

# Neil R. Bennett, PhD

## Curriculum Vitae

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**Employment**

**2021 – Present:** Assistant Professor, Department of Earth Sciences, University of Toronto.

**2020 – 2021:** Consultant, 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.

**2013 – 2016:** Postdoctoral Fellow, Geophysical Lab, Carnegie Institution of Washington.

**2007:** Junior Geologist, Nunaminerals, Nuuk, Greenland.

**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.

**Research Interests**

The differentiation of planets from global to micro scales; element partitioning; trace element speciation in silicate melts; controls on critical metal behaviour in magmatic systems, wetting properties of minerals and melts; high temperature and pressure materials synthesis.

**Lab-Based Research Tools**

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

**Research Funding**

**2021 – 2026:** \$30,000/yr NSERC Discovery Grant: Molten Salts as Agents of Extreme Fractionation

**2021 – 2026:** \$12,500 NSERC Launch Supplement

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

**2010:** \$5,000 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.

## Scholarships, Fellowships, and Awards

**2013 – 2015:** Barbara McClintock Postdoctoral Fellowship, Carnegie Institution of Washington.

**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.

## Teaching Experience

### Courses Taught

**2022 (planned):** Capstone Field Course

**2019, 2020:** Introductory Chemistry

### Teaching Assistantships

**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

### Supervisory Roles

**2012:** NSERC Summer Research Student: Co-Supervisor.

## Manuscripts in Preparation

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

## Submitted and Peer-Reviewed Publications

Sio, C. K., **Bennett, N. R.**, Schauble, E., Edwards, P., Lesher, 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).

Lesher, 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.**, Zaczajcz, 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.

## Invited Talks

Bennett, N. R., Noble metal logistics: Distributing highly siderophile elements between the core and mantle, *Bayerisches Geoinstitut (BGI)*, 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*, 2016.

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

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

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

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

## Selected Conference Abstracts

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

Bennett, N. R. & Brenan, 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. & Brenan, J. M. The Metal-Silicate Partitioning of Re & Pt: Constraining Mantle Os Isotope Systematics, *Geological Association of Canada and Mineralogical Association of Canada Meeting*, 2011.

## Community Service

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

**2019:** Meritus Scholarship Interviewer.

**2015:** Goldschmidt Conference, Session chair.

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

**2010 – 2011:** ‘Rockfest’ seminar series organiser; 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.

## Referees

**Prof. James Brenan**, Dalhousie University, 1450 Oxford Street, Halifax NS B3H 4R2.  
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**Dr Anat Shahar**, Geophysical Laboratory, Carnegie Institution of Washington, 5251  
Broad Branch Road NW, Washington, DC 20015. ashahar@carnegiescience.edu,  
202-478-8929

**Prof. Charles Lesher**, Department of Geoscience, Aarhus University, Høegh-  
Gulbergs Gade 2, 8000 Aarhus C. lesher@geo.au.dk, 530-400-7478