

5. CURRICULUM VITAE AND PUBLICATIONS

PART 1

1a. Personal details				
Full name	<i>Title</i>	<i>First name</i>	<i>Second name(s)</i>	<i>Family name</i>
	A. Prof.	Claudine	Helen	Stirling
Present position	Assoc. Prof. (Research) / Scientific Director – Centre for Trace Element Analysis, Department of Chemistry			
Organisation/Employer	University of Otago			
Contact Address	Dept of Chemistry			
	PO Box 56			
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1b. Academic qualifications

1997	Ph.D.	Geochemistry	Australian National University
1991	B.Sc. Hons (Class I)	Geology	Victoria University of Wellington

1c. Professional positions held

Feb. 2014 - Assoc. Prof. (Research) / Scientific Director – Centre for Trace Element Analysis & Dept. Chemistry, University of Otago

2009 Part-year parental leave (absent from the University)

2005 – 2014 Senior Research Fellow / Scientific Director – Centre for Trace Element Analysis & Dept. Chemistry, University of Otago

2004 – 2005 Senior Scientist, Dept. Earth Sciences, ETH Zürich, Switzerland

2000 – 2004 Research Scientist, Dept. Earth Sciences, ETH Zürich, Switzerland

1997 – 2000 Postdoctoral Fellow, Dept. Geological Sciences, Univ. Michigan, U.S.A.

1d. Present research/professional speciality

Analysis of the metallic element isotope systems (with emphasis on the U-series and transition metal systems e.g. Cd and Fe) using multiple-collector plasma source mass spectrometry (MC-ICP-MS) with applications in geochemistry, (paleo)oceanography, and (paleo)climatology (*h*-index: 23, Scopus).

Main research contributions: First to demonstrate 'stable' $^{238}\text{U}/^{235}\text{U}$ isotope fractionation of U in natural samples and the potential of this system as a paleo-environmental tracer; first to investigate $^{238}\text{U}/^{235}\text{U}$ variations in meteorites by MC-ICPMS with implications for the accuracy of the U-Pb and chronometer and the timing and sequence of events in the early solar system; first application of MC-ICP-MS to U-series dating, providing new high-precision constraints on the timing of past interglacial sea-level change; first in situ measurements of the U-series isotopes using laser ablation MC-ICP-MS; first to develop high-precision multiple-Faraday U isotope and U-series measurements by MC-ICP-MS resulting in a 10- to 100-fold improvement in analytical precision.

1e. Total years research experience	18 years
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1f. Professional distinctions and memberships (including honours, prizes, scholarships, boards or governance roles, etc)

Selected Funded Research Grants

2016 M. Clarkson, C. Stirling, S. Kasemann, G. Dickens. "How does the Earth stop global warming? Testing climate stabilisation during 'hyperthermal' events." NZ Marsden Fund. \$300 K (declined; PI relocating to ETH Zürich)

2015 P. Kench, C. Stirling, J. Baker, G. Foster, K. Campbell. "Putting the Pacific Ocean to the Litmus Test: resolving a 4,000 year record of ocean pH from corals with the Boron Isotope Proxy." NZ Marsden Fund. \$810 K

