a Central Otago National Park. Those who captivate each generation leave a seed for the next generation − thanks Prof.

Ken Murray (DOC, Christchurch)

The Soils Group at Massey [University] wish to pass on their condolences and wishes of support to Prof. McCaw's family, particularly from our older and retired members of staff, Vince Neall and Jim Pollok, who were contemporary colleagues of John's.

Professor Mike Hedley (Group Leader, Soil and Earth Sciences, Institute of Agriculture and Environment, Massey University
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Prof McCraw taught me that there are stories in the landscape just waiting to be told. There is good science to be had in elucidating the story and there is also an 'art' in telling the story to captivate an

audience. He was master at both. Prof's lectures to first-year Earth science students captivated me in the 1970s with well-illustrated stories of plate tectonics, the fossil record and climate change from Antarctic studies. I can't help but wonder whether Prof would think that the current emphasis on climate change would be better viewed from a geologic context rather than the just a few decades.
Prof assembled a team to teach the breadth of Earth sciences and I have reflected many times in my career how well taught I was to undertake the work I have done. This is illustrated by me being able to map and describe land systems in the tropical north of Western Australia as I had an appreciation of tectonically stable landscapes and Earth processes in arid environments taught to me at the University of Waikato. However, Prof did forget to teach me about the flies and crocodiles! I don't know the politics of how Prof convinced Harry Gibbs to join the teaching staff at the university, but I was one who certainly benefited. Their joint experience of many years mapping and describing soils meant that they were able to teach me pedology that requires an understanding of Earth sciences in a landscape context, not just soils, and being able to apply that knowledge in the field. There are many times that I have been forced into a soil pit at short notice and expected to come up with a 'story' about what is going on and how it got there. I was taught well by Prof McCraw and his staff. Prof encouraged an open dialogue with his students and I am still impressed with the student engagement and degree of responsibility given to students on the 'boards of studies'. These were regular meetings, providing an opportunity for students and staff to discuss a wide range of matters and he even backed a proposal to change the appearance of the university's degree certificate. I don't think he appreciated all the things we students did, including placing his Fiat 500/Bambina [on the loading-bay platform: see photo below], but he no doubt considered it as just another student stunt.

Dr Bill Cotching (independent soil management consultant, Tasmania)

Prof McCraw's famed Fiat 500 (of which he had quite a number over the years) sitting alone on a loading platform in the School of Science, University of Waikato, after a 'hand-up' by students of his department (in the late 1970s). Held in high regard and genuine affection by his students, Prof was rather annoyed at the time but (as Bill notes above) undoubtedly saw the funny side a bit later after the situation had been retrieved mechanically. Photo (probably) by Rex Julian, University of Waikato.

Annette [neé Milne] and I are very saddened to hear of Prof's passing. There are some people in this world who shouldn't be permitted to pass on. Prof was one such person. [David Lowe] mentioned in his eulogy that many students "jumped ship from the high-school based subjects we'd known into the Earth sciences as a result of Prof's engaging 1st-year lectures". I was one of these students. I went to university to major in chemistry and it was at a time when Continental Drift was being superseded by Plate Tectonics. This is an extremely interesting area in its own right but Prof had a wonderful gift of turning an already fascinating subject into something extraordinarily gripping and captivating. His lectures were inspiring and beautifully delivered and he will be remembered by all who had the privilege of attending them. We owe him a great debt of gratitude for inspiring us to follow interesting and rewarding career paths.

T. Graham Shepherd (soil scientist/agricultural advisor, BioAgriNomics, Palmerston North)

Thanks for advising me of the sad news. I was just talking of the session at Waikato University last year [, when I visited and presented a seminar,] to a couple of colleagues over the weekend, and saying how delighted I was to have 'the Prof' come and listen, and to sit and chat with a REAL prof for an hour or so afterwards (with a mention of his being the only Earth scientist in New Zealand to have received a 'gong' from the Government) [the MBE award]. It was a great privilege to know the Prof ... he is still the only prof I refer to as THE PROF.

Professor Graeme Spiers (Chair, Environmental Monitoring, Departments of Chemistry, Earth Science and Biology, Laurentian University, Canada)

My first encounter with John McCraw was in the early stages of my doctoral studies at Waikato. Alex Wilson [my chief supervisor], Harry Gibbs, and John McCraw accompanied me on my first field trip. As we were returning to the university the vehicle ran out of fuel on the Tamahere Straight [just outside Hamilton]. The three professors argued among themselves for quite a while, then decided I should steer the vehicle, while all three of them pushed it to the nearest petrol station. A few years later when I joined the staff at Waikato, I took over the teaching of an 'Earth History' course from John McCraw, and he became my informal mentor. A somewhat gruff but kindly man, my recollection is that he steered the Earth sciences ship well, encouraging newcomers like me to develop their own research interests, but subtly indicating where those interests might help in the department's teaching endeavours. In addition, he contributed much to the wider university, having perspectives that went far beyond his own academic discipline. I thought this breadth of approach admirable and have tried to emulate it during my subsequent career. At the time of his retirement, he identified some of his projects to be undertaken thereafter as "fun research". As I approach my own retirement, I have taken that idea on board too. John McCraw's influence on my own career has been subtle yet pervasive; I suspect that, on reflection, there will be many of his students and colleagues who would concur with that view.

Dr Peter Hodder (Manager, Accreditation Victoria Business School, Victoria University of Wellington)

Thank you for advising us of Prof McCraw's passing. You have our sincere condolences. We understand the significance he held in his role as founding professor of Earth Sciences at the University of Waikato. His legacy is the great work that you and your colleagues continue today.

Associate Professor Peter Almond (HOD, Soil and Physical Sciences, Lincoln University)

As a part-time mature student in the 1970s I was so grateful to Prof McCraw for his teaching and encouragement during my undergraduate and masterate degrees at Waikato University and also when I returned 'jobless' from the UK to Hamilton in 1986, when he offered me a position as a first-year tutor in the Department of Earth Sciences. He was instrumental in supporting my enrolment for a D.Phil. in soil physics research in 1986, which was completed part-time a few years later during a marvellous and exciting growth period in the Department of Earth Sciences, both in student numbers and academic achievement, of which I was privileged to be part.
Prof McCraw was Head of Department and Dean at various times during this period, reflecting his status in the School of Science. The successful development of the department and popularity of degrees was in great part due to his governance and encouragement and enthusiastic support of both students and staff coupled with his shrewd management of resources. When I left the university in 2000 to set up my own company, Soil and Land Evaluation Ltd, it was Prof McCraw who offered me some excellent advice on consultancy and working independently in the corporate world. Since that time and until recently, whenever we have met, he always enquired about the business and how things were at and whether the soil maps that he compiled in the 1950s and 1960s are still relevant, followed by the comment, "Well, you know it's always a matter of scale".

Dr Richard Chapman (Soil and Land Evaluation, Hamilton)

John McCraw, though I never worked directly with him, has had a huge influence on my career – wherever I went he had pioneered the way. My first "real" job was working on soil survey for irrigation in Central Otago with DSIR Soil Bureau. J.D. McCraw did much of the early soil survey work and was the author of numerous soil surveys in Central Otago, thus he had established the basis of the soil-landscape models and series definitions that were [the] key to my ongoing work. I arrived at Waikato University just after Prof McCraw retired and I was assigned some of his first-year lectures. The basis of my lectures still contain an echo of his original structure and content (and I would like to think entertaining down-to-earth communication style). John McCraw, with Graeme Claridge, undertook the first New Zealand soil science expedition to Antarctica. I have had a long career following in his footsteps there. Prof McCraw founded and led the Department of Earth Sciences, and I served two terms as the department chairperson. Through all the 26 years I have been at Waikato, Prof has been an inspiring influence and example, through his public presentations, ongoing publications, and genial interest in the affairs of the department. He was a wonderful presence and personality and I will miss him greatly.

Dr Megan Balks (senior lecturer in Earth Sciences, School of Science, University of Waikato)

I was quite shocked and saddened to hear of John McCraw's fatal accident. The end of an era in many ways: the last telegram I ever sent anyone was a congratulatory one to him from Switzerland on the occasion of his retirement (shortly thereafter telegram technology became redundant). As a student I attended his lectures and seminars, etc., which I remember as being informative, digestible and delivered with very human touches, including his soft humour. For example I remember one seminar in which a person informed him (I can't remember the exact context now) that "… only one in ca. three bore holes was successful", to which John replied "… why not consider the first two as having been virtual and then start directly on the third one?" For me at that time he was more of a heroic "grey eminence", rather than someone I had any real personal contact with.

