Further information about Professor David J. Lowe
University of Waikato,
Hamilton,
New Zealand

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Recent and earlier research and contributions

David has published widely in a range of disciplines (tephrochronology, pedology, clay mineralogy, geochronology, geoarchaeology, landsliding, and Quaternary science) with more than 180 refereed publications in scientific journals or books (including 25 book chapters) to his name. He has undertaken research in New Zealand, Antarctica, Australia, Canada, Japan, and the U.K., and also has field experience in Taiwan, France, Germany, Ireland, Switzerland, western U.S.A. (eight states including Alaska and Hawaii), and Fiji.

David has recently published with colleagues an edited volume of the journal *Quaternary Geochronology* (Lane et al. 2017) specifically on tephras entitled “Advancing tephrochronology as a global dating tool: applications in volcanology, archaeology, and palaeoclimatic research” (vol. 40, pp. 1-146). The papers are grouped into two themes reflecting (1) advances in methodologies (4 papers) and (2) building regional tephrostratigraphic frameworks (7 papers). These 11 papers, together with an introductory article (Lane et al.) and obituary, showcase some of the recent advances in tephrochronology arising from research by members of the International Focus Group on Tephrochronology and Volcanism (INTAV) and the EXTending TephRAS (EXTRAS) project being led by David. Similarly, an invited review paper entitled “Correlating tephras and cryptotephras using glass compositional analyses and numerical and statistical methods: review and evaluation” by Lowe et al. (2107) published in *Quaternary Science Reviews* (vol. 175, pp. 1-44) is another output of EXTRAS. Methodological advances in the analysis of glass shards and how, using glass or crystal-based analyses, a range of statistical methods can be applied to enable tephras and cryptotephra deposits to be correlated to source volcanoes and from one place to the next, are presented and discussed in the paper. The paper also includes a quick guide to analytical problems and how they might be identified and overcome, and a simplified framework (flow-chart) for the process of undertaking tephra correlation. This paper is free to download from the Elsevier website until 2 November, 2017, at [https://authors.elsevier.com/a/1VIOV-4PRmKZ](https://authors.elsevier.com/a/1VIOV-4PRmKZ) (after then, access is via the usual journal subscription system).

Since 2016, David, with students and colleagues, has been leading a project examining volcanic hazards in the Waikato region by studying ‘hidden ash’ deposits, called ‘cryptotephras’, in lake sediments and peats as part of a project funded by EQC and the Waikato Regional Council. He has also been working with colleagues in New Zealand, Germany (Bremen Univ.), and the UK (Swansea Univ.) on liquefied tephra layers in lake sediments that are thought to relate to past earthquake activity on newly-discovered geological faults in the Hamilton area.

Another area of research recently completed has been on the discovery of two new morphological form, namely ‘books’ and ‘mushroom-cap-shaped’ (MCS) spheroids of the clay mineral halloysite that
arose indirectly from work with Vicki Moon and graduate students investigating geotechnical properties and landsliding in the Tauranga area. Previously, book-forms had been associated exclusively with kaolinite. The charge characteristics of the MCS spheroids helped explain the flow-sliding at Omokoroa through a new ‘attraction-detachment’ model published in *Geology*. New work on the structure of halloysite, partly derived from research undertaken in the Mt Gambier-Mt Schank area of Holocene volcanics in South Australia during leave at CSIRO in Adelaide in 1991-92, has also been completed with Jock Churchman and others.

From 2011, David led a Marsden-funded project “New views from old soils” (now completed) that examined research questions (1) how allophane sequesters and protects carbon in allophanic soils and paleosols, and (2) how ancient DNA (aDNA) is stored and protected in such materials and how such aDNA could be extracted and used to inform past environmental reconstructions (see publications). This work involved collaboration with Prof Alan Cooper, Dr Jock Churchman, and Dr Jennifer Young (University of Adelaide), Dr Nic Rawlence (University of Otago), and Dr Jamie Wood (Landcare Research, Lincoln). The Waikato group included former student Dr Yu-Tuan (Doreen) Huang (now a postdoc in Umea, Sweden), Dr Ray Cursons, and Heng Zhang (now a PhD student). The group used synchrotron facilities at the National Synchrotron Radiation Research Centre (NSRRC), Hsinchu, Taiwan.

