

Michael W. Gaultois

Marie Skłodowska–Curie International Fellow

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Languages

Fluent in both French and English.

Education

2015–2017 Post-doctoral researcher, *University of Cambridge*, Cambridge, United Kingdom.

Marie Skłodowska–Curie International Fellow

Advisor: Professor [Clare Grey](#)

2011–2015 PhD Chemistry, *University of California*, Santa Barbara, CA, USA.

International Fulbright Science & Technology Fellow, NSERC Postgraduate Scholarship

Advisor: Professor [Ram Seshadri](#)

Thesis: Design principles for oxide thermoelectrics

Created a database of thermoelectric materials and developed online visualization tools, extracted trends and insight, and developed material selection guidelines and design principles.

2009–2011 MSc Chemistry, *University of Saskatchewan*, Saskatoon, SK, Canada.

Julie Payette–NSERC Research Scholarship

Advisor: Professor [Andrew P. Grosvenor](#)

Thesis: Final-state Effects in X-ray Spectra from Transition Metal Oxides and Silicates

Prepared and characterized amorphous and crystalline inorganic materials using X-ray absorption and photoelectron spectroscopy at synchrotron radiation facilities.

2004–2009 BSc Chemistry (Honours), *University of Alberta*, Edmonton, AB, Canada.

Advisor: Professor [Arthur Mar](#)

Thesis: Anionic Ga–Ga bonding in RE–Co–Ga systems (RE = Gd, Tb, Dy, Ho, Er)

Thesis: Anion-stabilized differential fractional site occupancy in ternary Zr–Si–As

Created isothermal ternary phase diagrams, grew single crystals and determined the structures of novel intermetallic phases, and used ab initio calculations to determine the electronic structure.

Publications

With [DOI](#) links where available.

34. Anton O. Oliynyk, Erin Antono, Taylor D. Sparks, Michael W. Gaultois, Leila Ghadbeigi, Bryce Meredig, and Arthur Mar. High-throughput machine-learning-driven synthesis of full-Heusler compounds. *Chem. Mater.* 28:7324–7331, 2016. [[doi](#)]
Independent collaboration
33. Anton O. Oliynyk, Taylor D. Sparks, Michael W. Gaultois, Leila Ghadbeigi, and Arthur Mar. Gd₁₂Co_{5.3}Bi and Gd₁₂Co₅Bi, Crystalline doppelgänger with low thermal conductivities. *Inorg. Chem.* 55:6625–6633, 2016. [[doi](#)]
Independent collaboration

