

Annual report on behalf of the Quaternary research community in New Zealand with regard to international membership of the International Union for Quaternary Research (INQUA)

Author: David J. Lowe, University of Waikato, Hamilton

Date: 5 December, 2018

Catalyst: Influence Annual Reporting Template

Supported International Union membership:	International Union for Quaternary Research (INQUA)
New Zealand national delegate:	Professor David J. Lowe
Affiliated New Zealand organisation/national committee:	Group of New Zealand Quaternary researchers, most of whom are members of the Australasian Quaternary Association (AQUA) , which is affiliated with INQUA, and various other science associations/societies in New Zealand.
President/Chair of New Zealand organisation or national committee (or Secretary if the President is the same as the NZ National Delegate):	Dr Lynda Petherick (Victoria University of Wellington) is current Vice-President of AQUA (2018-2020). Dr Helen Bostock (NIWA) is Immediate Past-President, AQUA, and member <i>ex officio</i> of AQUA Committee (2012-18).
Reporting year:	2018
Report date:	5 December 2018

I have discussed the contents of this report with some of the leading New Zealand Quaternarists and/or leaders of several INQUA-funded projects/IFGs (names are listed on p. 4-5).

Citation:

Lowe, D.J. 2018. Quaternary research in New Zealand and relationship to the International Union for Quaternary Research (INQUA). *Annual Report for 'Catalyst Fund: Influence' for 2018*. School of Science, University of Waikato, Hamilton, 7 pp.

1. Catalyst: Influence assessment criteria

1.1. Please comment on how the supported union membership involves recognised global science and innovation leaders, the connection with whom could benefit New Zealand in a substantive manner.

Many of the top Quaternary science specialists globally are members of the International Union for Quaternary Research (INQUA), and a number of New Zealand Quaternary scientists are in that category. Membership of INQUA provides access to this international knowledge base and the latest developments in the discipline, as described in the report for 2017, which included Appendix A (report completed in March 2018: Lowe, 2018a). The appendix provided examples of the international recognition of New Zealand Quaternary researchers and geological archives as globally important or unique, and of New Zealand participation and leadership in (a) globally-significant research and (b) in decision making at the international level through INQUA and through associated activities/outlets involving Quaternary research and its dissemination.

Most of New Zealand's Quaternary researchers have been involved with INQUA-led projects or research groups, referred to as international focus groups (IFGs), that enable them to tackle globally-relevant research questions in the disciplines encompassed by the Quaternary (see Appendix A of Lowe, 2018a). Key questions about climate change in the past are a main focus because understanding the causes and timing spatially and through time requires a global and multi-disciplinary approach, with a Southern Hemisphere perspective especially important because of the general paucity of data in much of the hemisphere to compare with that from the Northern Hemisphere. Future models of changing climate are largely contingent upon robust paleoenvironmental data, dated at high precision, being obtained from a range of archives throughout New Zealand and surrounding marine sediments by Quaternary scientists (IPCC, 2018). Increasingly, high-resolution past-environmental data are needed as are improved chronologies, to enable questions of leads and lags in past climate systems to be answered at a range of scales (both regionally and globally).

INQUA's five broad commissions (Coastal and Marine Processes; Humans and the Biosphere; Palaeoclimates; Stratigraphy and Chronology; Terrestrial Processes, Deposits and History) provide seed funding to IFGs and projects annually (on a competitive basis) to enable new and especially collaborative research to be undertaken on important topics that may incorporate revised or new methodologies. Many early career researchers (ECRs) especially have benefitted from the funding provided by INQUA through support to attend and participate in meetings and conferences through travel grants. In addition, the New Zealand and Australian Quaternary research communities have forged closer relationships over the past decade under the umbrella of the Australasian Quaternary Association (AQUA), which is affiliated with INQUA. AQUA members have been very active with biennial conferences hosted in New Zealand and Australia, the publication of biannual newsletters, and financial and in-kind support for the INQUA-led IFGs and projects.

1.2. Please comment on how the International Union membership has advanced New Zealand's research, science and technology reputation over the last year and/or presented new opportunities for collaboration in research fields of strategic importance to New Zealand.