Late in 2015, the second edition of the award-winning book “A Continent on the Move: New Zealand Geoscience Revealed” was published by the Geoscience Society of New Zealand together with GNS Science. This edition contained numerous updates and considerable new material. As well as contributing two articles, David was the editor responsible for 10 articles in Chapter 11 “Climate Swings and Roundabouts” (pp. 262-295). He also contributed a chapter to a new book “The Drama of Conservation – The History of Pureora Forest, New Zealand” that was published by Springer, Berlin, and the New Zealand Department of Conservation, Wellington.

In August, 2013, the final volume of the AUSTALASIAN INTIMATE project was published as Vol. 74 of *Quaternary Science Reviews* (pp. 1-280) “Linking Southern Hemisphere records and past circulation patterns: the AUS-INTIMATE project” (edited by J. Reeves, B. Alloway, T. Barrows). David contributed or co-authored three papers for this volume (2013), two earlier papers towards the project (2007, 2008), and contributed to a poster and bulletin published by GNS Science (2005).

David (with Prof Louis Schipper) convened the second Waikato-Bay of Plenty regional soils meeting, Wai-BoP Soils 2013, on 5 Dec, 2013, at the University of Waikato on behalf of the NZ Society of Soil Science. David and Louis co-convened the first Wai-BoP Soils meeting in December 2011.

In July 2011, David co-convened a session on tephrochronology at the Inqua Congress in Bern, Switzerland, and represented New Zealand on the International Council. He and colleagues convened two symposia at the Inqua Congress in Nagoya, Japan, in July-August 2015.

In May 2010, David gave a public lecture in Kirishima, Kyushu Island, Japan, as part of the INTAV "Active Tephra" conference. He also presented a series of seminars at 4 universities during a JSPS-sponsored tour of Japan after the conference.

In 2009, David was invited by the Queensland Branch of the Australian Society of Soil Science to give the Ron McDonald Memorial Lecture in Brisbane, the first New Zealander to be given the award. His
lecture was entitled "Where pedology meets geology - insights into Andisols in Australasia".

In November 2007, David was a key-note plenary speaker at an international symposium on Quaternary environmental change that was held in Tsukuba, Japan, to mark the 50th anniversary of the Japan Quaternary Association (JAQUA). David also gave a seminar at the National Taiwan University (NTU) in Taipei, Taiwan, in November, 2007. Earlier David gave two keynote talks at the INQUA congress held in Cairns in July-August 2007. In March 2006 David was an invited speaker at a conference on Andisols in the Mt Fuji area of central Japan. David also worked for several months in 2006 at both the Waikato Radiocarbon Dating Lab in Hamilton and at Scion Research in Rotorua.

In 2005, David attended an international tephra conference in the Yukon Territory (Canada) and visited colleagues in Saskatchewan and central Alaska as part of his sabbatical leave. Earlier, David spent eight months undertaking palaeoenvironmental and tephrochronological research in universities in Northern Ireland and Great Britain during sabbatical leave in 1998-99, and ten months undertaking pedological and volcanological research on Quaternary volcanic eruptives and associated soils in southeast South Australia whilst at CSIRO (Division of Soils) in Adelaide 1991-92.

David's early professional experience includes soil survey-related work for the Soil Bureau of DSIR, Hamilton, and benzene synthesis in the liquid-scintillation based Waikato Radiocarbon Dating Laboratory. In Antarctica during the 1978-79 field season, David’s four-man field party (led by now-Emeritus Professor Michael Selby) manhauled a sledge whilst undertaking geological, geomorphological and pedological mapping in the Transantarctic Mountains. The party also discovered unique iron meteorites, one of which is displayed in the Canterbury Museum (Antarctic Wing), Christchurch.