- 2015 R. Middag, S. Sander, C. Stirling. "The ice is melting: How do trace metals in the ocean influence the Antarctic marine ecosystem and global climate?" NZ Marsden Fund. \$300 K
- 2015 R. Sykes and 5 key researchers incl. C. Stirling. "Understanding petroleum source rocks, fluids, and plumbing systems in New Zealand basins: A critical basis for future oil and gas discoveries." NZ Min. Bus., Innov. & Employment. \$9.6 M
- 2014 C. Stirling, C. Moy, H. Jenkyns, D. Porcelli. "Global ocean anoxia during ancient 'greenhouse' climates: Prospects for a warming world." NZ Marsden Fund. \$739 K.
- 2012 S. Sander, C. Stirling, P. Boyd, K. Hunter. "From soils to seas: How does the long-term fate of aerosol iron impact ocean productivity." NZ Marsden Fund. \$818 K
- 2011 C. Stirling, M. Palin. "Excimer laser system." Univ. Otago Equipment Com. \$200 K.
- 2010 C. Stirling. "Cadmium stable isotopes: A tracer of nutrient cycling in the South Pacific Ocean." Univ. Otago Grant. \$40 K
- 2009 D. McPhail, M. Norman, C. Stirling, S. Wakelin, T. Kyser. "Biogeochemical drivers of U isotope fractionation in regolith and groundwater." Aust. ARC Fund. \$490 K
- 2009 Y. Amelin, V. Bennett, R. Armstrong, I. Metcalfe, C. Stirling, and 9 other co-PIs. "A facility for sensitive and precise isotopic dating of Earth's and extraterrestrial rocks." Australian ARC Linkage, Infrastructure, Equipment & Facilities (LIEF) Fund. \$1.3 M
- 2007 C. Stirling, Y. Amelin and A. Halliday. "Supernova explosion or colliding cosmic clouds: reconciling the origin of our solar system." NZ Marsden Fund. \$330 K
- 2007 K. Hunter, C. Stirling and R. Frew. "Southern Ocean biogeochemistry: calibrating the cadmium paleo-proxy." NZ Marsden Fund. \$780 K
- 2007 M. Numata (mentors: C. Stirling & K. Hunter). "Metal isotope analysis: a new tool to trace heavy metal contaminants in urban NZ". NZ FRST Postdoc. \$302 K
- 2002 E. Bard, C. Stirling, G. Davies, H. Elderfield, M. Frank, A. Halliday, G. Henderson, T. Stocker. "STOPFEN: Sea-level, temperature and ocean circulation: past present and future non-linear feedbacks." EU Network proposal – Framework 5. \$2.5 M
- 2001 C. Stirling. "Climate forcing & the timing of past sea-levels". ETH Grant. \$203 K

Other Distinctions and Achievements

- 2012 – present. Associate Editor of *Geochimica et Cosmochimica Acta* (Elsevier)
- 2005 – 2015. Associate Editor of *Quaternary Geochronology* (Elsevier)
- 2012– present. *Assessment Panel* member for the *Royal Soc. NZ Marsden and Catalyst Funds*
- 2012 Co-recipient of *Univ. Otago Research Group Award (excellence in oceanography)*
- 2012 Member of *Univ. Otago Advancement of Teaching and Learning Committee*
- 2010 – 2013. Member of the *University of Otago Research Committee*
- 2008 – 2016. Theme Committee Member: *Goldschmidt Conf.*, - Japan 2016, coordinated 9 independent sessions within Theme 17; Session convenor: *Goldschmidt Conf.* – Japan 2016; USA 2014; Czech Repub. 2011; Canada 2008; *Ocean Sciences* – USA 2014; *AGU Fall Meeting* – USA 2013; *34th Int. Geol. Congress* - Australia 2012; *Sea-Level Rise Workshop*, Switzerland 2008
- 2008 – 2016. Speaker Invitations: *RiMG Non-Traditional Stable Isotope Conf.*, USA 2016; *Goldschmidt Conf.*, USA 2014; Canada 2012; *GEOTRACES Conf.*, UK 2012; *Sea Level Rise Int. Workshop* - UK 2010; USA 2009; Switzerland 2008; *Past Interglacials Int. Workshop*, USA 2010; *AGU Fall Meeting* - USA 2008; USA 2007
- 2006 Invited Keynote Speaker: *Goldschmidt Conference*, Australia
- 2003 Expedition leader: International Scientific Expedition to Henderson Island
- Member of the international *GEOTRACES*, *IODP*, *PALSEA*, *EARTHTIME* & EU 'STOPFEN' networks

1g. Total number of peer reviewed publications and patents	Journal articles	Books, book chapters, books edited	Conference proceedings	Patents
	56	4		

PART 2

2a. Research publications and dissemination

Peer-reviewed journal articles

Selected Publications

J.M. Rolison, C.H. Stirling, R. Middag, M.J.A. Rijkenberg (in press). Uranium stable isotope fractionation in the Black Sea: Calibration of the $^{238}\text{U}/^{235}\text{U}$ paleoredox proxy. *Geochim. Cosmochim. Acta*.

D.L. Schrader, K. Nagashima, A.N. Krot, R.C. Ogliore, Q.-Z. Yin, Y. Amelin, A. Kaltenbach, C.H. Stirling (2016). A homogeneous distribution of ^{26}Al in the protoplanetary disk during chondrule formation. *Geochim. Cosmochim. Acta.*, <http://dx.doi.org/10.1016/j.gca.2016.06.023>.