Dr Guy Lister (formerly Geologisches Institut, ETH-Zentrum, Zurich)

It was in March 1970 that I first met Professor John McCraw. I was treating my first year as a general intermediate year, not knowing what I actually wanted to do. Within a short time he had turned my world upside down. I no longer saw the land, the rocks and the soil as static but as things on the move. Harry Gibbs always referred to the living soil! Mike Selby and Cam Nelson provided valuable

assistance on geomorphology and sedimentology, but it was John McCraw who, with his feet firmly planted in the ground with his eyes on, and seemingly over, the horizon, that inspired me to follow a career in Earth sciences. The two first-year Earth sciences papers were also the only papers I passed, having found that the Raglan surf and a female student more attractive alternatives to physics, chemistry, biology and maths. Whilst other lecturers talked from an academic perspective, John talked about things he had done, not just things that he knew. He (and Harry) had turned to academia after living a real life, and his inspiration was instrumental in me having a rewarding career in the applied Earth sciences. If John had not been there in 1970, I may well have ended my university studies then and there. But there would be no more failed papers, because I now saw the world through different eyes … the eyes of John McCraw, and what an exciting world it was.

Nick Rogers OBE (engineering geologist, Tonkin and Taylor, Auckland)

Professor John McCraw was a close friend, academic par excellence, and mentor to me for many years. I first noticed Professor McCraw during a demonstration I gave at the Waikato Museum making and using stone adzes in 1995 to a full-capacity gallery. I couldn't help but notice this white haired, regal bearing, noble man of intelligence staring at my every move from a chair. It astounded him to see both Mr Dante Bonica and me flaking cobbles of basalt and argillite into preform adzes and using already finished ones on wood. This encounter began a close friendship ever since. Prof McCraw taught me over many hours of discussions with him at his home, often with "The McCraw experience", a one-hour talk on Earth sciences across the spectrum. I would sometimes take a few adzes and slabs of sandstone including the odd chunk of hematite and ferryhydrite to show him how pre-European Maori used these resources. My common test for him in return was a "Te Wiremu experience", and to see if he could tell the difference with my adzes and some of the old ones as I laid them out at his feet, pulling out his magnifying glass for a closer look!

Prof worked hard to unlock many of the Maori narratives and legends and how many of them aligned themselves with Western sciences. We travelled across the Waikato together and I translated many of the old Maori place names such as Tokanui (big rock) and Karaapiro (rotten rock) used to classify stones and rocks that were used by my ancestors in the hope and understanding that he would draw more Maori students into Earth sciences.

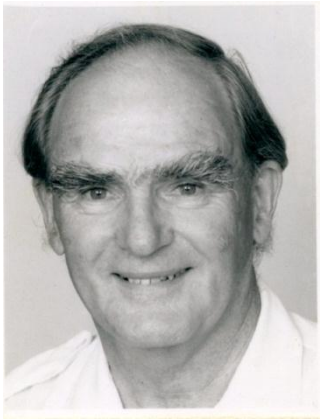
I miss Professor McCraw a lot. He was like a kaumatua, an elder, a mentor, and a great friend and I am humbled to have sat at the feet of such a giant and to receive his wise intelligent counsel. May you rest well, Professor J.D. McCraw. Moe mai ra e aku Rangatira.

Wiremu Puke (RMA practitioner, stone-tool carver of Ngati Porou and Ngati Wairere descent, and empirical ethnographic researcher)

[Wiremu was project designer of the Te Parapara Garden, Hamilton Gardens, which was featured at the NZSSS conference in Hamilton in early December, 2014.]

Obituary – Jim Pollok

JAMES ARMSTEAD POLLOK - 5 November 1918 – 1 January 2015



Jim Pollok, former Reader in Soil Science at Massey University, was a Palmerston North identity. His teaching career led to generations of agricultural and horticultural science and diploma students being enthused and motivated by him; known by his legendary name Podzol, a term of affection for his unorthodox teaching style and memorable lectures. His career took him to four of the university colleges in New Zealand.

James (Jim) Armstead Pollok

Jim was born youngest of four children to Annie and Robert Pollok in Invercargill on 5 November 1918. His father had begun Pollok's Pharmacy there in 1912, introducing the concept of "Night Pharmacy" (now called Urgent Pharmacy), which kept his father frantically busy, especially during the 1919-20 flu epidemics. Jim attended Invercargill Middle School, later followed by Southland Boys High School from 1932 to 1935. He obtained a First in History in three successive years and matriculated (gaining University Entrance). By this time, his mother was widowed, so in those Depression years he accepted employment with J.G. Ward & Co. (of Sir Joseph Ward fame), stock and station agents, first as an office clerk and later as junior ledger keep from 1936-38. In the last 6 months of 1938 he worked on a farm prior to attending Otago University College where he completed an Agricultural Intermediate Examination in Physics, Chemistry and Biology. But 1939 saw the outbreak of World War II, so after completing his first year at Otago University, Jim volunteered for active service. He initially volunteered for the New Zealand Army, but the service was over recruited at this time, so Jim attended Canterbury Agricultural College at Lincoln in 1940. He completed the first year of a Batchelor of Agricultural Science; and then an unusual advertisement attracted his attention.

Jim saw an ad in *The Press* "for a confidential job under arduous circumstances" which immediately piqued his curiosity and he applied. He was accepted along with 17 others, and in December 1940 was soon learning elementary electronics and being trained in Radio Direction Finding (or RDF), later called radar (a term regarded as secret at the time) at Auckland University College, prior to being transferred to HMS *Philomel* Naval Base at Devonport in Auckland.

When the German pocket battleship Graf Spee was scuttled off Montevideo in the Battle of the River Plate, HMS *Achilles* sailed past the burning hulk. Lieutenant Harper, RNVR, the ship's Torpedo Officer, who in peace time had been employed by the British Post Office, noted that *Graf Spee* was fitted with a large radar antenna. Following this encounter, HMS *Achilles*, which had been assigned to the New Zealand Division of the Royal Navy in 1937, returned to Devonport, New Zealand, for repairs and refit. Immediately a prototype radar set was built by the Physics Department at Canterbury University College and with support from the Department of Scientific & Industrial Research (DSIR), was installed on the *Achilles*. When Achilles set sail from Auckland in June 1941 bound for Wellington, Jim and 3 colleagues were appointed her first RDF operators as ordinary seamen. Upon arrival in Wellington Sir Ernest Marsden and Lieutenant Harper visited, to assist with fine-tuning the equipment. Achilles then set sail and Jim spent 6 months with her in South Pacific waters.

Jim as an RDF operator on HMS Achilles, 1940.

Jim was then redesignated an RDF mechanic and promoted to Leading Hand to be then transferred to the United Kingdom. He spent 6 months at HMS *Valkyrie*, a shore-based Royal Navy radar training establishment on the Isle of Man, as a Radar Mechanic Instructor. Following this he was posted to Portsmouth, and promoted to Temporary Acting Probationary Sub-Lieutenant on the strength of his University education in New Zealand. Here he underwent an intensive technical course in Royal Navy radar equipment for 3 months. On completion Sub-Lieutenant Pollok was appointed ship's radar officer on the battleship HMS *Ramillies*, then undergoing an extensive refit in Devonport, in the UK. After 3 month's preparations, *Ramillies* set sail and soon after Jim was promoted to Lieutenant. In 1943 Ramillies joined the Eastern Fleet at Mombasa, Kenya, on the Indian Ocean. Following this posting HMS *Ramillies* returned to Great Britain via the Suez Canal and the Mediterranean. Based at Scapa Flow she was visited by King George VI as she prepared for the Normandy D-Day landings. *Ramillies* and HMS *Warspite* formed the heavy bombardment force covering the British sector of the invasion (in particular Sword Beach); *Ramillies* although old at this stage was explicitly chosen because of the proven reliability of her 15 inch guns. Jim also had the honour of switching on special jamming equipment that was designed to interfere with the enemy's coastal radar defences that day. Next day *Ramillies* returned to Portsmouth to take on more ammunition, and then sailed backed to Normandy. On this second occasion the battleship was instructed to support the attack on Caen, some kilometres in from Sword Beach, where the Germans were using the rail marshalling yards as a point of resistance. *Ramillies* fired over 1,000 rounds of 15-inch missiles, weighing close to a ton each.

Lieutenant Jim Pollok, RNZ Navy Volunteer Reserve, 1945

Following the D-Day landings *Ramillies* was deployed to the Mediterranean again, this time to support the Allied landings near Toulon in southern France in 1944. In October 1944 Jim was then given long leave back in New Zealand. *Ramillies* then returned to Portsmouth and was placed in reserve in January 1945. In April 1945 he was reassigned as Assistant Radar Officer to HMS *Indefatigable*, which had joined the British Pacific Fleet based out of Sydney. This was also known as Task Force 57, and comprised some 50 warships of which 17 were aircraft carriers. This Force was tasked with neutralising Japanese airfields in the Sakishime Islands and providing air cover against kamikaze attacks. At the end of hostilities, Indefatigable was present in Tokyo Bay for the formal surrender on 2 September 1945, and then assisted in repatriating Allied Prisoners' of War that had been held in Japan. By December 1945 Jim ended his war service as Lieutenant, Royal New Zealand Navy Volunteer Reserve.