**Recently completed research projects**

Recently completed research undertaken with colleagues from New Zealand and overseas, and with postgraduate students, includes:

1. Developing new age models for key tephra marker beds for New Zealand since 30,000 years ago using Bayesian modelling techniques including revising the age of Kawakawa/Oruanui tephra (published in 2008 and 2013).
2. Critically reviewing the methods for analysing glass shards from tephras and cryptotephras and presenting and evaluating the numerical and statistical methods that may be applied to tephra/cryptotephra correlation.
3. Contributing to the development of the New Zealand climate event stratigraphy (NZCES) as part of the NZ-INTIMATE project (published in the AUS-INTIMATE issue of *Quaternary Science Reviews* Vol. 74, 2013). Previously contributed to the preliminary NZCES in 2007.
5. Evaluating the likelihood of the “bipolar seesaw” mechanism operating in the New Zealand region since 30 cal ka.
6. Determining the timing and impacts of early Polynesian settlement in New Zealand, and assessing the impacts of volcanism on early Maori in New Zealand.
7. Developing a comprehensive model relating tephras to archaeology in New Zealand, and determining the calendar age of the Kaharoa eruption of Mt Tarawera at AD 1314 ±12 using dendrochronological wiggle-match dating and radiocarbon dating.
8. Using tephrochronology with palynology and other palaeoenvironmental proxies to compare the synchronicity or otherwise of abrupt climate change during the transition from marine isotope Stage
(MIS) 2 to Stage 1 (Last Termination), including identification of a cooling event from ca. 13,800-12,600 cal yr BP.

9. Reviewing the Andisols of the world and of New Zealand and Australia.

10. Determining climatic and vegetational change from MIS 5e (Last Interglacial) through to MIS 1 (Holocene) in Northland using analyses of cores from Lake Omapere near Kaikohe.

11. Developing new models of upbuilding pedogenesis in tephra and loess deposits in New Zealand.

12. Developing soil-landscape modelling techniques to map target soil properties in plantation forests in Southland, central volcanic plateau and Northland regions, and assessing the affects of forest harvesting on the efficacy of such modelling.


14. Contributing to two joint papers defining the climate event stratigraphy of New Zealand as part of the Australasian INTIMATE project (in 2007 and 2013).

15. Contributing to a chapter on tephrostratigraphy and tephrochronology for Elsevier's Encyclopaedia of Quaternary Science (including a revised 2nd edition published in 2013), and contributed a chapter on tephrochronology to Encyclopaedia of Scientific Dating Methods in 2014.

16. Determining the paleoclimate of the Auckland region during MIS 2 using tephalopalynological analysis of cores from Kohuora Crater, Auckland Volcanic Field, and of Adelaide Tarn, NW Nelson, since c. 16,000 years ago.

17. Reviewing the alteration, formation and occurrence of minerals in soils.

18. Developing improved tephra correlation techniques using electron microprobe analysis of glass shards in bi-modal Rotorua Tephra, and of melt inclusions in strongly weathered tephra deposits.

19. Reviewing the use of palaeoenvironmental ancient DNA in Quaternary research.


22. Documenting the occurrence of new morphologies of halloysite (‘books’, ‘mushroom-cap-shaped spheroids’) and the structure of halloysite, especially the way in which H₂O is incorporated into the sheets. Also, contributed to the new ‘attraction-detachment’ model built around the charge characteristics and abundance of the mushroom-cap-shaped spheroids in a very sensitive layer at Omokoroa in the Tauranga region that helped enable flow sliding to occur.

23. Discovery of accelerated weathering of glass in Andisols in North Island because of the use of fertilizers for the past ~50 years (with Matthew Taylor and colleagues).
Paddy fields growing rice near Tokyo

Ultisol landscape, Mahurangi Forest, Northland

World tephra specialists, Dawson City, Yukon Territory, 2005

Pedology students in Whakarewarewa Forest Rotorua, 2013
Publications

**Tephrochronology, Quaternary science and environmental change**


Lowe, D.J., Blauw, M., Hogg, A.G., Newnham, R.M. 2013. Ages of 24 widespread tephras erupted since 30,000 years ago in New Zealand, with re-evaluation of the timing and palaeoclimatic implications of the late-glacial cool episode recorded at Kaipo bog. *Quaternary Science Reviews* 74, 170-194.