32. Matthew T. Dunstan, Serena A. Maugeri, Wen Liu, Matthew G. Tucker, Oluwadamilola O. Taiwo, Belen Gonzalez, Phoebe Allan, Michael W. Gaultois, Paul Shearing, David A. Keen, Anthony Phillips, Martin Dove, Stuart Scott, John Dennis, and Clare P. Grey. In situ studies of materials for high temperature CO₂ capture and storage. *Faraday Discuss.* 192:217–240. [doi]
31. Michael W. Gaultois, Anton O. Oliynyk, Arthur Mar, Taylor D. Sparks, Gregory J. Mulholland, and Bryce Meredig. Web-based machine learning models for real-time screening of thermoelectric materials properties. *APL Mater.* 4:053213 (11pp), 2016. [doi]
Top 15 Most Read Articles of 2016, Cover Article, Independent work
30. Leo Lamontagne, Geneva Laurita, Michael W. Gaultois, Michael Knight, Leila Ghadbeigi, Taylor D. Sparks, Markus Gruner, Rossitza Pentcheva, Craig Brown, and Ram Seshadri. High thermopower with metallic Conductivity in *p*-type Li-substituted PbPdO₂. *Chem. Mater.* 28:3367–3373, 2016. [doi]
29. Taylor D. Sparks, Michael W. Gaultois, Anton Oliynyk, Jakoah Brgoch, and Bryce Meredig. Data mining our way to the next generation of thermoelectrics. *Scr. Mater.*, 111:10–15, 2016. [doi]
Independent work
28. Michael W. Gaultois, Jason E. Douglas, Taylor D. Sparks, and Ram Seshadri. Single-step preparation and consolidation of reduced early-transition-metal oxide/metal *n*-type thermoelectric composites. *AIP Adv.*, 5(9), 2015. [doi]
27. Kristin A. Denault, Jakoah Brgoch, Simon D. Kloss, Michael W. Gaultois, Joan Siewenie, Katharine Page, and Ram Seshadri. Average and local structure, Debye temperature, and structural rigidity in some oxide compounds related to phosphor hosts. *ACS Appl. Mater. Interfaces*, 7(13):7264–7272, 2015. [doi]
26. Michael W. Gaultois, Moureen C. Kemei, Jaye K. Harada, and Ram Seshadri. Rapid preparation and magnetodielectric properties of trirutile Cr₂WO₆. *J. Appl. Phys.*, 117(1):014105 (5pp), 2015. [doi]
25. J. Brgoch, M. W. Gaultois, M. Balasubramanian, K. Page, B. C. Hong, and R. Seshadri. Local structure and structural rigidity of the green phosphor beta-SiAlON:Eu²⁺. *Appl. Phys. Lett.*, 105(18):181904 (4pp), 2014. [doi]
24. Phillip T. Barton, Moureen C. Kemei, Michael W. Gaultois, Stephanie L. Moffitt, Lucy E. Darago, Ram Seshadri, Matthew R. Suchomel, and Brent C. Melot. Structural distortion below the Neel temperature in spinel GeCo₂O₄. *Phys. Rev. B*, 90(6):064105 (7pp), 2014. [doi]
23. Gregor Kieslich, Ulrich Burkhardt, Christina S. Birkel, Igor Veremchuk, Jason E. Douglas, Michael W. Gaultois, Ingo Lieberwirth, Ram Seshadri, Galen D. Stucky, Yuri Grin, and Wolfgang Tremel. Enhanced thermoelectric properties of the *n*-type Magneli phase WO_{2.90}: reduced thermal conductivity through microstructure engineering. *J. Mater. Chem. A*, 2(33):13492–13497, 2014. [doi]
22. Adam J. Hauser, Jeremy M. Lucy, Michael W. Gaultois, Molly R. Ball, Jennifer R. Soliz, Yongseong Choi, Oscar D. Restrepo, Wolfgang Windl, John W. Freeland, Daniel Haskel, Patrick M. Woodward, and Fengyuan Yang. Magnetic structure in epitaxially strained Sr₂CrReO₆ thin films by element-specific XAS and XMCD. *Phys. Rev. B*, 89(18):180402(R) (6pp), 2014. [doi]
Independent collaboration
21. Kristin A. Denault, Jakoah Brgoch, Michael W. Gaultois, Alexander Mikhailovsky, Ralf Petry, Holger Winkler, Steven P. DenBaars, and Ram Seshadri. Consequences of optimal bond valence on structural rigidity and improved luminescence properties in Sr_{*x*}Ba_{2–*x*}SiO₄:Eu²⁺ orthosilicate phosphors. *Chem. Mater.*, 26(7):2275–2282, 2014. [doi]
20. Michael W. Gaultois and Taylor D. Sparks. How much improvement in thermoelectric performance can come from reducing thermal conductivity? *Appl. Phys. Lett.*, 104(11):113906 (4pp), 2014. [doi]
Independent collaboration