Jim as wicketkeeper for the NZ Universities XI, 1948

Following demobilisation Jim returned to Canterbury Agricultural College as a Returned Serviceman to complete his Agricultural Science degree. He was a keen cricketer and played for the 1st XI at Lincoln College from where in 1947 he was selected as wicketkeeper for the New Zealand Universities XI. He played rugby for the College's second XV and was also an excellent tennis player. On graduating, Jim was awarded an American Field Service Scholarship which enabled him to study for a Masterate in Soil Science at the University of Minnesota from 1948-49. During this time the Director of the Soil Survey of England & Wales visited Minnesota and Jim sought a position with the soil survey team based at Rothamstead Agricultural Research Station, at Harpenden in Hertfordshire. For 3 years, along with Tony Hodge (a geographer) and Dicky Searle (a geologist), Jim was tasked with preparing the map of the Soils of Cambridgeshire. Field data were compiled on 6 miles to the inch British Ordinance sheets. They travelled in a Hillman Minx van to locations, then dispersed, mapped and reassembled at the end of each day. Their training was by way of the Soil Survey of England and Wales Field handbook, by G. R. (Robin) Clarke, first published in 1940. But it was G.W. Robinson's book which Jim regarded as his pedological bible.

Around 1952 a New Zealander came to Rothamstead seeking to recruit a soil scientist, and the Director of Rothamstead put Jim's name forward. The position was related to the post=war fertilizer industry in New Zealand, and although Jim accepted an offer of employment back in New Zealand, the position was unsuitable. A year later Jim was looking for work and gained a temporary position in the Dunedin office of the Soil Bureau of DSIR. Here his purpose was to assist in mapping the soils on the Taieri Plain around Mosgiel, south of Dunedin.

In 1955, Jim responded to an advertisement for a Junior Lecturer in Inorganic Chemistry and Soil Science at Massey Agricultural College. Jim became Professor A. W. Hudson's assistant, frequently accompanying him to put down fertiliser trials in hill country. Jim joined a nascent team of practical thinkers who devoted their research skills mainly to fertilisers (Hudson and Cliff Fyfe) and drainage (George Hopewell and Derm Bowler). Jim regarded Cliff as the finest chemist at Massey, The Diploma students undertook a two-year course of study and Jim taught the principles and practices of soils in the first year and fertilizer and lime applications in the second. He also taught elementary chemistry and physics to employees from milk and cheese factories. It is significant that Jim was probably the first pedologist to be appointed to a university in New Zealand.

By 1958 Jim had proven to be a captivating and entertaining speaker, and so was promoted to Lecturer in Soil Science. He advocated the value of campus life and was made warden of the old hostel with Peter McGillivary as Head Warden. There are many stories from this decade of raids between the Palmerston North Nurses' Hostel and the all male Massey Agricultural College Halls of Residence. Needless to say, Jim captured one young lady one night, scrawling messages in lipstick on Hostel mirrors; she ran, he gave chase and completed a perfect rugby tackle on her in his pyjamas. He then got dressed and returned her to the matron, rather like presenting a trophy. No more was said, or needed to be said.

For a number of years under the first Vice-Chancellor's (Sir Alan Stewart's) reign, Jim was the University Marshal for Graduation ceremonies. This had a rather practical side in which Jim inspected the students' dress code beforehand, and if they didn't have a jacket he would lend them one of his. Jim was also the Honorary Custodian of the cricket Oval. Again in Sir Alan Stewart's reign, no one was allowed to play cricket on the Oval unless dressed in their whites. So Jim had to police this rule as well. He became a stalwart of the facility until an artificial surface was installed that ruined the bounce of the ball; seldom has cricket been played on it since. At the time of writing, and since Jim's death, we understand this artificial wicket has been uplifted and is to be replaced with good dinkum soil.

Jim recognised at this time that he had a limited knowledge of North Island soils and sought permission to visit the soil survey office staff in Whangarei in Northland. Fifty pounds was raised to support this venture and Jim spent a period with Charles Sutherland. Four soils were collected, including the famous Wharekohe podzol to create the first soil monoliths in the Massey collection. A testimony to Jim's soil monolith industry was that on his 90th birthday celebration there were 58 soil monoliths on display – a lasting testimony to the contribution he made to soil science at Massey University.

The 1960's saw a significant expansion of and devolution of the University of New Zealand with the University Colleges of Auckland, Victoria, Canterbury and Otago becoming separate Universities. In this period Victoria University opened an extension in Palmerston North in the Humanities sited across the Manawatu River from Massey Agricultural College. Following the Parry Report on the University system in New Zealand, the two institutions in Palmerston North were merged into a single multi-faculty University, soon to receive funding for New Zealand's first and only veterinary faculty. Soil Science, as part of "Soils and Field Husbandry" began to grow with the appointments of Harry Jacks and John Kirkman. Jim was now teaching Degree students and developing lectures in Pedology, previously part of Cliff Fife's domain.

In 1962 Massey Agricultural College hosted an International Conference of Commissions IV and V of the International Society of Soil Science, an important event for the New Zealand Society of Soil Science. Norman Taylor was in-charge and many of the soil survey staff of the Soil Bureau DSIR descended on Massey in preparation for this conference. These included Harry Gibbs, Des Cowie, Maurie Fieldes, Norm Wells and others. Jim assisted in preparing some of the field sites such as the Dannevirke and Tokomaru soil pits. This established a connection between Jim and the Soil Bureau pedologists and launched Jim back into pedology and soil survey. He felt at ease dropping into the local Soil Bureau office at DSIR Grasslands, to consult with Des Cowie and other staff, such as Paul Fitzgerald and talk 'pedology and soil survey'. The 1962 conference brought numerous respected overseas pedologists such as Professor Gerasimov from Russia and Professor Mückenhausen from Germany to Massey. Jim participated in both the North and South Island conference tours during which he established a relationship with Professor Mückenhausen that would lead on to him studying for his D.agr. degree in Bonn, West Germany. Throughout the 1960s and 70s Soil Bureau staff built a legacy based on Norman Taylor's 1948 Genetic soil map of New Zealand and classification. This together with the Soil Survey Method published by Taylor and Pohlen 1962 provided the basis for Jim's teaching of soil genesis and classification. Throughout this time Jim was a welcome guest at the annual soil survey conferences held by the Soil Bureau at various locations throughout New Zealand. In later years these meetings were expanded to include the meetings of the New Zealand Society of Soil Science. All had accompanying field tour programs and so it was in this manner that Jim built up his knowledge of New Zealand soils and their landscapes to be duly incorporated into his degree and diploma courses in soil science.

Participants on the South Island tour associated with the International Society of Soil Science Conference in 1962. Professor Muckenhausen (Germany) who encouraged Jim to study for his D.agr. with him, Dr. Glentworth (Scotland), Pierce Ryan (Ireland), and Dr. Becker (Germany) standing.

Jim's Doctorate in Agriculture with Professor Mückenhausen at the Institut für Bodenkunde der Rheinischën Friedrich-Wilhelms-Universität Bonn was undertaken in two periods of leave from Massey University in 1964/65 and 1974/75. I n 1964 Jim attended the 8th International Congress of Soil Science in Rumania and participated in field tours in Russia and Transylvania, before going on to study at Bonn. In 1968 he attended the Congress at Adelaide, Australia and participated in field tours in South Australia and Victoria and in 1974 he attended the 10th International Congress of Soil Science at Moscow and field tours in the Volga and Don regions of the then Soviet Union, during his second period of study in Germany. The slides and information from this tour became the basis upon which we

explained the soil forming factors and soil zonality from a Dokuchaiev perspective to our Soil Science I class for a couple of decades. Jim graduated from Bonn in 1975.

Meanwhile, in 1972, Massey University appointed its first Professor of Soil Science, J. Keith Syers, who stimulated soil science to its acme. During this expansion period, Jim was able to take his sabbatical with Professor Muckenhausen in 1974/75, whilst the newly appointed Vince Neall was able to look after his teaching. The subject of Jim's research for his doctorate was comparing soils derived from loess between Germany and New Zealand. Jim's specialty became the soil on the top terrace at Massey University, the Tokomaru silt loam, which Jim loved to talk about (Figure 6). Then in 1975 upon his return to New Zealand he married Fay Fairbrother.

Jim stroking the soil monolith of the Tokomaru silt loam, alongside the many other monoliths he collected for the "Departmental" collection.

Jim with Alan Pullar at the Mamaku loamy sand site, during the tour he led associated with the international conference Soils With Variable Charge, in 1980.