Shallow peat at Waihi Beach, North Island; Kaharoa tephra (erupted c. 1314 AD from Mt Tarawera) showing prominently (from Lowe 2011)

Ancient Maori village site (kainga) at Papamoa, North Island, on sand dune with white Kaharoa tephra forming the pre-village datum
Geoarchaeology and tephrochronology; science policy, Anthropocene, obituaries (etc)


PDFs of some papers are available at the University of Waikato 'Research Commons' at http://researchcommons.waikato.ac.nz/sci_eng/
Participants in INTAV’s “Active Tephra” conference in Japan 12 May, 2010. Sakurajima volcano in background erupted later that day. Photo: Koji Okumura.
Recognition

Honours and distinctions

David was Chair of the Department of Earth and Ocean Sciences, University of Waikato, from July, 2012, until April, 2014, when the department was merged with several others to form the new School of Science in the Faculty of Science and Engineering at the University of Waikato. He was until July 2015 programme convenor and postgraduate coordinator for the Earth sciences group within the school.

David has held, and holds, elected office in both international and national geoscience organizations and is the Immediate Past-President (2015-2019) of the International Focus Group on Tephrochronology and Volcanism (INTAV) within the International Union for Quaternary Research (INQUA). Previously he was Secretary 2007-2011 and President 2011-2015. David convened an international Inter-INQUA field conference on tephra, loess and paleosols in New Zealand in 1994 during an earlier stint (1991-1995) as Secretary of the Commission of Tephrochronology of INQUA (predecessor to INTAV). He helped to organise the “Active Tephra” conference in Japan in 2010 for INTAV. Currently, he and the INTAV committee are working on the next inter-INQUA specialist tephra conference to be held in 2018.

David has been involved for more than three decades in organizing and leading conference and society activities, thereby helping facilitate science communication for professional scientist and students from New Zealand and overseas. He convened the annual conference of the Geological Society of New Zealand in Hamilton in 2001. David has been on the organising committees of three further Geosciences Society of New Zealand annual conferences including most recently in November 2012 when the conference was hosted at the University of Waikato in Hamilton. He has also organized and led field trips through the North Island in association with international conferences including in 1993, 1994, 2008, and 2010, and for national conferences in 1981, 1982, 1985, 2006, 2012, and 2014. David is preparing for trips associated with the forthcoming Australasian Quaternary Association (AQUA) conference being held in Auckland in December, 2016.

In addition, David has hosted and supported dozens of visiting academics and young scientists, including 16 long-term visitors, from the USA, Canada, Australia, The Netherlands, Norway, England, Ireland, and Japan.

Currently David is currently a member of the editorial panels (boards) for four journals, Journal of Quaternary Science, Quaternary Geochronology, Quaternary International, and Frontiers in Earth Sciences. He was an associate editor for Soil Science Society of America Journal for 6 years from 2006 to 2011 and a member of the editorial advisory panel of New Zealand Journal of Geology and Geophysics for 6 years from 2004 to 2009.

David’s contributions to research and lecturing have been recognised by awards and honours both internationally and in New Zealand.
2016
- David has been working with colleagues as a guest editor for a special issue on tephrochronology (mainly papers presented in tephra symposia at the INQUA congress in Nagoya, Japan, in 2015) to be published in *Quaternary Geochronology* in early 2017
- Invited chapter by D.J. Lowe and B.V. Alloway (2105) “Tephrochronology” was published in the “Encyclopaedia of Scientific Dating Methods” (Springer), which won the Geoscience Information Society’s “Best Geoscience Reference Work Award”, 2016
- Member of the Hutton Fund Committee (Royal Society of NZ) for research grants for NZ zoology, botany and geology

2015
- Proposer and leader of an international tephra project, EXTRAS “Extending tephras” as a global geoscientific research tool stratigraphically, spatially, analytically, and temporally within the Quaternary” as a core part of the activities of the International focus group on tephrochronology and volcanism (INTAV) within INQUA, 2015-2023 (Dec 2015)
- Elected an Honorary Life Fellow of the International Union for Quaternary Research (INQUA) at Nagoya Congress, Japan, an award for “prominent internationally recognized Quaternary scientists for meritorious service to Quaternary science” (July 2015)
- Elected Immediate Past President, International Focus Group on Tephrochronology and Volcanism (INTAV) of INQUA, 2015-2019
- Member of ‘Continent on the Move’ Revision Committee of the Geoscience Society of New Zealand, and editor of chapter 11 “Climate Swings and Roundabouts” of revised 2nd edition (March 2014-September 2015)