19. Gregor Kieslich, Christina S. Birkel, Jason E. Douglas, Michael Gaultois, Igor Veremchuk, Ram Seshadri, Galen D. Stucky, Yuri Grin, and Wolfgang Tremel. SPS-assisted preparation of the Magnéli phase $\text{WO}_{2.90}$ for thermoelectric applications. *J. Mater. Chem. A*, 1:13050–13054, 2013. [[doi](#)]
18. Moureen C. Kemei, Phillip T. Barton, Stephanie L. Moffitt, Michael W. Gaultois, Joshua A. Kurzman, Ram Seshadri, Matthew R. Suhomel, and Young-Il Kim. Crystal structures of spin-Jahn-Teller-ordered MgCr_2O_4 and ZnCr_2O_4 . *J. Phys.: Cond. Matter*, 25:326001 (7pp), 2013. [[doi](#)]
17. Michael W. Gaultois, Taylor D. Sparks, Christopher K. H. Borg, Ram Seshadri, William D. Bonificio, and David R. Clarke. Data-driven review of thermoelectric materials: Performance and resource considerations. *Chem. Mater.*, 25:2911–2920, 2013. [[doi](#)]
Top 20 “Most Read Articles” of May–June, Cover Article of August
16. Michael W. Gaultois, Phillip T. Barton, Christina S. Birkel, Lauren M. Misch, Efrain E. Rodriguez, Galen D. Stucky, and Ram Seshadri. Structural disorder, magnetism, and electrical and thermoelectric properties of pyrochlore $\text{Nd}_2\text{Ru}_2\text{O}_7$. *J. Phys.: Cond. Matter*, 25:186004 (10pp), 2013. [[doi](#)]
15. James D. S. Walker, John R. Hayes, Michael W. Gaultois, Esther Rani Aluri, and Andrew P. Grosvenor. A case for oxygen deficiency in $\text{Gd}_2\text{Ti}_{2-x}\text{Zr}_x\text{O}_7$ pyrochlore-type oxides. *J. Alloys Compd.*, 565:44–49, 2013. [[doi](#)]
14. Michael W. Gaultois and Andrew P. Grosvenor. XANES and XPS investigations of the local structure and final-state effects in amorphous metal silicates: $(\text{ZrO}_2)_x(\text{TiO}_2)_y(\text{SiO}_2)_{1-x-y}$. *Phys. Chem. Chem. Phys.*, 14:205–217, 2012. [[doi](#)]
13. Brianna R. Slater, Haiying Bie, Michael W. Gaultois, Stanislav S. Stoyko, and Arthur Mar. Rare-earth cobalt gallides $\text{RE}_4\text{Co}_3\text{Ga}_{16}$ ($\text{RE} = \text{Gd-Er, Y}$): Self-interstitial derivatives of RE_2CoGa_8 . *Eur. J. Inorg. Chem.*, pages 3896–3903, 2011. [[doi](#)]
12. Jessica A. Sigrist, James D. S. Walker, John R. Hayes, Michael W. Gaultois, and Andrew P. Grosvenor. Determining the effect of Ru substitution on the thermal stability of $\text{CeFe}_{4-x}\text{Ru}_x\text{Sb}_{12}$. *Solid State Sci.*, 13:2041–2048, 2011. [[doi](#)]
11. Jessica A. Sigrist, Michael W. Gaultois, and Andrew P. Grosvenor. Investigation of the Fe K-edge XANES spectra from $\text{Fe}_{1-x}\text{Ga}_x\text{SbO}_4$: Local versus nonlocal excitations. *J. Phys. Chem. A*, 115:1908–1912, 2011. [[doi](#)]
10. Jessica M. Peddle, Michael W. Gaultois, and Andrew P. Grosvenor. On the oxidation of $\text{EuFe}_4\text{Sb}_{12}$ and $\text{EuRu}_4\text{Sb}_{12}$. *Inorg. Chem.*, 50:6263–6268, 2011. [[doi](#)]
9. Michael W. Gaultois and Andrew P. Grosvenor. XANES and XPS investigations of $(\text{TiO}_2)_x(\text{SiO}_2)_{1-x}$: the contribution of final-state relaxation to shifts in absorption and binding energies. *J. Mater. Chem.*, 21:1829–1836, 2011. [[doi](#)]
8. Michael W. Gaultois, John E. Greedan, and Andrew P. Grosvenor. Investigation of coordination changes in substituted transition-metal oxides by K-edge XANES: Beyond the pre-edge. *J. Electron Spectrosc. Relat. Phenom.*, 184:192–195, 2011. [[doi](#)]
7. Alina C. Sklad, M. W. Gaultois, and A. P. Grosvenor. Examination of $\text{CeFe}_4\text{Sb}_{12}$ upon exposure to air: Is this material appropriate for use in terrestrial, high-temperature thermoelectric devices? *J. Alloys Compd.*, 505:L6–L9, 2010. [[doi](#)]
6. Michael W. Gaultois, Alina C. Sklad, and Andrew P. Grosvenor. Effects of metal substitution on the electronic structure of mixed ionic-electronic conduction materials. In Matthew Dalzell, editor, *Canadian Light Source Activity Report 2009*, pages 108–109. Houghton Boston, Saskatoon, SK, 2010. [[url](#)]