Massey University was again to be the location of an International Soil Science Conference in 1980, with field tours in the North and South Islands, one of which Jim led. This was the Soils with Variable Charge Conference, which followed a period of several years trialling the United States "Soil Taxonomy" in New Zealand. A number of New Zealand soil scientists had contributed to the development of the new Andisol soil order in this classification, culminating in a two year visit by its principal architect Dr Guy Smith (after he retired from the U. S. Soil Conservation Service). Dr Vince Neall had been appointed to Massey in 1973, bringing with him a considerable knowledge of the geology and soils of Taranaki. Jim enjoyed assisting him in contributing important information on the allophanic soils (Andisols) in Taranaki. With financial support from DSIR, Vince and Jim completed the Soils of Egmont County (with Robin Palmer) and Eltham County (with Alison Franks), followed by The Soils and Geology of Riverside

Farm (with Ronald de Rose). Later Jim produced the publication Soils of Tuapaka Farm (a Massey-owned property near the Manawatu Gorge) with Brian McLaughlin.

But Jim's *magnum opus* would have to be the Soils of the Massey Farms, which is now available in an electronic interactive version as well as the printed form. He started on the Holocene river terraces in the 1950s and 1960s and as the University expanded, so did Jim's soil map. When the final compilation was required Jim was assisted by Michael Richardson, Frances Lewis and Alton McDonald. The soil map was digitised by Paul Nelson and Mike Tuohy and upgraded to ArcIMS (refer to Soil News Vol 56 No 5 2008 pp 167-168). Jim got great pleasure out of this exercise despite the limitations imposed by computer-based cartography. Another of Jim's contributions was as co-supervisor with Vince Neall to Carolyn Hedley's (nee Hubbard) soil conservation/erosion history study in the Southern Ruahine Range. Jim avidly followed Carolyn's PhD study into soil variability with respect to moisture parameters and became an enthusiast for fuzzy logic, reading widely on the subject.

Another extraordinary research activity was an expedition led by Jim, with John Kirkman, Hugh Wilde and Les Molloy of DSIR to investigate the unusual ultramafic soils of the rather inaccessible Red Hills in South Westland. This involved travelling south of Haast to Big Bay, and from thereon in by Shank's pony for about 10 days. This was quite a remarkable achievement for those days without helicopters.

Jim actively participated in the New Zealand Society of Soil Science. He regularly attended conferences and workshops; he was a member of Council for two terms from 1980-84. Jim was made an inaugural Fellow of the Society in 1995. He was a Past President of the Massey Branch of the Association of University Teachers. Also he was a Past President of The Manawatu Branch of The Royal Society of New Zealand.

One memorable occasion was in 1981, when the fourth year veterinary students voted him "The Lecturer of the Year". They invited him to speak at their annual dinner and when he came to leave found all the pockets of his raincoat had been filled with pebbles! Jim retired from teaching in 1983 as a Reader and was appointed Honorary Research Fellow in Soil Science.

Jim delivering his retirement speech in 1983. Professor J. Keith Syers second from right.

Jim had an active and very happy 32 years of retirement. In 1986 he and his wife Fay attended the 13th International Congress of Soil Science in Hamburg, Germany and participated in the field tour through Switzerland and Austria. In 1990 they also attended the 14th International Congress of Soil Science at Kyoto, Japan and took the opportunity to participate in a soils tour in China. Throughout this time period Jim was often in his Honorary Research Fellow's office revising and adding to the Massey soil map.

Jim (back row, third from right) and his wife Fay (in front of him to left) on an International Society of Soil Science 1986 Congress (Tour C), through the Swiss and Austrian Alps

Jim was also a keen conservationist supporting retention of our native forests and fauna. He acquired a property near Colville on the Coromandel Peninsula on which were many young kauri trees growing. He then organised a Queen Elizabeth II Covenant for the property to ensure the trees will grow to maturity and kauri will never be cut down again. This land has been left to his extended family to operate in the future, and it is where Jim and Fay's ashes have been spread (amongst the kauri trees - and future podzols?).

To the end, Jim had an active mind and always wanted to discuss everything from the meaning of words to the philosophy of life. In his last few weeks he was seen to be reading the book "Why does $E = mc^2$?". He was a strong supporter of The Samaritans when they became established in the Manawatu. He was appointed Chairman and later Patron of Brightwater Home for the Aged in Palmerston North.

He really was a unique character to work with. He had a great enthusiasm for life. He was always interested in people and would engage avidly in conversation with all whom he met. Jim passed away on 1 January 2015, the first day of the International Year of Soils.

In the words of The Seekers, Jim – "We know we'll never find another you."

His wife, Fay, predeceased him in September 2014.

Jim Pollok holds a special place in the history of pedology and soil survey in New Zealand. He was one of the first to have a formal university education in these aspects of soil science. Jim Pollok together with two other early pedologists, Charles Harris and Colin Vucetich were all graduates of Canterbury Agricultural College (now Lincoln University). Jim's passing together with the recent death of John McCraw draws the curtain down on these pioneer pedologists and soil surveyors who played such an important role that led to an understanding of New Zealand's soil resources in the decades following the Second World War."

Vince Neall & Philip Tonkin

Article

Healthy soils for a healthy life

Welcome to 2015 – International Year of Soils

2015 has been declared International year of soils (IYS) by the FAO. The objectives of the IYS, as set by FAO, are to:

- Raise awareness of soil among civil society and decision makers
- Educate the public
- Support effective policies and actions for the protection of soil resources
- Promote investment in sustainable soil management activities
- Strengthen initiatives in connection with sustainable development goals, and
- Advocate for rapid capacity enhancement for soil information collection and monitoring at all levels.

Key points to raise awareness of include:

- Healthy soils are the basis for healthy food
- Soils are the foundation for vegetation which is cultivated or managed for feed, fibre, fuel and medicinal products
- Soils support the planet's biodiversity and host ¼ of total biodiversity
- Soils help to combat and adapt to climate change by playing a key role in the carbon cycle
- Soils store and filter water and improve our resilience to floods and droughts
- Soil is a non-renewable resource, its preservation is essential for food security and our sustainable future.

The council of NZ Soil Science Society is working on a number of activites to celebrate the international year of soils and you are welcome to pass suggestions on to any council member. Also it is great to see a number of organisations and individuals already making progress on IYS activities. Among others: Jacqueline Rowarth has been "raising the profile" in some of her writing for newspapers, Landcare Research is working on some excellent initiatives, and radio New Zealand is getting on board. I hope all members of the NZ SSS will find some activities or ways to celebrate IYS. For ideas and further information you might like to check out:
the FAO website: http://www.fao.org/soils-2015/en/
The SSSA website: https://www.soils.org/IYS (includes the I (love) soil stickers, ideas for teaching activities and much much more…

If you do get into action to celebrate the international year of soils please register your event – see the SSSA website above, and let a member of the NZSSS council know.

Have a productive and positive year celebrating the wonderful resource that we know and love!

Megan Balks.

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Publications

Discontinued Earth Science Journal now available online

Cam Nelson (Emeritus Professor, University of Waikato)

Production of the New Zealand-based *Earth Science Journal* lasted only five years, from 1967 to 1971, issuing one volume and two numbers of the journal each year (Vol. 1, Nos.1 and 2 to Vol. 5, Nos. 1 and 2). The journal was established in 1967 under the auspices of The Waikato Geological Society, a predominantly amateur group of enthusiastic Earth scientists based in Hamilton, New Zealand who had loose links to the fledgling University of Waikato.

The intent of the journal was to encourage and publish articles that spanned widely across the Earth sciences discipline, including geology, geomorphology, pedology, climatology, oceanography and ecology. It was edited by Michael Selby, an internationally renowned geomorphologist, who was also influential in the eventual establishment of the Department of Earth Sciences at the University of Waikato in Hamilton in 1970 and went on to become the university's Deputy Vice-Chancellor from 1986 until his retirement in 2002.

The first issue of the journal, which includes several seminal papers on aspects of the physical environment in the Waikato region, was timed to coincide with the first conference of the Geological Society of New Zealand that was held in Hamilton in 1967. The journal existed through the willing assistance of many unpaid helpers, but by 1971 it was noted that rapid inflation had increased costs beyond what could be met by increased circulation and subscriptions, and so a decision was made to cease production.

