

## Robert McCarley Holder

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### Education

2018: **PhD** in Earth Science, University of California, Santa Barbara (UCSB).

Dissertation title: “What causes ultrahigh-temperature metamorphism? A case study from southern Madagascar.” Advisor: Bradley R. Hacker. Committee: John Cottle, Roberta Rudnick, Frank Spera

2016: **Summer Teaching Institute for Associates**, UCSB.

Higher-education teacher training program: “The STIA program provides graduate student instructors with...teaching orientation...based on principles of interactive, collaborative learning...designed to assist...with the planning, conduct and assessment of...undergraduate courses.”

2014: **MS** in Earth Science, UCSB.

Thesis title: “Monazite trace-element and isotopic signatures of (ultra)high-pressure metamorphism: examples from the Western Gneiss Region, Norway.” Advisor: Bradley R. Hacker. Committee: John Cottle, Frank Spera

2012: **BA *summa cum laude*** double major in Geology and Scandinavian Studies, Gustavus Adolphus College (GAC), Minnesota. Geology thesis title: “Strain analysis in the Virginia Horn area, northeastern Minnesota.” Advisor: James Welsh. Scandinavian Studies colloquium title: “On Masculinity in Scandinavia: creating a more gender-equal society.”

### Employment History

2020– : **Assistant Professor**, University of Michigan (UM), Ann Arbor, MI

2018–2020: **Postdoctoral Fellow**, Johns Hopkins University (JHU), Baltimore, MD

2012–2018: **Teaching Assistant** and **Graduate Student Researcher** as MS and PhD student, UCSB

2016: **Instructor of Record**, UCSB

2009–2012: **Teaching Assistant** as BA student, GAC

2010: **ICP-MS student technician**, GAC

2009: **Field Technician**, Great Basin Unified Air Pollution Control District, Inyo County, CA

### Postdoctoral Scholar Mentoring

- David Hernández-Uribe 2020– (UM): Mesozoic tectonic evolution and subduction metamorphism in central Baja California

### Graduate Student Advisees

- Yiruo Xu, PhD student 2021– (UM): Archean metamorphism and tectonics in the Superior Province, Ontario, Canada
- Julisan Street, PhD student 2021– (UM): Ultrahigh-temperature metamorphism and magmatism in southern Madagascar

### Committee Member for Graduate Students

- Justin Casaus, PhD student 2021– (UM): Apatite chemistry and hydrothermal alteration
- María Alejandra Rodríguez Mustafa, PhD student 2021– (UM): Geochronology and geochemistry of IOCG–IOA deposits
- Daniel Blakemore, PhD student 2020– (UM): Geochronology and geochemistry of IOCG–IOA deposits

### Undergraduate Student Mentoring

- Carl Swindle 2017–2018 (senior thesis, UCSB): Phase equilibria & regional metamorphic field gradients in granulites from Madagascar
- Adam Kershner 2016–2017 (research credits toward major, UCSB): Ti- and Al-in-quartz thermobarometry of granulites from Madagascar
- Alex Guzman 2016–2017 (research credits toward major, UCSB): U–Pb zircon dating of igneous rocks of southern Madagascar

### Teaching

- UM Instructor
  - Summer Field Camp (440): 2021
  - Petrology (412 / 352): 2021, 2022
  - Geochronology (485): 2021
- UCSB Instructor
  - Antarctica (a themed introductory geology and oceanography): 2016
- UCSB Teaching Assistant
  - Geomaterials: 2013
  - Analytical Methods: 2014
  - Spring Field Camp: 2013, 2014, 2015, 2016, 2017
  - Summer Field Camp: 2014
  - Introductory Field Geology for Non-majors: 2013, 2015, 2017
  - Metamorphic Petrology: 2012, 2014, 2016

### Awards, Grants, & Honors

- NSF-EAR Tectonics (submitted). Collaborative Research: Do subduction zone metamorphic rocks record evolving subduction-zone thermal structure or anomalous tectonic activity? Baja California. Lead PI. \$340,466
- NSF-EAR Tectonics 2022746. Collaborative Research: Did Mantle Magma Cause Ultrahigh-Temperature Metamorphism (UHTM) in Southern Madagascar? Co-PI. Start date 1 September 2020. \$259,405

