

# Neil R. Bennett, PhD

## *Curriculum Vitae*

Tel: +1-202-602-9728 Email: neil.bennett@utoronto.ca

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### Employment

- 2021 – Present** Assistant Professor, Department of Earth Sciences, University of Toronto.
- 2020 – 2021** Consultant, Engineering Team, Saildrone.
- 2019 – 2020** Sessional Teaching Faculty, Department of Chemistry and Biochemistry, CSU East Bay.
- 2018** Curriculum Designer, IXL Learning.
- 2017** Postdoctoral Associate, Geophysical Lab, Carnegie Institution of Washington and Visiting Scientist, University of California, Davis.
- 2013 – 2016** Postdoctoral Fellow, Geophysical Lab, Carnegie Institution of Washington.
- 2007** Junior Geologist, Nunaminerals, Nuuk, Greenland.
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### Education

- 2008 – 2013** PhD in Geology, University of Toronto. Thesis title: The solubility and metal-silicate partitioning of some highly siderophile elements: Implications for core-formation and planetary accretion.
- 2004 – 2008** MSci, Hons, 1<sup>st</sup> class (undergraduate masters) in Geology, University of Birmingham, UK. Thesis title: The magnetic fabric of the W. Mourne Granite, N. Ireland and its implications for shallow crustal level magma emplacement.
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### Research Interests

Planetary accretion and differentiation, element speciation and partitioning, ore-forming processes, mineralogy, igneous petrology, geochemistry, materials synthesis.

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### Equipment Experience

Solid media high-pressure apparatus (piston-cylinder and multi-anvil press); laser-heated diamond anvil cell; controlled atmosphere furnace; muffle furnace; electron probe micro-analysis (WDS); scanning electron microscopy (imaging and EDS); laser-ablation inductively coupled plasma mass spectrometry; focused ion beam milling; X-ray diffraction.

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### Funding

- 2021 – 2026** NSERC Discovery Grant: Molten Salts as Agents of Extreme Fractionation; \$30,000 CAD pa.
- 2021 – 2026** NSERC Early Career Researcher Supplement: Molten Salts as Agents of Extreme Fractionation; \$12,500 CAD.
- 2013 – 2015** Barbara McClintock Postdoctoral Fellowship, Carnegie Institution of Washington; ~\$65,000 USD pa.

**2011** GSA Graduate Student Research Grant: Soret Diffusion at the Core-Mantle Boundary; \$1,250 USD.

**2010** MSA Student Grant for Research in Mineralogy and Petrology: The Metal-Silicate Partitioning Behaviour of Re and Pt: Implications for Terrestrial Accretion and Core Formation; \$5,000 USD.

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## Scholarships, and Awards

**2008 – 2013** Connaught Scholarship; University of Toronto School of Graduate Studies.

**2008** Undergraduate Science Award; University of Birmingham.

**2008** Undergraduate Award for Single Honours Geology; University of Birmingham.

**2006** Undergraduate Student Award in Mineral Science; Mineralogical Society of Great Britain & Ireland.

**2006** Palaeontological Association Undergraduate Award.

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## Students Supervised

**2022 - Present** Jessica Verschoor, MSc Student, The effect of phosphorous on Fe-isotope fractionation in meteorites.

**2012** Juzer Noman, NSERC Summer Research Student, Metal-silicate partitioning of Au as a function of sulfur content.

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## Student Committees

**2021 – Present:** Bruna da Silva Ricardo, PhD Student, The kinetics of melt inclusion formation.

**2021 – Present:** Dilem Herdem, MSc Student, The fate of trace elements during the transformation of pyrite to pyrrhotite.

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## Teaching Experience

### Course Instructor

**2022 (planned)** Capstone Field Course, University of Toronto

**2019, 2020** Introductory Chemistry, California State University East Bay

### Teaching Assistantships (University of Toronto)

**2012** Capstone Field Course

**2009 – 2012** Introduction to Field Mapping

**2008, 09, 11** Igneous and Metamorphic Petrology

**2010** Structural Geology

**2010** Introductory Geology

**2008, 09** Introduction to Mineralogy

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## Manuscripts in Preparation

**Bennett, N. R.**, Jackson, C. R. M., Du, Z., Fei, Y. *In Prep*. The metal-silicate partitioning of tungsten at magma ocean pressures: Implications for the tungsten isotope heterogeneity of plume mantle.

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## Submitted and Peer-Reviewed Publications

**Bennett, N. R.**, Sio, C. K., Schauble, E., Edwards, P., Leshner, C. E., Wimpenny, J., Shahar, A. *In Revision*. An impact origin for main group pallasites revealed by iron isotopes.

Jackson, C. R. M., Cottrell, E., Du, Z., **Bennett, N. R.**, Fei, Y. 2021. High pressure redistribution of nitrogen and sulfur during planetary stratification, *Geochemical Perspectives Letters*, **18**, 37-42.