At my request to preserve this historical record in digital format, an online pdf version of the full run of the *Earth Science Journal* has been kindly prepared in early 2015 by Research Commons staff in the The Library, University of Waikato, Hamilton, New Zealand. It is accessible on the Research Commons website at the following link:

http://researchcommons.waikato.ac.nz/handle/10289/9088

Soil Atlas: Facts and figures about earth, land and fields

The Soil Atlas 2015 report has recently been published by the Institute for Advanced Sustainability Studies (IASS) in Potsdam and JRC has authored a chapter. The Soil Atlas 2015 is an easy-to-read and informative publication that gives clear facts and figures on the global significance and state of land, soil and agriculture, and proposes solutions for the protection of soil resources. The global significance of soils demands global responses.

http://www.boell.de/en/2015/01/07/soil-atlas-facts-and-figures-about-earth-land-and-fields

The Dirt

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

Growing Underground

Even though no soil is used, you have to take your hat off to Richard Ballard and Steven Dring of Growing Underground. One hundred feet below central London, they are growing microgreens and herbs using LED lighting and hydroponics in disused tunnels; once used as air raid shelters. The tunnels provide a naturally consistent climate (16° C) while air filters keep out pests and therefore no pesticides are needed. The 2.5 ha 'farm' plans to market their greens to restaurants and markets, and expand into edible flowers and tomatoes; all with some of the lowest food miles around.
(Source: http://growing-underground.com/)

More soil as art

Although most soil scientists can easily see the beauty in the soil beneath our feet, some people may need to see it in a museum before it can be properly appreciated. Now they can. Artist Olafur Eliasson has transformed an entire wing of the Louisiana Museum of Modern Art in Denmark with180 tons of gravel into a rocky grey landscape with a small stream meandering through it. This remarkable instillation (RIVERBED) "reverses the relation between nature and art".
(Source: http://en.louisiana.dk/exhibition/olafur-eliasson)

Waikato/Bay of Plenty

Landcare Research

Scott Fraser, **Sharn Hainsworth** and **David Palmer** are re-visiting Gary Orbell's 1977 "Soils of Part Franklin County". This project, funded by both Auckland Council and Waikato Regional Council, aims to develop digital soil mapping capability and a new digital soil map in the Pukekohe area. This new, more detailed, soil information will be useful for making land management decisions by farmers and growers in the region, as well as providing more detailed soil information for Regional Council use.

Photo: Looking north from Pukekohe Hill over market gardening, intensive dairy and drystock land (middle distance) with the Manukau Harbour and Waitakare Ranges in the distance.

David Palmer has been awarded a Landcare Research Manaaki Tangata Fellowship. He will use the funding for a digital soil mapping project (DSM) using soil data from Southland. DSM techniques will be used in collaboration with Sydney University to expand Landcare Research's skills in DSM nationally and internationally.

AgResearch Ruakura

It's been a relatively quiet time post-Christmas holidays at Ruakura with many taking the opportunity for a well-deserved break in the glorious January weather. However, during this time there were a few significant changes. First we bid farewell to **Marlies Zonderland-Thomassen** who is returning to the Netherlands after four years with AgResearch. Marlies was part of the Lifecycle Assessment team and specialised on the development and application of water Footprinting in pastoral agricultural systems Secondly, we bid farewell to **Sheree Balvert** as a Research Associate and said hello to Sheree Balvert the PhD student (of Waikato University)! Also during this time the team was joined by **Ben Campbell**,

a summer student from Waikato University. Ben helped out in a range of practical tasks including the notorious 'urine spotting' trial at Scott Farm. We sincerely hope this has not put him off agricultural research forever.

On that topic (i.e. urine), **Mark Shepherd** et al. have established a new experiment at Tihoi looking at urinary N uptake in plantain in comparison with pasture. Information on novel crops and new environments (summer tends to be brief down there!) will be of value for our colleagues trying to models these infernal urine patches.

The Pastoral 21 programme has 12 months remaining. There are some exciting results coming from the programme. While these are and will be disseminated to the science community via the usual routes, there is also a concerted effort to capture the key practical messages for the industry and work with extension/development specialists to spread the word. A workshop was run with the science team to start to capture these key points. It was a really an excellent day and a great starting point for the process. The headline message is that through using established scientific principles to design and manage dairy systems, we have been able to maintain production and substantially decrease nutrient losses to water. Watch this space for more details …

Finally, a large contingent from Ruakura travelled down to Massey University for the classic Fertiliser and Lime Research Centre Workshop. There were numerous team posters presented, with many continuing the theme of urine patch dynamics, N response, nitrous oxide emissions and N mineralisation from farm slurry. Well done **Diana Selbie**, **Sheree Balvert**, **Mark Shepherd**, **Stuart Lindsey** and **Moira Dexter**. As usual, **David Wheeler** gave a presentation on updates to OVERSEER, while **Gina Lucci**, together with **Jim Risk** of Ballance Agri-nutrients, gave a presentation on the forthcoming MitAgator critical source area modelling tool.

Manawatu/Hawke's Bay

Plant & Food Research – Palmerston North

Jade is measuring the degree of SWR of disturbed soil samples.

We farewell **Jade Gribben**, who spent her summer working on soil water repellency (SWR) with **Karen Mason** and **Karin Müller** in our Production Footprints' team. As part of the studentship Jade measured runoff and drainage patterns from intact pastoral soil slabs using the **R**un**o**ff **M**easurement **A**pparatus (ROMA). She also investigated spatial and temporal changes of hydrophobicity of the slabs. Jade is planning on continuing her work on SWR as a special topic in her undergraduate studies this year at Lincoln University.

ROMA in action.

Tree Transpiration of Desert Vegetation & Their Irrigation with Treated Waste Water

Brent Clothier and **Steve Green** are presently working in Abu Dhabi on a project resourced by the Environment Agency-Abu Dhabi (EAD) on using treated waste water to irrigate desert forests to reduce their reliance on dwindling groundwater resources.

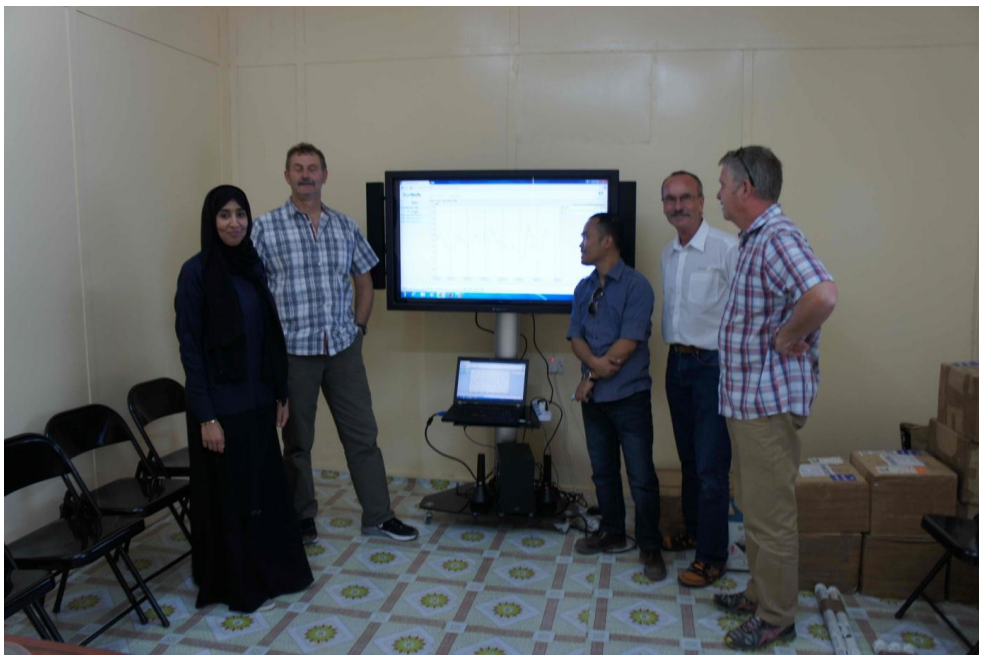
The work forms the basis of the PhD of EAD scientist **Wafa Faisal Al-Yamani** whose doctoral studies will be through the Massey University-Plant & Food Joint Graduate School.

The EAD boss, Her Excellency Razan Khalifa Al Mubarak, commented "*... EAD had announced is its commitment to reduce the use of groundwater by 80% in forestry by 2030, in line with its mandate to promote the conservation of Abu Dhabi's natural heritage*." She added that "*Our objective is to ensure that only recycled water is used for irrigation, while conserving groundwater resources. We are working with other agencies and are developing distribution infrastructures to capture recycled water at treatment plants and deliver it to forests throughout the emirate*".

Wafa notes that as part of her PhD a "*... forest irrigation management tool will be developed to allow EAD to tailor irrigation approaches for specific forests based on tree species, local climate and soil properties, and to forecast growth rates and productivity indices of these trees grown with recycled water and sometimes saline water."*

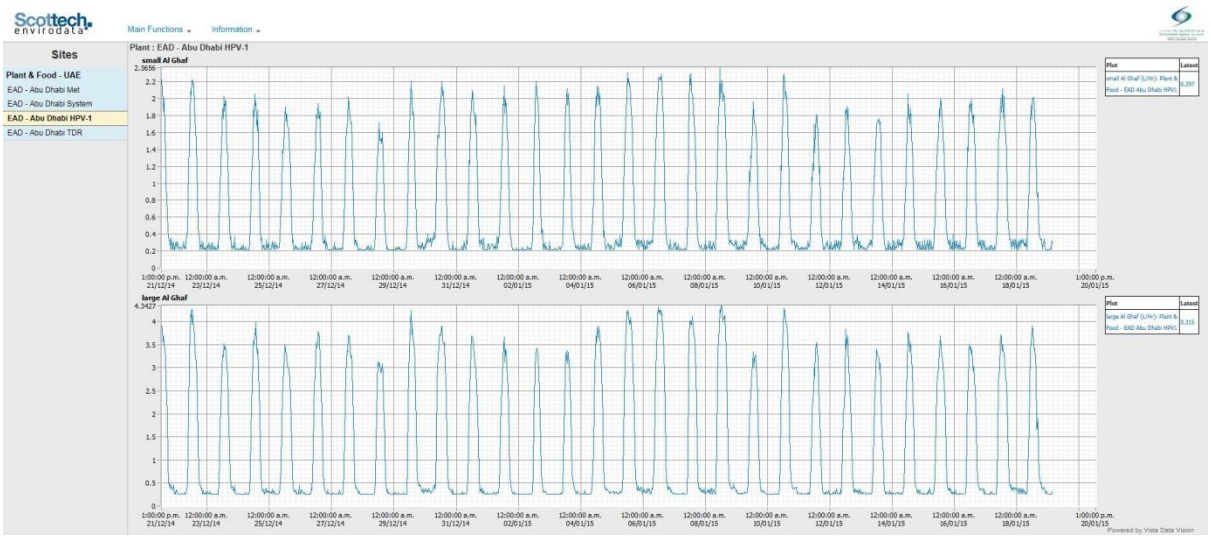
Attallah Khan (Barari Forest Management), Steve Green (PFR), Wafa Faisal Al Yamani (EAD), and Steve Dixon (Maven Consultants) discuss the experiments on instrumented Al Ghaf trees at the Kub Al Dahs forest in the western desert of Abu Dhabi.