J.L. Hinojosa, C.H. Stirling, M.R. Reid, C.M. Moy, G.S. Wilson (2016). Trace metal cycling and uranium isotope systematics in New Zealand's fjords: Implications for reconstructing global paleoredox conditions in organic-rich sediments. *Geochim. Cosmochim. Acta*. 179, 89-109.

J.L. Hinojosa, C.M. Moy, C.A. Prior, T.I. Eglinton, C.P. McIntyre, C.H. Stirling, G.S. Wilson. (2015). Investigating the influence of regional climate and oceanography on marine radiocarbon reservoir ages in southwest New Zealand. *Estuarine, Coastal and Shelf Science* 167, 526-539.

C.H. Stirling, M.B. Andersen, R. Warthmann, A.N. Halliday (2015). Isotope fractionation of ^{238}U and ^{235}U during biologically mediated uranium reduction. *Geochim. Cosmochim. Acta*. 163, 200-218.

J.M. Rolison, R. Middag, C.H. Stirling, M.J.A. Rijkenberg, H.J.W. de Baar (2015). Zonal distribution of dissolved aluminium in the Mediterranean Sea. *Mar. Chem.* In press.

J.L. Hinojosa, C.M. Moy, C.H. Stirling, G.S. Wilson, T.I. Eglinton (2014). Carbon cycling and burial in New Zealand's fjords. *Geochem. Geophys. Geosyst.* 1–17. doi:10.1002/2014GC005433.

T. Iizuka, Y. Amelin, A. Kaltenbach, P. Koefoed, C.H. Stirling (2014). U-Pb systematics of the unique achondrite Ibitira: Precise age determination and petrogenetic implications. *Geochim. Cosmochim. Acta*. 132, 259-273.

M.J. Murphy, C.H. Stirling, A. Kaltenbach, S.P. Turner, B.F. Schaefer (2014). Fractionation of $^{238}\text{U}/^{235}\text{U}$ by reduction during low temperature uranium mineralisation processes. *Earth Planet. Sci. Lett.* 388, 306-317.

R.L. Kinaston, R.K. Walter, C. Jacomb, E. Brooks, C. Stirling, M. Reid, N.G. Tayles, S.E. Halcrow, A.R. Gray, B. Shaw, R. Fyfe, and H.R. Buckley (2013). New isotope data identify the possible founders of the prehistoric Wairau Bar settlement in New Zealand. *PLOS ONE*. 8, e64580.

K. Cooper, V. Benani, A. Tawse-Smith, M. Reid, C. Stirling, G. Dias (2013). Effect of a Cordless retraction Paste on Titanium Surface: A topographic, chemical and biocompatibility evaluation. *Brazil. Oral. Res.* 27, 211-217.

C.H. Stirling (2012). Keeping Time with Earth's Heaviest Element. *Science* 335, 1585-1586.

M. Gault-Ringold and C.H. Stirling (2012). Anomalous isotopic shifts associated with organic resin residues during cadmium isotopic analysis by double spike MC-ICPMS. *J. Anal. Atomic Spectrom.* 27, 449-459. doi:10.1039/C2JA10360E.

M. Gault-Ringold, T. Adu, C. Stirling, R. Frew, and K. Hunter (2012). The

Biogeochemistry of Cadmium and Cadmium Isotopes in Subantarctic Surface Waters. *Earth Planet. Sci. Lett.* 341-344, 94-103.

W. Abouchami, M. Rehkamper, S. Galer, T. Horner, Z. Xue, G. Henderson, F. Wombacher, M. Schonbachler, M. Gault-Ringold, and C.H. Stirling (2012). In search of a common reference material for cadmium isotope studies. *Geostandard Geoanalytical Research* 10.1111/j.1751-908X.2012.00175.

E.A. Boyle, S. John, W. Abouchami, J.F. Adkins, Y. Echegoyen-Sanz, R. Flegal, K. Fornace, C. Gallon, S. Galer, M. Gault-Ringold, F. Lacan, A. Radic, M. Rehkamper, O. Rouxel, Y. Sohrin, C. Stirling, D. Vance, Z. Xue, and Y. Zhao (2012). Intercal - GEOTRACES IC1 (BATS) Contamination-Prone Trace Element Isotopes Cd, Fe, Pb, Zn, (and Mo) Intercalibration. *Limn. Ocean. Methods.* 10, 653-665.