**Bennett, N. R.** 2021. Controls on Element Partitioning. *Encyclopedia of Geology, 2<sup>nd</sup> Edition*. Elias, S. & Alderton, D. (Eds.) Amsterdam: Elsevier Academic. (Invited Submission).

Leshner, C. E., Dannberg, J., Barfod, G. H., **Bennett, N. R.**, Glessner, J., Lacks, D., Brenan, J. M. 2020. Iron isotope fractionation at the core-mantle boundary, *Nature Geoscience*, **13**, 382-386.

Sio, C. K., Parsons-Davis, T., Lee, E., Pascall, A., Kuntz, J. D., Wimpenny, J., Goodell, J., Roberts, K. E., Bandong, B. B., **Bennett, N. R.** 2020. Additive manufacturing of platinum group element (PGE) reference materials with a silica matrix. *Rapid Communications in Mass Spectrometry*, **34**, e8627,1-9.

Brenan, J. M., Mungall, J. E., **Bennett, N. R.** 2019. Control of the highly siderophile elements in lunar basalts by iron sulfide melt. *Nature Geoscience*. **12**, 701-706.

Rizo, H., Andrault, D., **Bennett, N. R.**, Humayun, M., Brandon, A., Vlastelic, I., Moine, B., Poirier, A., Bouhifd, M., Murphy, D. T. 2019. <sup>182</sup>W evidence for core-mantle interaction in the source of mantle plumes. *Geochemical Perspectives Letters*, **11**, 6-11.

Sio, C. K., Roskosz, M., Dauphas, N., **Bennett, N. R.**, Mock, T., Shahar, A. 2018. The isotope effect for Mg-Fe interdiffusion in olivine and its dependence on crystal orientation, composition and temperature. *Geochimica et Cosmochimica Acta*, **239**, 463-480.

**Bennett, N. R.** & Fei, Y. 2018. Pressure, sulfur and metal-silicate partitioning: The effect of sulfur species on the parameterization of experimental results. *American Mineralogist*, **103**, 1068-1079.

Jackson, C. R. M., **Bennett, N. R.**, Du, Z., Cottrell, E., Fei, Y. 2018. Early episodes of high-pressure core formation preserved in plume mantle. *Nature*, **553**, 491-495.

Du, Z., Jackson, C. R. M., **Bennett, N. R.**, Driscoll, P., Fei, Y., Deng, J., Lee, K., Greenberg, E., Prakapenka, V. 2017. Insufficient energy from MgO exsolution to power early geodynamo. *Geophysical Research Letters*, **44**, 1-6.

**Bennett, N. R.**, Brenan, J. M., Fei, Y. 2016. Magma ocean thermometry: Controls on the metal-silicate partitioning of gold, *Geochimica et Cosmochimica Acta*, **184**, 173-192.

Brenan, J. M., **Bennett, N. R.**, Zacjacz, Z. 2016. Experimental results on fractionation of the highly siderophile elements (HSE) at variable pressures and temperatures during planetary and magmatic differentiation, *Reviews in Mineralogy and Geochemistry*, **81**. (Invited Submission)

**Bennett, N. R.**, Brenan, J. M., Fei, Y. 2015. Metal-silicate partitioning experiments at high pressure and temperature: experimental methods and a procedure for the highly siderophile elements, *Journal of Visualized Experiments* , **100**. (Invited Submission)

**Bennett, N. R.**, Brenan, J. M., Koga, K. T. 2014. The solubility of platinum in silicate melt under reducing conditions: results from experiments without metal inclusions, *Geochimica et Cosmochimica Acta* , **133**, 422-442.

Smythe, D. J., Brenan, J. M., **Bennett, N. R.**, Regier, T., Henderson, G. S. 2013. Quantitative determination of cerium oxidation states in alkali-aluminosilicate glasses using M<sub>4,5</sub>-edge XANES, *Journal of Non-Crystalline Solids* , **378**, 258-264.

**Bennett, N. R.** & Brenan, J. M. 2013. Controls on the solubility of rhenium in silicate melt: implications for the osmium isotopic composition of Earth's mantle, *Earth and Planetary Science Letters* , **361**, 320-332.

Stevenson, C. T. E. & **Bennett, N. R.** 2011. The emplacement of the Palaeogene Mourne Granite Centres, Northern Ireland: new results from the Western Mourne Centre. *Journal of the Geological Society* , **168**, 831-836.

Brenan, J. M. & **Bennett, N. R.** 2010. Soret separation of highly siderophile elements in Fe-Ni-S melts: implications for solid metal-liquid metal partitioning, *Earth and Planetary Science Letters* , **298**, 299-305.

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## Invited Talks

Bennett, N. R., Noble metal logistics: Distributing highly siderophile elements between the core and mantle, *Bayerisches Geoinstitut (BGI)* , Germany, 2019.