Equipment has been installed in the first species of desert trees, Al Graf, and the sap flow measurements of tree water-use and the changing pattern of soil water content measured by TDR are beamed by FTP up to a cloud site to record results in real time that can be interrogated either in the Emirates, or in New Zealand.



Wafa (EAD), Steve (PFR), Rommel (EAD), Brent (PFR), and Steve (Maven) inside the 'hut' where the data from the sensors are logged and then uploaded to an FTP site.

An example of the real-time display of tree water use results downloaded from the cloud is presented below.



The data on tree transpiration of Al Ghaf trees in near Madinat Zayed accessed via an FTP site in the 'cloud'.

It's an exciting and important project. And getting to the field site can be exciting ...

A great spectacle en route to the field site where the jockeys bring their steeds back to the stables across the road.

Massey University, Palmerston North

The 28th Annual FLRC Workshop was held during February and was another very worthwhile event. More than 300 people attended during the three-days and there were 99 presentations both oral and poster.

The title and theme of the workshop this year was '**Moving farm systems to improved nutrient attenuation**' and an excellent keynote presentation was given by Professor Phil Jordan from the School of Environmental Sciences, Ulster University. In his capacity as Head of the Agricultural Catchments Programme in Ireland, he was well placed to give an insight into the current catchment-based research in response to EU policies in Irish agricultural catchments.

Professors Mike Hedley and Phil Jordan

Also giving keynote presentations were:

- Associate Professor Grame Doole (University of Waikato and MPI) who spoke on the economic impact of water quality regulation in New Zealand,
- Professor Rich McDowell (AgResearch and Lincoln University) talking about farming within a phosphorus limt, and
- Mr Jim Wilson a Scottish farmer on his thrid visit to the FLRC workshop who runs the family farm in Hilton of Fern in Angus and is also Managing Director of Soil Essentials and a leading global figure in Precision Agriculture.

The organisors also 'constructed' a session to update delegates on the status of regional policy for nutrient management and invited Horizons, Waikato and Canterbury Regional Councils to contribute.

The 29th Annual FLRC Workshop is scheduled to be held on the 9th-11th February 2016.

AgResearch Grasslands

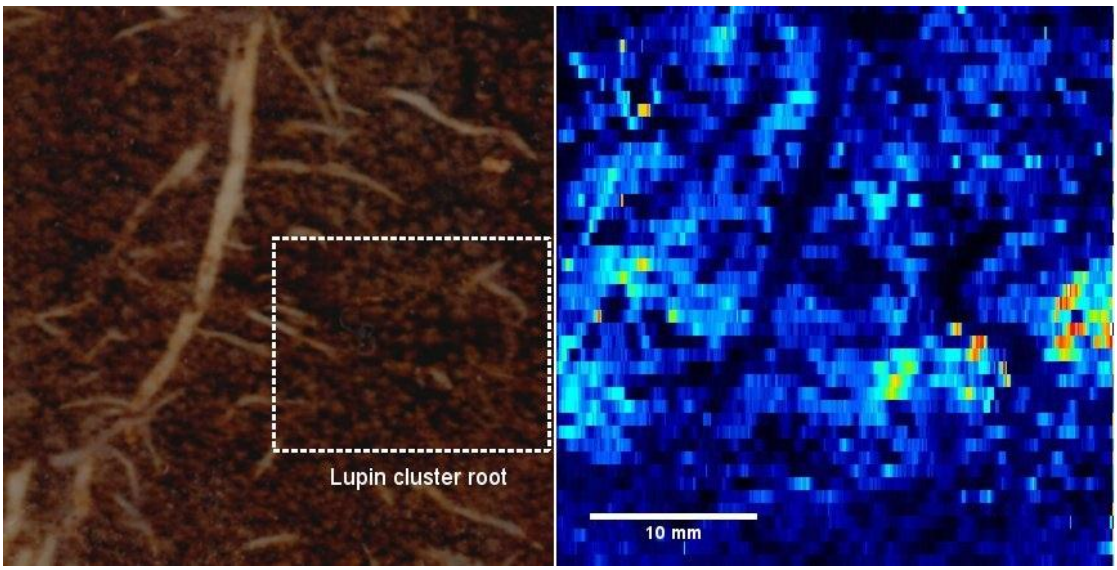
Val Snow, **Mike Dodd** and **Estelle Dominati** recently attended a two-day workshop in Brisbane to collaborate with partners in CSIRO (Peter Thorburn, Jodi Biggs, Neil Huth) and from Colorado State University (Bill Parton) on an MPI funded project aimed at improving the soil carbon – soil physical property relationships in APSIM. The idea is to be able to use the model to demonstrate how increasing soil carbon confers tangible benefits to soil ecosystem services (e.g. crop yield, water storage, nutrient retention) be-yond the GHG mitigation value of carbon sequestration. The CSIRO team have focussed on developing algorithms that relate soil carbon to soil bulk density, field capacity, wilting point and hydraulic conductivity, which have been encapsulated in a carbon effects calculator spreadsheet. The NZ team have focussed on developing algorithms to link those soil properties to root proliferation. Jodi and Estelle presented the results of a number of simulations incorporating the additional relationships, revealing that additional C has clear benefits in terms of yield via enhancement of nutrient supply but in some cases this is actually offset by soil physical effects. Ultimately the algorithms will be coded into new versions of the APSIM soil modules.

Canterbury

Lincoln University

Carol Smith hosted Stephen Cattle from the University of Sydney, in early February. They are working on a collaborative project assessing the similarities of Australian parna and New Zealand loess, in particular the different provenance and formation pathways for the sediments, using conventional micromorphology techniques and QEMSCAN® (Quantitative Evaluation of Minerals by SCANning electron microscopy). This is a new technique which integrates SEM and X-ray spectroscopy to generate quantitative mineralogical and granuolmetric information. We are aiming to present results at this year's INQUA congress in Nagoya.

Nik Lehto worked with scientists from the University of Bolzano and The University of Soil Science (BOKU) in Tulln (Austria) to visualise trace element mobilisation in the rootzone of lupins. Nik is a world-leader in the use of techniques that could be used to visualise, for example, the distributions of growth-limiting nutrients in NZ's agricultural systems. Such understanding could enable the enhancement of nutrient efficiency leading to increased profitability of NZ's farming systems.



Iron mobilization observed at high resolution at a lupin cluster root using Laser Ablation ICP-MS and diffusive gradients in thin-films (DGT)

Plant & Food Research, Lincoln

PFR hosted a group of farmers from Brazil in January. There were 25 farmers in group. These people were very enthusiastic arable farmers with a strong interest in forage crops for dairy support. **Bill Griffin** gave an overview of PFR and its capabilities. **Richard Gillespie** and **Mike George**, with **Alex Michel**, showcased the rainshelter facility, and **John de Ruiter**, with **Shane Maley** and **Steven Dellow**, talked about the Forages for Reduced Nitrate leaching crops, kale, sunflowers, cereals, maize, and fodder beet. The science language barrier was ably overcome by Edmar Teixeira.

PFR Lincoln was well represented at the recent FLRC workshop in Palmerston North. **Roger Williams, Steve Thomas, Abie Horrocks, Weiwen Qiu, John de Ruiter** and **Edith Khaembah** presented or showed posters.
A full team meeting of the Forages for Reduced Nitrate Leaching program will be held at Lincoln next week. Several members of the PFR Lincoln team will be attending and contributing to the Dairy NZ hosted meeting. A field tour will include PFR Lincoln's FRNL field trials.

Trish Fraser has joined the organising team for the December 2016 soils conference to be held in Queenstown.