From 1 January to 31 December 2018, the New Zealand Quaternary research community, with strong support from Australian counterparts, made significant advances in several ways, in part catalyzed through membership of INQUA:

- (a) By continuing and maintaining collaborative national and international opportunities for presenting and discussing new research and networking at five conferences/workshops held in this period by leaders of INQUA-funded IFGs and project – the key IFGs and projects in New Zealand currently supported by INQUA include SHAPE (ongoing IFG), INTAV (ongoing IFG), EXTRAS (project), SHeMax (project), and AQUA itself (biennial conference);

- (b) by supporting and mentoring ECRs (including students) through the GNS Science Quaternary Techniques Short Course;
- (c) by mentoring and developing ECRs (including students) through provision of opportunity for them to participate in conferences or workshops using funds provided by INQUA and AQUA to support travel or to offset registration or other costs; and
- (d) by contributing to the formal subdivision of the Holocene in a publication this year (Walker et al., 2018).

The development of several key IFGs and projects, led in part by New Zealand Quaternary researchers, has been critical in improving and bringing together researchers with widely varying interests to tackle difficult problems and 'big' topics such as climate change that are essential to help obtain a global understanding of environmental change past, present, and future. Further details are given below in section 2 (see also Lowe, 2018a).

1.3. Please comment on what the New Zealand research sector, aligned with the International Union membership, can offer to international researchers, with a view to creating potential partnership, or cement New Zealand's involvement, in the activity over the long-term.

Very strong partnerships have been developed by New Zealand and Australian researchers through the IFGs and projects that are supported by INQUA. The advent of the Australasian INTIMATE project led to the more-or-less entire Quaternary communities of New Zealand and Australia becoming involved to develop new ideas and to publish benchmark papers and interpretations and a new template for interpreting climate change from c. 30,000 years ago through to c. 8000 years ago (e.g. Barrell et al., 2013; Reeves et al., 2013a, 2013b). Although centered on Australasia, the myriad of connections between New Zealand and Australian researchers and counterparts all around the world means that international partnerships are strong and durable. For example, the INTAV executive comprises representatives from New Zealand, Canada, UK, Japan, and Switzerland. And every four years the global Quaternary research community assembles for the full INQUA congress (held in Japan in 2015 and to be held in the Republic of Ireland in 2019), with New Zealand an important voice on the International Council and with numerous scientific sessions being convened by New Zealand and other scientists, i.e. the INQUA community provides one of the best examples of strongly connected and productive relationships in science that is tackling globally-relevant problems. New Zealand Quaternary scientists are extremely productive and effective given the small size of our community.

1.4. Please comment on what has been planned for New Zealand to leverage off the opportunities identified in 1.2 or 1.3. If these are ongoing activities, please comment on the progress since last year's report.

As evident below (and also reported in Lowe, 2018a), the current IFGs and projects being undertaken in New Zealand are set to run until the INQUA congress in Dublin in July 2019. As noted in section 2, a number of conferences and workshops were held in 2018 under the auspices of the INQUA IFGs and projects. Because 2019 is the year of the full congress of INQUA in Dublin, workshops and meetings for the first part of 2019 have been curtailed because most efforts of the New Zealand Quaternary research leaders are instead being directed towards developing and convening numerous sessions (symposia) for the congress. For example, SHAPE (Dr Drew Lorrey), SHeMax (Dr Lynda Petherick), and INTAV (Prof David Lowe) are convening multiple sessions in Dublin (see <http://www.inqua2019.org/special-sessions/>). Considerable funding from INQUA, and also to a lesser extent from AQUA, is available to help support ECRs attend the congress as bursaries (<http://www.inqua2019.org/bursaries/>). A number of New Zealand-based ECRs will be supported in this way (applications are due by 16 January 2019).

An important direct output of the INTAV international tephra meeting that was held in June-July 2018 in Romania is to be a special issue of the *Journal of Quaternary Science*. The INTAV executive has received formal support from *JQS* to publish up to 40 papers in a special issue entitled “Crossing New Frontiers: Extending Tephra as a Global Geoscientific Research Tool (EXTRAS Project)”. The issue, being edited by Peter Abbott (UK/Switzerland), Britta Jensen (Canada), Daniel Veres (Romania), Takehiko Suzuki (Japan), and David Lowe (New Zealand), is scheduled to be published in January 2020.

2. Information relevant to the research community in the previous year

2.1. Please list/update list of New Zealander(s) participating in International Union work programmes and/or the Union council(s).