E.A. Kristensen, G.P. Closs, R. Olley, J. Kim, M. Reid, and C. Stirling (2011). Determining the spatial distribution of spawning by anadromous and resident brown trout *Salmo trutta* L using strontium content of eggs collected from redds. *Ecol. Freshwater Fish* No. doi: 10.1111/j.1600-0633.2010.00451.x

B. Shaw, H. Buckley, G. Summerhayes, S. Bulmer, C. Stirling, M. Reid (2011). Prehistoric migration at Nebira, South Coast of Papua New Guinea: New insights into interaction using isotope and trace element concentration analyses. *J. Anthropol. Archaeol.* 30, 344-358.

M.B. Andersen, C.H. Stirling, B. Zimmermann, A.N. Halliday (2010). Precise determination of the open ocean $^{234}\text{U}/^{238}\text{U}$ composition. *Geochem. Geophys. Geosyst.* 11, 10.1029/2010GC003318.

M.B. Andersen, C.H. Stirling, E.-K Potter, A.N. Halliday, S.G. Blake, M.T. McCulloch, B.F. Ayling, M.J. O'Leary (2010). The timing of sea-level high-stands during MIS 7.5 and 9: Constraints from open- and closed-system U-series dating of fossil corals from Henderson Island. *Geochim. Cosmochim. Acta* 74, 3598-3620.

Y. Amelin, A. Kaltenbach, T. Izuka, C.H. Stirling, T.R. Ireland, M. Pataev, S.B. Jacobsen (2010). U-Pb chronology of the Solar System's oldest solids with variable $^{238}\text{U}/^{235}\text{U}$. *Earth Planet. Sci. Lett.* 300, 343-350.

B. Shaw, H. Buckley, G. Summerhayes, D. Anson, S. Garling, F. Valentin, H. Mandui, C. Stirling, M. Reid (2010). Migration and mobility at the Late Lapita site of Reber-Rakival (SAC), Watom Island using isotope and trace element analysis: A new insight into Lapita interaction in the Bismarck Archipelago. *J. Archaeol. Sci.* 37, 605-613.

C.H. Stirling, M.B. Andersen (2009). Uranium-series dating of fossil coral reefs: Extending the sea-level record beyond the last glacial cycle. Invited Paper In: *Earth Planet. Sci. Lett. Frontiers* 284, 269-283.

C.H. Stirling & PALSEA Working Group (2009). The sea-level conundrum: Case studies from paleo-archives. *J. Quat. Sci.* 25, 19-25.

C.H. Stirling, M.B. Andersen (2009). Extending the uranium-series dating of fossil coral reefs back to Marine Isotope Stage 15. In: *PAGES (Past Global Changes) Special Issue* 17, 62-64.

M.B. Andersen, C.H. Stirling, E.-K. Potter, A.N. Halliday, S.G. Blake, M.T. McCulloch, B.F. Ayling, M. O'Leary (2008). High-precision U-series measurements of more than 500,000 year old fossil corals. *Earth Planet. Sci. Lett.* 265, 229-245.

M. Gutjahr, M. Frank, C.H. Stirling, L.D. Keigwin, A.N. Halliday (2008). Tracing the Nd isotope evolution of North Atlantic Deep and Intermediate Waters in the western North Atlantic since the Last Glacial Maximum from Blake Ridge sediments. *Earth*

Planet. Sci. Lett. 266, 61-77.

C.H. Stirling, M.B. Andersen, E.-K. Potter, A.N. Halliday (2007). Low-temperature isotopic fractionation of uranium. *Earth Planet. Sci. Lett.* 264, 208-225.

M. Gutjahr, M. Frank, C.H. Stirling, V. Klemm, T. van de Fleirdt, L.D. Keigwin, A.N. Halliday (2007). Reliable extraction of a deepwater trace metal isotope signal from Fe-Mn oxyhydroxide coatings of marine sediments. *Chem. Geol.* 242, 351-370.

M.B. Andersen, C.H. Stirling, D. Porcelli, A.N. Halliday, P.S. Andersson, M. Baskaran (2007). High precision $^{234}\text{U}/^{238}\text{U}$ measurements of Arctic seawater and rivers: Implications for the transport and behaviour of riverine U in the marine environment. *Earth Planet. Sci. Lett.* 259, 171-185.