John de Ruiter shows kale to a group of arable farmers from Brazil

Last year **Craig Tregurtha** (research associate in the Land Use and Management team) participated in the endurance cycling phenomenon known as Everesting. This involves cycling up a hill but only counting the vertical distance until reaching the height of Everest, 8848m. In August, Craig completed his "climb" having to cover 173km in actual distance. His time of just slightly over 12 hours ranked him 8th in the world. While most of us might shake our heads in amazement, we also admire the stamina and bloody mindedness of the effort.

And not content with that, he's had another two successful attempts! His second attempt was completed in 9h and was a world record time!!!

Congratulations Craig!

Otago/Southland

AgResearch Invermay

Conditions in Otago and Canterbury are dry, which is odd given the very wet spring we had. A field trial aimed at quantifying nitrous oxide emissions from effluent applied to pasture, funded by MPI, has come to an end. Research associates Alison Rutherford and Wayne Worth completed field measurements in late January, and the next step will be collating the results from other trials conducted across the country and from earlier trials".

Abstracts

Effect of dicyandiamide (DCD) delivery method, application rate and season on pasture urine patch nitrous oxide emissions

J. Luo, S. Ledgard, B. Wise, B. Welten, S. Lindsey, A. Judge, M. Sprosen
Ruakura Research Centre, AgResearch Limited, Private Bag 3123, Hamilton, New Zealand

Abstract
Here we report a study which was designed to examine the effect of a nitrification inhibitor dicyandiamide (DCD) on N_2O emissions from pasture urine patches. The aspects of DCD use that were studied were delivery method, application rate and timing of dairy cow urine deposition. Dairy cow urine (700 kg N ha^{-1}) was applied to pasture on a free draining Otorohanga silt loam soil in New Zealand in the autumn and winter of 2013 with DCD applied at different rates (0, 10, 30 and 60 kg ha^{-1}). In the autumn, DCD was delivered to the soil either by mixing DCD with the urine collected from dairy cows or by using urine from cows that had ingested DCD while being kept in a stall. In the winter, only treatments with DCD mixed in urine were used. Total N_2O emissions from urine applied in the autumn or the winter were 1.66 or 1.79 kg N_2O-N ha^{-1} $year^{-1}$, respectively. This resulted in an annual EF_3 (emission factor, as a percentage of applied urine N lost as N_2O-N) of 0.21 and 0.20%, respectively. The EF_3 was reduced equally with either DCD delivery method with the reductions increasing with increasing DCD rate. This indicates that DCD in urine, excreted by cows that are provided DCD-amended feed, can effectively reduce N_2O emissions and that a higher DCD rate will be more effective. Further work is required to ensure that DCD applied using this innovative technique is also effective using different feed and animal types under a range of environmental conditions.

Biology and Fertility of Soils. In press

Identifying improvements required to simulate nh_3 volatilisation following urine or urea application using NZ-DNDC

Donna Giltrap[1*], Jimena Rodriguez[2,3], Peter Berben[1], Thilak Palmada[1], Surinder Saggar[1,2]
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[3]*Currently at Nuevo Manantial S.A., Durazno, Uruguay*

Abstract
Correct simulation of ammonia (NH_3) loss through volatilisation is important for process-based models of soil N cycling as this can have a significant effect on the soil mineral-N concentration and subsequent N-transformation processes. In addition, volatilised NH_3 represents a significant loss of N from pasture soils, and can act as a secondary source of nitrous oxide (N_2O) emissions when redeposited on soil.

In this study we use data from two field experiments on the same soil (Tokomaru silt loam) to test the process-based NZ-DNDC model. In the first experiment, cattle urine was applied at 530 kg N ha^{-1}, and NH_3 emissions, soil pH and mineral-N were monitored over 30 days. In the second experiment, urea was applied at either 0 (control), 30 or 60kg N/ha. The urea was followed by either 5 mm, or 10 mm of irrigation applied after a delay of 8, 24, or 48 hours. NH_3 emissions and soil mineral N were collected for 2 weeks following urea application.

Both these data sets revealed processes within the NZ-DNDC model that need improving. For the urine application, the model over-estimated the increase in the soil pH (simulated maximum ~8.7 compared with observed 6.7) and of the NH_3 emissions. Modifying the model to use observed pH changes improved the simulated NH_3 loss. For the urea plus irrigation experiments, the model

simulations showed a much lower effect for irrigation timing on NH_3 EF compared with the experiments. This is because NZ-DNDC does not simulate the physical transport of urea down the soil profile.

Our model results show that to improve simulated NH_3 emissions from urine patches and applied urea the simulation of pH in NZ-DNDC needs to be improved and to account explicitly for the different buffering capacities of soils. Meanwhile, a urea transport process needs to be added to simulate the potential mitigation of NH_3 emissions by irrigation. These improvements are the focus of future work.

Abstract for the FLRC Workshop, 10-12 Feb 2015, Palmerston North, New Zealand

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Routes of DCD uptake in pasture plants: a preliminary glasshouse study

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The nitrification inhibitor, dicyandiamide (DCD) can mitigate nitrate leaching and nitrous oxide emissions in New Zealand pastures and was commercially available to farmers (as spray suspension or granular formulations) until January 2013, when its use was suspended due to detection of traces of DCD found in exported milk. It is evident that DCD in the milk must have entered into the ruminant's body via ingested pasture and/or soil adhering to the pasture. The question is: did the DCD originate solely from the leaf surface or was it absorbed into leaf tissues? Alternatively, was the DCD taken up by the roots and translocated to the shoots? We investigated these routes of DCD into the plant by separately examining leaf uptake and root uptake in two glasshouse experiments. In experiment 1, DCD (at 10 kg/ha) was sprayed onto the foliage of ryegrass/clover growing on an intact soil core, off which 41–64% was intercepted. Surface residues of DCD were quantified periodically by thorough rinsing of the foliage, which decreased (P <0.005) over 21 days. The foliar uptake (absorbed DCD) quantified by analysing the DCD content of a blended extract of the rinsed plant material ranged between 2.7 and 5.2% of the DCD applied and did not change over time. Experiment 2 quantified the root uptake of DCD in two soils of contrasting drainage by analysing the blended extract of the foliage for DCD over 37 days. The DCD uptake in the foliage was between 2.6 and 6.3%, which increased over time (P <0.001) in both the soils. During the second harvest (97 days after DCD application), 1.2–2.2% of the DCD was detected in the foliage but no DCD was found in both the soil and roots. Interestingly, there was little pasture growth during the study period. This preliminary study raises several questions: is the DCD protected from decomposition in both the pasture shoot and root or in the rhizosphere for continuous uptake? Are these results reproducible and can these estimates be extrapolated to field conditions? Will similar levels of DCD be taken up under lower interception by the foliage/soil?

Abstract for the FLRC Workshop, 10-12 Feb 2015, Palmerston North, New Zealand

The role of precision agriculture for improved nutrient management on farms

Carolyn Hedley
Landcare Research, Palmerston North, New Zealand

Abstract

Precision agriculture uses proximal and remote sensor surveys to delineate and monitor within-field variations in soil and crop attributes, guiding variable rate control of inputs, so that in-season management can be responsive, e.g. matching strategic nitrogen fertiliser application to site-specific field conditions. It has the potential to improve production and nutrient use efficiency, ensuring that nutrients do not leach from or accumulate in excessive concentrations in parts of the field, which creates environmental problems. The discipline emerged in the 1980s with the advent of affordable geographic positioning systems (GPS), and has further developed with access to an array of affordable soil and crop sensors, improved computer power and software, and equipment with precision application control, e.g. variable rate fertiliser and irrigation systems. Precision agriculture focusses on improving nutrient use efficiency at the appropriate scale requiring (1) appropriate decision support systems (e.g. digital prescription maps), and (2) equipment capable of varying application at these different scales, e.g. the footprint of a one-irrigation sprinkler or a fertiliser top-dressing aircraft. This article reviews the rapid development of this discipline, and uses New Zealand as a case study example, as it is a country where agriculture drives economic growth. Here, the high yield potentials on often young, variable soils provide opportunities for effective financial return from investment in these new technologies.

Journal of the Science of Food and Agriculture 95 (1), 12-19, January 2015.