Prof David Lowe (University of Waikato):

- (i) New Zealand representative of RSNZ (and for the New Zealand Quaternary science community) on the International Council of INQUA
- (ii) Formal advisor to SACCOM, INQUA
- (iii) Co-organiser of the “Crossing New Frontiers” tephra meeting held in Romania, June-July 2018
- (iv) Immediate Past-President on the executive of INTAV, under the aegis of which the executive has proposed three tephra-focussed sessions for the full INQUA congress in Dublin, 2019
- (v) Leader of the ongoing EXTRAS project of INTAV
- (vi) Member of advisory editorial boards of *Quaternary International*, *Journal of Quaternary Science*, *Quaternary*, *Quaternary Geochronology*
- (i) Co-guest editor of special issue of *Journal of Quaternary Science* on tephra (in preparation)

Dr Marcus Vandergoes (GNS Science):

- (i) Lead convenor of annual GNS Science Quaternary Techniques Short Course, Lower Hutt, 2018

Dr Andrew Lorrey (NIWA):

- (i) New Zealand early career researcher representative on SACCOM, INQUA
- (ii) Convenor of SHAPE workshop held in Wollongong, February, 2018
- (iii) Co-leader of SHAPE, under the aegis of which the executive has proposed a SHAPE session for the full INQUA congress in Dublin, 2019

Dr Lynda Petherick (Victoria University of Wellington):

- (i) Leader of SHeMax, under the aegis of which the executive has proposed a SHeMax session for the full INQUA congress in Dublin, 2019
- (ii) Convenor of SHeMax workshop held in Brisbane, June, 2018
- (iii) Vice-president of AQUA (2018-19)
- (iv) Lead guest editor for planned special issue in journal on SHeMax (in preparation)

Prof Rewi Newnham (Victoria University of Wellington):

- (1) New Zealand representative on formal subdivision of the Holocene series/epoch (see Walker et al., 2018)
- (2) Regional Editor (Asia and Australasia), *Journal of Quaternary Science*

- (3) Member of advisory editorial board of *The Holocene*

Prof Andrew Mackintosh (Victoria University of Wellington):

- (i) Lead Author, Intergovernmental Panel on Climate Change (IPCC) “Special report on the ocean and cryosphere in a changing climate” (in preparation: <https://www.ipcc.ch/report/srocc/>)
- (ii) Review Editor and member of advisory editorial board of *Frontiers in Cryospheric Sciences*

Dr Helen Bostock (NIWA):

- (i) Immediate Past-President (New Zealand) of the Australasian Quaternary Association (AQUA) and member *ex officio* of AQUA committee (2012-2018)

Dr Carol Smith (Lincoln Univ.):

- (i) Co-editor of *Quaternary Australasia* (newsletter of AQUA)

Dr Andrew Rees (Victoria University of Wellington):

- (i) Member of AQUA committee (2016-18, 2019-20)

Assoc Prof Peter Almond (Lincoln University):

- (i) Member of AQUA committee (2016-18, 2019-20)

Associate Prof Alan Hogg (Radiocarbon Dating Laboratory, University of Waikato):

- (i) Member of editorial advisory board of *Quaternary Geochronology*

2.2. Please list International Union activities over the last year of relevance to your research community and describe how these have been communicated.

Conferences involving INQUA-related IFGs and projects included the following.