C.H. Stirling, A.N. Halliday, E.-K. Potter, M.B. Andersen, B. Zanda (2006). A low initial abundance of ^{247}Cm in the early solar system and implications for r-process nucleosynthesis. *Earth Planet. Sci. Lett.* 251, 386-397.

B.F. Ayling, M.T. McCulloch, M.K. Gagan, C.H. Stirling, M.B. Andersen, S. Blake (2006). SST seasonality and astronomical modulation of Sr/Ca and $\delta^{18}\text{O}$ in *Porites* corals from the MIS 9 (339-303 ka) interglacial. *Earth Planet. Sci. Lett.* 248, 447-460.

C.H. Stirling, D. Porcelli, A.N. Halliday (2005). In search of live ^{247}Cm in the early solar system. *Geochim. Cosmochim. Acta* 69, 1059-1071.

E.-K. Potter, C. H. Stirling, M.B. Andersen, A. N. Halliday (2005a). High Precision Faraday collector MC-ICPMS thorium isotope ratio determination. *Int. J. Mass Spec. Ion Proc.* 247, 10-17.

E.-K. Potter, C.H. Stirling, U.H. Wiechert, A.N. Halliday, C. Spötl (2005b). Uranium-series dating of corals *in situ* using laser-ablation MC-ICPMS. *Int. J. Mass Spec. Ion Proc.* 240, 27-35.

M.B. Andersen, C.H. Stirling, E.-K. Potter, A.N. Halliday (2004). Toward epsilon levels of measurement precision on $^{234}\text{U}/^{238}\text{U}$ by using MC-ICPMS. *Int. J. Mass Spec. Ion Proc.* 237, 107-118.

M.B. Andersen, C.H. Stirling, E.-K. Potter, A.N. Halliday (2004). Toward epsilon levels of measurement precision on $^{234}\text{U}/^{238}\text{U}$ by using MC-ICPMS. *Int. J. Mass Spec. Ion Proc.* 237, 107-118.

C.H. Stirling, T.M. Esat, K. Lambeck, M.T. McCulloch, S.G. Blake, D.-C. Lee, A.N. Halliday, Orbital forcing of the Marine Isotope Stage 9 interglacial. *Science* 291 (2001) 290-293.

M. Rehkämper, M. Schönbachler, C.H. Stirling (2001). Multiple Collector ICP-MS: Instrumentation, measurement techniques and analytical capabilities, *Geostandards Newsletter* 25.

C.H. Stirling, D.-C. Lee, J.N. Christensen, A.N. Halliday (2000). High precision in situ ^{238}U - ^{234}U - ^{230}Th isotopic analysis using laser ablation. *Geochim. Cosmochim. Acta* 64, 3737-3750.

C.H. Stirling, T.M. Esat, K. Lambeck, M.T. McCulloch (1998). Timing and Duration of the Last Interglacial: Evidence for a restricted interval of widespread coral reef growth, *Earth Planet. Sci. Lett.* 160, 745-762.

C.H. Stirling, T.M. Esat, M.T. McCulloch, K. Lambeck (1995). High-precision U-series dating of corals from Western Australia and implications for the timing and duration of the Last Interglacial, *Earth Planet. Sci. Lett.* 135, 115-130.

Peer reviewed books, book chapters, books edited
M.B. Andersen, C.H. Stirling, and S. Weyer (in press). Uranium stable isotope fractionation. Invited Chapter In: <i>Rev. Mineral. Geochem.: Measurements, Theories and Applications of Non-Traditional Stable Isotopes</i>. C.H. Stirling (2015). U-series geochronology of corals and marine carbonates. Invited Chapter In: <i>Encyclopaedia of Scientific Dating Methods, Encyclopedia of Earth Sciences Series</i> (Ed: J. Paces, Springer Publishing Group) A.N. Halliday, C.H. Stirling, P.A. Freedman, F. Oberli, B. Reynolds, and R.B. Georg (2010). High precision isotope ratio measurements using multiple collector inductively coupled plasma mass spectrometry. Invited Chapter In: <i>Encyclopaedia of Mass Spectrometry Vol 5: Elemental, Isotopic and Inorganic Analysis by Mass Spectrometry</i> (Eds: R. Houk and D. Matthews). S.J. Goldstein and C.H. Stirling (2003). Developments in analytical techniques for measuring uranium-series nuclides: 1992-2002, Invited Chapter In: <i>Rev. Mineral. Geochem.: U-series Geochemistry</i>, 23-57.