Spatial Variability of CO_2, CH_4, and N_2O fluxes during midsummer in the steppe of Northern China

Jianzhong Cheng[1], Xinqing Lee[1], Benny K.G. Theng[2], Bin Fang[1,3], Fang Yang[1,3], Bing Wang[1], Like Zhang[1]
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[2]Landcare Research Private Bag 11052, Palmerston North 4442, New Zealand
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Spatial variability is a major source of uncertainty in estimating the fluxes of greenhouse gases between steppe and atmosphere. The fluxes of CO_2, CH_4, and N_2O were carried out between 08:00 and 10:00 h. of the following day during the midsummer period from a transect (area: 5.25×10^6 ha) in the semiarid steppe of northern China, using the dark static chamber technique and gas chromatography. Two land uses were chosen for this study: soils with plant covers and bare soils. Daily average GHG fluxes from the steppe transect were: 1.3×10^5 t C for CO_2, -66.3 t C for CH_4, and 1.1 t N for N_2O. The emission of CO_2 from soils with plant cover was significantly higher ($P < 0.05$) than that from the corresponding bare soils. The canopy effect, however, was observed for neither CH_4 ($P = 0.058$) nor N_2O ($P = 0.772$). Air temperature and relative humidity were the major factors affecting the diurnal variation in site-based CO_2 flux ($P < 0.05$), while soil pH controlled its spatial variation ($P < 0.05$). The spatial uptake of CH_4 correlated negatively with soil total N (TN) content ($P < 0.05$), while the flux of N_2O significantly increased with soil organic carbon ($P = 0.031$) and TN ($P = 0.022$), indicating that soil organic matter is an important factor determining the N_2O flux in the steppe of northern China.

Polish Journal of Environmental Studies **23**: 319−328 (2014)

Lipid peroxidation and cytotoxicity induced by respirable volcanic ash

Javiera Cervini-Silva, Antonio-Nieto-Camacho, Virginia Gomez-Vidales, María Teresa Ramirez-Apan, Eduardo Palacios, Ascención Montoya, Stephan Kaufhold, Zeanal Abidin and Benny K.G. Theng

This paper reports that the main component of respirable volcanic ash, allophane, induces lipid peroxidation (LP), the oxidative degradation of lipids in cell membranes, and cytotoxicity in murin monocyle/macrophage cells. Naturally-occurring allophane collected from New Zealand, Japan, and Ecuador was studied. The quantification of LP was conducted using the Thiobarbituric Acid Reactive Substances (TBARS) assay. The cytotoxic effect was determined by the 3-[4,5-dimethylthiazol2-yl]-2,5-diphenyltetrazolium bromide colorimetric assay. Electron-Paramagnetic Resonance (EPR) determinations of naturally-occurring allophane confirmed the incorporation in the structure and clustering of structural Fe^{3+}, and nucleation and growth of small-sized Fe (oxyhydr)oxide or gibbsite. LP induced by allophane varied with time, and solid concentration and composition, reaching 6.7 ± 0.2 nmol TBARS mg $prot^{-1}$. LP was surface controlled but not restricted by structural or surface-bound Fe^{3+}, because redox processes induced by soluble components other than perferryl iron. The reactivity of Fe^{3+} soluble species stemming from surface-bound Fe^{3+}or small-sized Fe refractory minerals in allophane surpassed that of structural Fe^{3+} located in tetrahedral or octahedral sites of phyllosilicates or bulk iron oxides. Desferrioxamine B mesylate salt (DFOB) or ethylenediaminetetraacetic acid (EDTA) inhibited LP. EDTA acted as a more effective inhibitor, explained by multiple electron transfer pathways. Registered cell-viability values were as low as 68.5 ± 6.7%.

Journal of Hazardous Materials **274**: 237−246 (2014)

Biomass accumulation and carbon sequestration in an age-sequence of *Zanthoxylum bungeanum* plantations under the Grain for Green Program in karst regions, Guizhou province

Jianzhong Cheng, Xinqing Lee, Benny K.G. Theng, Like Zhang, Bin Fang and Fushan Li

Ensuring ecological security in the environmental degradation has always been a top priority in China. Under the Grain for Green Program (GGP), millions of hectares of farmland in the karst region of Guizhou province have been converted into *Zanthoxylum bungeanum* plantations in order to arrest and reverse "rocky desertification". The aim of this study was to estimate biomass increment and carbon accumulation in four different aged (1-, 4-, 7- and 10-year-old) *Z. bungeanum* stands, as well as the distribution of carbon stock among the various biomass components and soil depths. The total plant biomass measured for the four stands of different ages was 0.05, 6.76, 12.22, and 16.71 Mg ha^{-1}, respectively. Compared with other plant species in the region, *Z. bungeanum* plantations have a larger capacity for accumulating biomass. The C content in components of *Z. bungeanum* tree ranged from 40.47% to 48.64% with the mean value of 44.67%. The use of the standard coefficient (50%) in converting biomass into C storage results in 10% overestimation. Soil organic carbon (SOC) storage at the top soil (0–30 cm) increased from 75.22 Mg C ha^{-1} in 1-year-old stand to 80.06 Mg C ha^{-1} in 10-year-old stand, and decreased with increasing soil depth for each stand age. Total ecosystem C storage increased with plantation age, averaging 75.24, 79.79, 84.43, and 87.62 Mg C ha^{-1}, respectively, of which more than 90% was stored in the soil. Our study suggests that the protection of SOC in surface soils during plantation management practices plays a crucial role in improving the C sequestration. Data of plantation area and annual biomass C accumulation rate (under the GGP in Guizhou province) indicate a net C sink of 6.35×10^6 Mg in 2010, corresponding to a 4.92% compensation of C emission from energy consumption in that year. Besides increasing C storage over time, the large-scale planting of *Z. bungeanum* has the potential of restoring severely degraded soils in the karst region of SW China.

Agricultural and Forest Meteorology **203**: 88−95 (2015).

Assessment of potential biofilter materials To mitigate methane emissions

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Previous laboratory and field studies demonstrated the ability of volcanic pumice soil to mitigate both high and low rates of CH_4 where both type I and type II methane oxidising bacteria (MOB) present were responsible for removing CH_4. However, limited global availability of volcanic pumice soil necessitated the need to bio-remediate to assess other potentially suitable, economical and widely available biofilter materials. We mixed small part of the inoculum (volcanic soil) with larger part of the potential biofilter materials, viz. in situ soil (isolated from the effluent pond bank area), pine biochar, garden waste compost, fresh and weathered pine bark mulch. The efficiency of these materials to remove CH_4 was monitored over 6 months at 25^oC with periodical feeding of CH_4 and O_2 to support microbial growth and activity. All materials (except fresh mulch) supported the growth and activity of methanotrophs. However, the efficiency of CH_4 removal in all the materials fluctuated between no or low CH_4 removal and high CH_4 removal phases, indicating the disturbances in the community. Among these, soil and biochar removed > 80% CH_4 and was more resilient to changes in the community. Amendment of soil and biochar with micro-quantities of macro- and micro-nutrients (nitrate mineral salts) enhanced the stabilisation with CH_4 removal of up to 99%. This study demonstrated that (1) other soils and cheaply available materials can be used as a biofilter material by spiking with CH_4 enriched medium, and (2) nutrient additions enhance the growth and activity of MOB in the biofilter materials.

Abstract for the FLRC Workshop, 10-12 Feb 2015, Palmerston North, New Zealand

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Regulating sustainable nutrient management through farm environmental plans

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Abstract

Farm Environmental Plans (FEPs) are tools to help farmers identify and address sustainable resource use issues as they apply to the unique conditions and situations of individual farms. They have a rich history of use in New Zealand, extending back to the 1940s with the concept of 'conservation farming' to promote erosion control. Increasingly they are being viewed as an important contemporary tool for promoting sustainable nutrient management down on the farm, especially as it relates to reducing environmental impact and improving freshwater quality. Today, at least three regional councils have specified FEPs as regulatory requirements in their second generation regional plans, and there is a growing expectation that all NZ farmers in the future may need to operate under a FEP to achieve freshwater reforms.

In this paper we present a provisional snapshot of the contemporary state of farm environmental planning in NZ, and highlight several challenges and opportunities regarding the current and future use of FEPs as tools to bring about effective change.

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Are we on course for a train wreck with soil information and data for sustainable nutrient management?

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Abstract
Information and data regarding the properties and distribution of New Zealand soils has traditionally been collected by research-orientated organisations, generally at scales that facilitate the mapping of large areas efficiently. Increasingly, however, a variety of new providers are emerging to service the growing demand for more detailed soil surveys of individual farms, driven largely by council-requirements for sustainable nutrient management, and by the pursuit of resource-use efficiencies around fertiliser and irrigation. While aptly qualified providers exist, there is a risk of new providers entering the market without experience or qualification. Currently there are no standards or quality controls regarding farm soil survey, and anyone can claim to have expertise in soil characterisation and farm soil mapping.

In this paper we discuss why the collection of reliable farm-scale soil information is a difficult undertaking, and demonstrate financial and environmental risks of 'getting it wrong' with soil information for farm management and compliance requirements. Considerations for promoting greater transparency, assurance to end users, and national consistency, are also discussed.

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C.. Assessment of national policy: effectiveness of programmes of measures on water quality on a regional and national scale
D.. Field research and data interpretation: research (monitoring and modelling) at plot and field scale for quantifying effects of farming practices and changes in land use
E.. Managing protected areas: risk assessment monitoring and modelling of water quality and quantity, for drinking water supply and ecosystem conservation within Habitat and Species Protection Areas
F and G.. Decision-making and implementation: role of policy, stakeholder and science in decision-making, and social and economic incentives and constraints for implementation (carrots and sticks)
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