- (1) SHAPE: a workshop entitled “Southern Hemisphere Assessment of PalaeoEnvironments (SHAPE) Workshop: Quaternary variability, abrupt change and tipping points”, convened by Dr Drew Lorrey, was held 2-3 February, 2018, at the University of Wollongong, NSW, Australia.
- (2) GNS Science: the “Quaternary Techniques Short Course” for 2018 was held at the National Isotope Centre of GNS Science, Lower Hutt, 17-18 May, 2018. It was organized by Drs Marcus Vandergoes, Karyne Rogers, Jocelyn Turnbull, and Liz Keller together with Helena Cowan and Ren Wanden (GNS Science) with participation from 17 leading Quaternary researchers from GNS Science, Victoria University of Wellington, University of Otago, University of Waikato, and NIWA.
- (3) SHeMax: a meeting of The Last Glacial Maximum in the Southern Hemisphere (SHeMax) project, convened by Dr Lynda Petherick, was held at the Morton Bay Research Station (MBRS) of the University of Queensland on North Stradbroke Island from 28-30 June 2018. A report for the meeting was compiled by Ellerton (2018).
- (4) INTAV: the International Focus Group on Tephrochronology and Volcanism (INTAV), held a conference from 24 June-1 July, 2018, the Cheile Gradistei Fundata in the village of Moieciu de Sus, a panoramic resort location near Braşov between the Piatra Craiului and Bucegi Mountains in the southern Carpathians, Transylvania, Romania. Daniel Veres (Romania) and Ulrich Hambach (Germany) convened the meeting along with Siwan Davies (Wales, UK), Peter Abbott (UK/Switzerland), Britta Jensen (Canada), Takehiko Suzuki (Japan), and David Lowe (New Zealand). The proceedings were prepared by Hambach and Veres (2018) (see

https://www.bayceer.uni-bayreuth.de/intav2018/en/key_dates/5001/1/16443/INTAV_Programm_final_vers2-2.pdf). Several reports of the meeting have been published, including those of Lowe (2018b, 2018c, 2018d) and Karátson et al. (2018). Several New Zealand-based ECRs (Dr Jenni Hopkins, Leonie Peti) were supported financially by grants from INQUA.

- (5) AQUA: AQUA held its biennial meeting in Canberra 9-14 December, 2018, at Crawford Precinct, Acton Peninsula, Canberra (convenor Dr Scott Mooney). As well as a full conference, a three-day pre-conference field trip “High altitude environments of Eastern Australia” was also run 5-8 December. This meeting follows the very successful biennial meeting of AQUA that was held in Auckland in December, 2016 (see Lowe, 2018a).

Each of these meetings/workshops provided further opportunity for new research and collaborations and for ECRs to engage with the established Quaternary community of both New Zealand and Australia.

- (6) Developing a formal subdivision of the Holocene involved input from Prof Rewi Newnham (Victoria University of Wellington). The proposal on which this subdivision is based was submitted by the Subcommission on Quaternary Stratigraphy, approved by the International Commission on Stratigraphy, and formally ratified by the Executive Committee of the International Union of Geological Sciences on 14th June 2018. A paper to this effect has just appeared online in *Episodes* (Walker et al., 2018) and another one is soon to be submitted to *JQS*.
- (7) Helen Bostock and David Lowe (Bostock and Lowe, 2018) published an update of progress towards formalisation of the Anthropocene. After several years of meetings and discussion, the Anthropocene Working Group (AWG) overwhelmingly supported the idea that the Anthropocene is functionally and stratigraphically different from the Holocene, recommending that it started about 1950 (coincident with the ‘Great Acceleration’). Members of the AWG voted in favour of the formalisation of the Anthropocene at the level of epoch. This means that, following ratification from several other organisations, the Holocene Epoch is to be terminated, but both the Anthropocene and the Holocene are to remain within the Quaternary Period and Cenozoic Era. In the next few years the AWG will submit a final proposal to the International Commission of Stratigraphy, in order for the Anthropocene Epoch to be formally included in the Geological Time Scale.

Communication in all of these activities has been made via published papers in the international literature as well as via notices and reports in newsletters including *Quaternary Australasia* (AQUA), *Quaternary Perspectives* (INQUA), *IAVCEI News*, *Geoscience Society of New Zealand Newsletter*, multiple Facebook sites, and individual organisational (focus group or project) webmail services. David Lowe also reported to the New Zealand Quaternary community at least eight times in 2018 with brief updates or surveys on activities and issues via an email list (~60 names) of the main active Quaternary researchers in New Zealand. These emails are also usually copied to Australian INQUA representative Dr Jessica Reeves (Federation University Australia).

3. Additional comments

3.1. Additional comments relevant to the International Union membership that you would like to share with the Society, MBIE, and/or the research community.

Prof David Lowe was made an Honorary Life Member of INTAV at the tephra meeting held in Romania on 27 June, 2018.