2014
- Member of 2014 Hatherton Award Committee of the Royal Society of New Zealand

2011
- Awarded the McKay Hammer Award by the Geoscience Society of New Zealand “for the most meritorious contribution to New Zealand geology published in the years 2008-2010”
- Lead co-guest editor of volume 246 of set of papers “Enhancing tephrochronology (INTREPID project): Hiroshi Machida commemorative volume” for journal *Quaternary International*
- New Zealand delegate (Royal Society of New Zealand) to International Council, 18th International INQUA Congress, Bern, and current New Zealand representative 2011-2015
- Co-convenor of tephrochronology symposium at 18th International INQUA Congress, BERN
- Participated in a Canadian Broadcasting Corp (CBC) television documentary in episode “Western Pacific Rim” for series “Geologic Journey II”
- Awarded “Citation of Excellence for Associate Editors for 2010” by *Soil Science Society of America Journal*

2010
- Elected Fellow of Royal Society of New Zealand
- Awarded Marsden Fund funding for 3-year project on ancient DNA and paleosols in the North Island
- Awarded Fellowship of Japanese Society for the Promotion of Science for lecture tour of Japan in May
- “Outstanding reviewer” award for papers handled 2008-9 from *Quaternary Science Reviews*
2009
- Ron McDonald Memorial Lecture award, Queensland branch, Australian Society of Soil Science.
- Leader of INTREPID project of INTAV “Enhancing tephrochronology as a global research tool” and INTREPID II (ongoing project supported by INQUA) (completed July 2015)
- The book "A continent on the Move: New Zealand Geoscience into the 21st Century", published in 2008 by the Geological Society of NZ, and of which David was one of 3 technical/scientific editors, was awarded "best book in environment" category at Montana NZ Book Awards.

2008
- Appointed to a personal chair (professorship) at Waikato University 1 February
- Presented inaugural professional lecture "A date with tephra" 16 December
- Invited participant at international consortium workshop "Studying uncertainty in palaeo-environmental reconstruction - a net" (SUPRAnet) in U.K.
- Co-guest editor of volume (vol. 178) of papers "Global Tephra Studies - John Westgate and Andrei Sarna-Wojcicki Commemorative Volume" for journal *Quaternary International*.

2007
- Invited plenary keynote speaker at international symposium "Quaternary Environmental Change in Asia and the Western Pacific", Tsukuba, Japan, November.
- Invited keynote speaker in two sessions 'Recent advances in tephrochronology' (S. Davies/K. Aoki, convenors) and 'Abrupt environmental and archaeologic changes' (J. Lowe/C. Turney, convenors) at 17th International INQUA Congress, Cairns, Australia, 28 July- August.
- Elected Full Voting Member, International Union for Quaternary Research Commission on Stratigraphy and Chronology (INQUA-SACCOM), 2007-2011
- Appointed Secretary, International Focus Group on Tephrochronology and Volcanism (INTAV) of INQUA, 2007 - 2011.
- Official New Zealand delegate (Royal Society of NZ) to International Council, 17th International INQUA Congress, Cairns.

2006
- Invited key-note speaker at international field conference on "Volcanic-ash Soils", Mt Fuji area, Japan (March).
- Associate investigator in team (lead by Professor Rewi Newnham) awarded funding by the Nature Environment Research Council (NERC), UK, for research on cryptotephra studies in northern New Zealand.

2005
- Invited co-author of chapters in international and national encyclopaedias (*Encyclopaedia of Quaternary Science, Encyclopaedia of New Zealand*)
- Invited speaker at international inter-INQUA tephra conference "Tephra Rush" in Dawson City, Yukon Territory, Canada.

2004
- Invited key-note speaker at the 2nd International Workshop on Andisols in Sendai, northeast Japan
- Invited by the Vice-Chancellor to speak at the 40th Anniversary Celebration Winter Lecture Series at University of Waikato
2003
- Associate investigator in team (led by Dr Alan Hogg) awarded Marsden funding for palaeoclimatic analysis and radiocarbon calibration of marine isotope stage 3 using *Agathis australis* (kauri).