5. Michael W. Gaultois, Andrew P. Grosvenor, Peter E. R. Blanchard, and Arthur Mar. Ternary arsenides $Zr(Si_xAs_{1-x})As$ with $PbCl_2$ -type ($0 \leq x \leq 0.4$) and $PbFCl$ -type ($x = 0.6$) structures. *J. Alloys Compd.*, 492:19–25, 2010. [[doi](#)]
4. Michael W. Gaultois and Andrew P. Grosvenor. Coordination-induced shifts of absorption and binding energies in the $SrFe_{1-x}Zn_xO_{3-\delta}$ system. *J. Phys. Chem. C*, 114:19822–19829, 2010. [[doi](#)]
3. Stephane Dufresne, Michael Gaultois, and William G. Skene. Environmentally friendly preparation of a conjugated polyazostilbene: A photophysical and electrochemical investigation. *Opt. Mater.*, 30:961–967, 2008. [[doi](#)]
2. Stephane Dufresne, Michael Gaultois, and William G. Skene. Disodium 5,5'-diamino-2,2'-ethylenedibenzenesulfonate tetrahydrate. *Acta Crystallogr.*, E63:M2714–U772, 2007. [[doi](#)]
1. Stephane Dufresne, Michael Gaultois, and William G. Skene. Bis(triethylammonium) 4,4'-diaminotrans-stilbene-2,2'-disulfonate. *Acta Crystallogr.*, E63:O3926–U1847, 2007. [[doi](#)]

Invited presentations

14. Metrics for quantitative evaluation of material resource considerations, *99th Canadian Chemistry Conference, Workshop on Sustainable Approaches to Materials Research*, Halifax, NS, Canada (3–4 June 2016).
13. High throughput DFT screening and experimental characterization of CO_2 looping materials, *Khalifa University*, Abu Dhabi, United Arab Emirates (24 February 2016).
12. High throughput DFT screening and experimental characterization of CO_2 looping materials, *International Workshop on Advanced Materials*, Ras al-Khaimah, United Arab Emirates (21 February 2016).
11. Design principles for oxide thermoelectric materials, *Materials Research Outreach Program Symposium*, Santa Barbara, CA, USA (4 February 2015).
10. Site disorder in Ru pyrochlores and the search for oxide thermoelectric materials, *Lujan Neutron Scattering Center*, Los Alamos, NM, USA (22 January 2014).
9. Using low-temperature physical property measurements to predict high-temperature material performance, *Quantum Design Inc.*, San Diego, CA, USA (20 November 2013).
8. Big data for big problems: Visualizing large datasets for thermoelectric materials discovery, *Third Bilateral UCSB–Chalmers University Workshop on Materials Science and Engineering*, University of California, Santa Barbara, CA, USA (24 August 2013).
7. Data-driven thermoelectric materials discovery: Developing design principles for oxides, *Institute of Inorganic Chemistry and Analytical Chemistry, Johannes Gutenberg–Universität Mainz*, Mainz, RP, Germany (11 July 2013).
6. Data-driven thermoelectric materials discovery: Developing design principles for oxides, *Catalonia Institute for Energy Research, Universitat de Barcelona*, Barcelona, CT, Spain (9 July 2013).
5. Data-driven thermoelectric materials discovery: Developing design principles for oxides, *Unitat de Física dels Materials, Universitat Autònoma de Barcelona*, Barcelona, CT, Spain (8 July 2013).
4. Towards oxide-based thermoelectric materials, *Chemical Sciences Student Seminar, University of California*, Santa Barbara, CA, USA (23 October 2012).
3. Determination of local structure using total scattering and pair distribution function analysis, *Department of Chemistry, University of Saskatchewan*, Saskatoon, SK, Canada (5 June 2012).