References

- Barrell, D.J.A., Almond, P.C., Vandergoes, M.J., Lowe, D.J., Newnham, R.M., NZ-INTIMATE members 2013. A composite pollen-based stratotype for inter-regional evaluation of climatic events in New Zealand over the past 30,000 years (NZ-INTIMATE project). *Quaternary Science Reviews* 74, 4-20.
- Bostock, H.C., Lowe, D.J. 2018. Update on the formalisation of the Anthropocene. *Quaternary Australasia* 35 (1), 14-16.
- Ellerton, D. 2018. An overview of the final SHEMax meeting, North Stradbroke Island, Queensland, 28-30 June 2018. *Quaternary Australasia* 35 (2), 20-24.
- Hambach, U., Veres, D. (editors) 2018. Book of Abstracts, *Crossing New Frontiers: INTAV International Field Conference on Tephrochronology, 'Tephra Hunt in Transylvania'*, Moieciu de Sus, Romania, 24 June-1 July, pp. 1-160.
- IPCC 2018. Special report on global warming of 1.5°C. Intergovernmental Panel on Climate Change, Geneva.
- Karátson, D., Veres, D., Lowe, D.J. 2018. INTAV tephra conference "Crossing New Frontiers: Tephra Hunt in Transylvania", 24 June–1 July, 2018, Moieciu de Sus, Romania. *IAVCEI News 4/2018* (in press).
- Lowe, D.J. 2018a. Quaternary research in New Zealand and relationship to the International Union for Quaternary Research (INQUA). Annual Report for 'Catalyst Fund: Influence' for 2017 (with Appendix A). School of Science, University of Waikato, Hamilton, 24 pp.
- Lowe, D.J. 2018b. Quaternary science in New Zealand: report to the Catalyst Fund. *Quaternary Australasia* 35 (1), 10-14, with Appendix A "Summary of Quaternary-related research in New Zealand and relationship to International Union for Quaternary Research (INQUA) (17 pp.)" at <http://aqua.org.au/wp-content/uploads/2018/06/Quaternary-NZ-issues-summary-2018.pdf>
- Lowe, D.J. 2018c. Report: International tephra conference "Crossing New Frontiers: Tephra Hunt in Transylvania", 24 June–1 July, 2018, Moieciu de Sus, Romania. *Quaternary Australasia* 35 (2), 14-19.
- Lowe, D.J. 2018d. Report on the INTAV international tephra conference "Crossing New Frontiers: Tephra Hunt in Transylvania", 24 June–1 July, 2018, Moieciu de Sus, Romania. *Quaternary Perspectives* 25 (2), 9-11. (Also available on the INTAV website: <http://www.comp.tmu.ac.jp/tephra/intavtmu/top.html>)
- Reeves, J.M., Barrows, T.T., Cohen, T.J., Kiem, A.S., Bostock, H.C., Fitsimmons, K.E., Jansen, J.D., Kemp, J., Kraus, C., Petherick, L., Phipps, S.J., OZ-INTIMATE Members 2013a. Climate variability over the last 35,000 years recorded in marine and terrestrial archives in the Australian region: an OZ-INTIMATE compilation. *Quaternary Science Reviews* 74, 21-34.
- Reeves, J.M., Alloway, B.V., Barrows, T.T. (editors) 2013b. Linking Southern Hemisphere records and past circulation patterns: The AUS-INTIMATE Project. *Quaternary Science Reviews* 74, 1-279.
- Walker, M., Head, M.H., Berkehammer, M., Björck, S., Cheng, H., Cwynar, L., Fisher, D., Gkinis, V., Long, A., Lowe, J., Newnham, R.M., Rasmussen, S.O., Weiss, H. 2018. Formal ratification of the subdivision of the Holocene Series/Epoch (Quaternary System/Period): two new Global Boundary Stratotype Sections and Points (GSSPs) and three new stages/subseries. *Episodes* (in press), 11 pp. DOI: [10.18814/epiiugs/2018/018016](https://doi.org/10.18814/epiiugs/2018/018016)

Signature:

Delegate:  (Prof David J. Lowe)

Date submitted to the Society: 5 December 2018

Please return this form to the Royal Society Te Apārangi by email using the email address International.Unions@royalsociety.org.nz. For transparency reasons, we would appreciate if the report is additionally cc'ed to the President/Chair of the affiliated New Zealand organisation/national committee.

Note that all or parts of this report may be made assessable to the public on the Royal Society Te Apārangi Catalyst: Influence website and through a Catalyst: Influence newsletter.