2002
- Awarded the N.H. Taylor Memorial Lecture Award of the New Zealand Society of Soil Science
- Awarded Fellowship of the New Zealand Society of Soil Science

2000
- Invitation Fellow of the Japan Society for the Promotion of Science, undertaking a lecture tour of five universities and carrying out pedological and tephrostratigraphic field work on Hokkaido, Honshu and Kyushu islands, Japan.

1999
- Participated in a Television New Zealand documentary on the origins and timing of settlement of early Polynesians in New Zealand
- Associate investigator in team (led by Professor Rewi Newnham) awarded funding by the Natural Environment Research Council (NERC), U.K., for research on interhemispheric synchrony of global climate change

1998
- Distinguished Scholar Award, Queen's University of Belfast, U.K.

1996
- Sole guest editor of volumes 34-36 "Tephra, Loess, and Paleosols - An Integration" for journal *Quaternary International*

1995
- Awarded a Higher Education 'Link' Award by the British Council to facilitate joint research with Plymouth University, England.

Earlier
- Academic Merit Award of the University of Waikato (1992)
- Visiting scientist award, CSIRO Division of Soils, Adelaide (1991-1992)
- W.A. Pullar Prize of the Geological Society of New Zealand (1986) (inaugural prize winner)
- Sir Theodore Rigg Award of the New Zealand Society of Soil Science (inaugural Waikato University prize winner, 1982).
Professors Lowe, Chen (National Taiwan Univ., Symbolic ancient altar depicting the soils of Taipei) and Takesako (Meiji Univ., Japan) in China (at Taiwan Soil Museum, Taichung, Prof Chen’s lab, 2007)

External Involvement

**Membership of professional and learned societies**

- Immediate Past President of *International Focus Group on Tephrochronology and Volcanism* (INTAV) 2015-2019
- President of *International Focus Group on Tephrochronology and Volcanism* (INTAV) 2011–2015; previously Secretary 2007-2011 and 1991-1995
- Co-leader NZ Society of Soil Science biennial conference (Hamilton) field trip “Hot volcanic soils”, Dec 2014
- Co-leader Geoscience Society of NZ annual conference (Hamilton) field trip “Where geology meets pedology”, Nov 2012
- Co-convenor of two Waikato-Bay of Plenty regional soil science meetings, “Wai BoP Soils”, at Waikato University (Dec 2011, 2013) on behalf of NZ Society of Soil Science
- New Zealand Quaternary representative for INQUA from 2007-2019
- Fellow of the Royal Society of New Zealand since 2010
- Co-leader of North Island field trip "Volcanoes to Ocean" for 19th World Soil Congress in Brisbane 2010.
- Co-organiser of INTAV "Active Tephra" conference in Kirishima, Japan, 2010
- Co-leader of North Island field trip "Ashes and Issues" for 4th joint international soils conference of Australian and New Zealand soil science societies in Palmerston North, 2008
- Visited national soil museums in Taichung, Taiwan, and Tsukuba, Japan, 2007;
- Co-leader of field trip “Land and Lakes” for biennial conference of society in Rotorua 2006; Fellow of New Zealand Society of Soil Science (FNZSSS) since 2002; N.H. Taylor Memorial Lecturer in 2002; member of society since 1975
- Member of Royal Society of New Zealand (MRSNZ) from 1994 to 2010
- Member of Geological Society of New Zealand since 1975 (foundation member Waikato Branch); on National Committee GSNZ two terms 2000-2003; convenor of annual conference "Advances in Geosciences", Hamilton, 2001
- Foundation member of Australasian Quaternary Association (AQUA) since 1979
• Executive Secretary of Commission on Tephrochronology (COT) of International Union for Quaternary Research (INQUA) 1991-1995; Convenor international inter-INQUA field conference "Tephras, Loess, Paleosols", Hamilton, 1994
• Co-leader New Zealand field trip, 10th International Clay Conference, Adelaide, in 1993
• Editorial Advisory Panel, New Zealand Journal of Geology and Geophysics for 7 years 2004-2010
• Editorial Board, Quaternary Geochronology since 2015
• Editorial Board (Review Editor), Frontiers in Earth Sciences since 2014
• Editorial Board, Quaternary International since 2005
• Editorial Board, Journal of Quaternary Science since 2008
• Associate Editor, Soil Science Society of America Journal (Pedology Division) for 6 years from 2006 to 2011.