Bennett, N. R., Experimental results on fractionation of the highly siderophile elements (HSE) at variable pressures and temperatures during planetary and magmatic differentiation, *RiMG Short Course, Scripps Institution of Oceanography* , USA, 2016.

Bennett, N. R., Magma ocean thermometry: experiments on the metal-silicate partitioning of Au, *University of Maryland* , USA, 2016.

Bennett, N. R., Terrestrial accretion and core formation: insights from the highly siderophile elements, *Smithsonian Museum of Natural History* , USA, 2014.

Bennett, N. R., Metal-silicate partitioning: consequences for the late-veener and conditions of core metal segregation, *University of Maryland* , USA, 2014.

Bennett, N. R., Lateral emplacement of the Western Mourne Granite, N.Ireland, from AMS fabric data, *AGU Joint Assembly* , Canada, 2009.

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## Selected Conference Abstracts

Bennett, N. R., Sio., C. K., Schauble, E., Leshner, C. E., Edwards, P., Wimpenny, J., Shahar, A. Experimentally Determined Fe-Isotope Fractionation Between Metal and Olivine: Implications for Pallasite Formation. *GACMAC Meeting* , 2022.

Jackson, C. R. M., Cottrell, E., Du, Z., Bennett, N. R., Fei, Y. High Pressure Redistribution of Nitrogen and Sulphur During Planetary Stratification. *American Geophysical Union - Fall Meeting* , 2021

Sio, C. K., Render, J., Wimpenny, J., Leshner, C. E., Brennan, J. M. & Bennett, N. R. Nickel Isotope Fractionation in Fe-Ni and Fe-Ni-S Alloys by Thermomigration. *American Geophysical Union - Fall Meeting*, 2021

Sio, C. K., Parsons-Davis, T., Lee, E., Pascall, A., Kuntz, J. D., Wimpenny, J., Goodell, J., Roberts, K. E., Bandong, B. B., Bennett, N. R. Additive manufacturing of PGE standards with a silica matrix. *Goldschmidt Conference*, 2020.

Jackson, C. R. M., Cottrell, E., Du, Z., Bennett, N. R., Fei, Y. Core Formation and Magma Ocean Outgassing Set Planetary NSC Ratios. *American Geophysical Union - Fall Meeting*, 2020.

Bennett, N. R. & Fei, Y. Pressure, Sulfur and Metal-Silicate Partitioning: Does the Formation of Metal-Sulphur Species in Silicate Melt Affect the Parameterisation of Experimental Results? *American Geophysical Union - Fall Meeting*, 2016.

Bennett, N. R., Jackson, C. R. M., Du, Z., Fei, Z. Planetary Differentiation in the Laboratory: Methods for Metal-Silicate Partitioning Experiments in the Diamond Anvil Cell and their Application to Tungsten. *Geological Society of America Annual Meeting*, 2016.

Bennett, N. R. & Fei, Y. Element Redistribution in Fe-Ni-O Melts by a Thermal Gradient: Implications for Siderophile Element Partitioning During Core Formation and Crystallization, *American Geophysical Union - Fall Meeting*, 2014.

Bennett, N. R. & Brennan, J. M. Equilibrium Core Formation Loses its Lustre: High Pressure and Temperature Partitioning of Gold, *Goldschmidt Conference*, 2012.

Bennett, N. R. & Brennan, J. M. Suppression of Metal Inclusions and the Effect of Carbon on Pt Solubility in Haplobasalt at High Pressure and Temperature, *American Geophysical Union Fall Meeting*, 2011.

Bennett, N. R. & Brennan, J. M. The Metal-Silicate Partitioning of Re & Pt: Constraining Mantle Os Isotope Systematics, *GACMAC Meeting*, 2011.

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## Community Service

**Reviewer for:** Geology, Earth and Planetary Science Letters, *Geochimica et Cosmochimica Acta*, AGU Books, *American Mineralogist*, *Frontiers in Earth Science*, NERC Research Fellowship Program, German Science Foundation (DFG).

**2022 (Planned)** GACMAC Conference, Session Convener: The critical metal-magma connection: Tracing metal source, transport, and ore formation.

**2019** Meritus Scholarship Interviewer.

**2015** Goldschmidt Conference, Session Chair: The geochemistry of Earth's core.

**2011 – 2012** Association of Geology Graduate Students, President; University of Toronto.

**2010 – 2011** Association of Geology Graduate Students, "Rockfest" seminar series organizer; University of Toronto.

**2010 – 2011** Society of Economic Geologists, University of Toronto Chapter, committee member.

- 2009 – 2010** Prospectors and Developers Assoc. of Canada, conference volunteer.
- 2009** American Geophysical Union Joint Assembly, conference volunteer.
- 2005 – 2006** Lapworth Society, committee member; University of Birmingham.
- 2004 – 2008** UCAS Prospective Student Visits, volunteer; University of Birmingham.
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