2. Le rayonnement synchrotron et son application pour l'étude des oxydes et silicates métalliques, *L'Association francophone pour le savoir (ACFAS) 6e Forum du Savoir*, Saskatoon, SK, Canada (16 March 2011).
1. Presentation to the Governor General of Canada, Her Excellency the Right Honourable Michaëlle Jean, *Canadian Light Source Inc.*, Saskatoon, SK, Canada (24 August 2010).

Selected awards and recognition

2016

- Runner up, Air Force Research Lab **Materials Science and Engineering Data Challenge** (\$5 000 prize).
- Chosen by the University of Cambridge to attend the Singapore National Research Foundation 2017 Global Young Scientists Summit. (5 nominees in Cambridge)

2015

- **Marie Skłodowska–Curie Individual Fellowship**.

2014

- “Outstanding Oral Presentation” Award, *Functional Inorganic Solid State Materials Symposium, 97th Canadian Chemistry Conference and Exhibition*.
- Outstanding Service to the Department Award, *Department of Chemistry and Biochemistry, UCSB*
- Doctoral Student Travel Grant, *UCSB Academic Senate*

2013

- Sponsored by NSERC to attend the 2013 Lindau Nobel Laureate meeting. (5 nominees in Canada)

2012

- “Outstanding Poster” Award, *Materials Research Society (MRS) Fall Meeting*. (8 awarded)
- Graduate Thesis Award, for the most outstanding thesis in Physical and Engineering Sciences. *U. Saskatchewan*.
- Henry Taube Medal, for the “most significant overall contribution to research and scholarly activity,” *U. Saskatchewan*.
- Dow-MRL Outreach Outstanding Service Award, *UCSB*

2011

- **Vanier Canada Graduate Scholarship** (*declined*)
- **NSERC Alexander Graham Bell Canada Graduate Scholarship** (CGS-D) (*declined*)

2010

- **International Fulbright Science & Technology Award**, *U.S. Department of State*
- Gerhard Herzberg Memorial Scholarship, *U. Saskatchewan*
- **Julie Payette–NSERC Research Scholarship**, held at *U. Saskatchewan*

Professional services

Reviewer for the following:

- ACS Petroleum Research Fund
- Applied Physics Letters
- Chemistry of Materials
- International Journal of Applied Ceramic Technology
- Journal of Alloys and Compounds
- Journal of Materials Chemistry
- Journal of Materials Chemistry A
- Journal of Materials Science
- Journal of the American Ceramic Society
- Materials Letters
- Materials Research Express
- Nanoscale Research Letters
- Physica Status Solidi A
- RSC Advances

Teaching

I taught and supervised 11 lab sections with anywhere from 14 to 48 students. I developed lectures and quizzes, and presented lab techniques used during experiments. Students in my sections nominated me for several teaching awards. I have also developed and presented guest lectures for multiple 1.5 hr Materials Science and Chemistry graduate classes. Outside of the University, I have developed and presented hour-long interactive presentations on light (Grade 4 curriculum), the periodic table of elements (Grade 5 curriculum), phase transitions, properties at extreme temperatures, and materials science.

Mentoring

I have trained and guided 18 undergraduate and highschool researchers, including Samantha Flint (Cambridge), Jamie Capel (Cambridge), Ellie Bennett (Cambridge), Emma Cai (Cambridge), Matthew Sullivan (Cambridge), Adam Bateson (Cambridge), Steven Cabral (UCSB), Isaac Scott (UCSB), Trevor Ayers (UCSB), Chris Borg (UCSB), Zachery Glenn (Jackson State), Jessica Sigrist (U. Sask.), James Walker (U. Sask.), Shaylin Eger (U. Sask.), Lana Huynh (U. Sask.), Jessica Peddle (U. Sask.), Alina Sklad (U. Sask.), Ariane Quintal (U. Montreal). These activities have resulted in multiple publications with undergraduate authors, and undergraduates have been primary authors in many cases.