- NSF-EAR Instrumentation and Facilities 1831766. Acquisition of a laser-based system for trace-element mapping and large-*N* geochronology by inductively coupled plasma mass spectrometry (ICP-MS). Coauthor and Senior Personnel (Lead PI: Daniel Viete, JHU)
- Most Helpful Graduate Student (awarded by vote of Earth Science graduate students at UCSB), 2018
- UCSB Doctoral Student Travel Grant 2017
- EGU Outstanding Student Poster Award 2017
- UCSB Alumni Graduate Award in Research Excellence 2017
- UCSB Earth Science Graduate Student Opportunity Award 2017
- UCSB Earth Research Institute Summer Research Fellowship 2017
- UCSB Tanya Atwater Global Field Travel Fund 2016
- UCSB George Tunell Memorial Fellowship 2016
- Microanalysis Society Early Career Scholar Award 2016
- United States Antarctic Service Medal 2015
- UCSB Lloyd & Mary Edwards Field Studies Fellowship 2015
- UCSB Tanya Atwater Global Field Travel Fund 2015
- PSAAPG Imperial Barrel Award Competition, UCSB team 2014
- UCSB Earth Science Graduate Award for Research Excellence 2014
- Sigma Xi Scientific Research Society 2012
- Undergraduate Speaker, Phi Beta Kappa Annual Meeting, GAC 2012
- Phi Beta Kappa Academic Honor Society 2011
- GAC Chester O. Johnson Geology Scholarship 2010

### **Research Fieldwork**

- United States, Upper Midwest 2019. Archean gneisses of the southern Superior Province. 2 weeks
- United States, Maryland 2019. Baltimore Mafic Complex & felsic plutons near Baltimore. ~12 daytrips
- United States, California 2019. Neoproterozoic dolomites in the Death Valley region. 1 week
- Scotland 2018. Shetland Ophiolite and mafic-ultramafic bodies in the Portsoy Shear Zone. 2 weeks
- United States, Nevada 2018. Paleoproterozoic granulites in the McCullough Range. 1 week
- Austria & Czech Rep. 2017. UHP & UHT rocks of the Bohemian Massif, Variscan Orogen. 2 weeks
- Antarctica 2015. High-K magma suites of the McMurdo Dry Valleys. 7 weeks
- Madagascar 2014. UHT metamorphism and magmatism in the East-African–Kuunga Orogen. 4 weeks
- Norway 2013. UHP metamorphism in the Western Gneiss Complex, Caledonian Orogen. 3 weeks
- Canada, Ontario 2010. Stromatolites in the Gunflint Formation. 1 week
- United States, Minnesota, 2010. Sediment provenance in the Le Sueur River watershed. 1 week
- United States, California, 2009. Mapping modern aeolian sediments, Keeler Dunes. 3 weeks

### Professional Fieldtrips & Classes

- Wilderness First Responder certification, 2021
- CPR and AED certification, 2021
- Lower-crustal deformation in the Bohemian Massif, Austria, 2 days, EGU Assembly 2017
- Metamorphic rocks of the Picuris & Tusas Ranges, New Mexico, 5 days, GSA Annual Meeting 2016
- Hydrothermal features of Yellowstone, Wyoming, 5 days, GSA Annual Meeting 2016
- Igneous & metamorphic rocks of the Namaqua Metamorphic Complex, Namibia, 1 week, Granulites & Granulites Conference 2015
- Sequence stratigraphy with ExxonMobil at UCSB, 1 day, 2014
- Indiana University Summer Field Camp in southwest Montana, 6 weeks, 2012

### Synergistic Activities beyond Academic Collaboration

- Founding member of Petronet, an early-career professional network that aims to increase accessibility, diversity, inclusion, and collaboration among petrologists and high-temperature geochemists.
- Unlearning Racism in the Geosciences program participant for UM Department of Earth and Environmental Sciences and Petronet (see previous bullet point).
- Book reviewer for *Reviews in Mineralogy and Petrology, Volume 83, Petrochronology: Methods and Applications*, eds. Matthew J. Kohn, Martin Engi, and Pierre Lanari. American Mineralogist
- Convener and Chair of AGU Fall Meeting 2017 session *Petrochronology and microstructural geochronology* (V022) with D. Moser, K. Tait, and J. Darling
- Convener and Chair of GSA Annual Meeting 2019 session *Metamorphic Petrology Past, Present and Future: Preparing for the next 100 years with the Mineralogical Society of America* with S. Penniston-Dorland and M. Caddick
- Manuscript reviewer for: *American Mineralogist, Computers and Geosciences, Contributions to Mineralogy and Petrology, Earth and Planetary Science Letters, Episodes, Geology, Geoscience Frontiers, Journal of Metamorphic Geology, Lithos, Nature Communications, and Precambrian Research*. 29 manuscripts reviewed since 2017
- NSF-EAR Tectonics *ad hoc* proposal reviewer
- External thesis reviewer for Curtin University (1 MS) and Adelaide University (2 PhD) students

### Visiting Lectures/Seminars

10. Title TBD. Queens University, Kingston, Ontario. September 9, 2021
9. Metamorphism and the evolution of plate tectonics. Virtual talk for Western Washington University. May 18, 2021
8. Metamorphism and the evolution of plate tectonics. Virtual talk for the Smithsonian Museum of Natural History, Washington DC. April 29, 2020
7. Metamorphism and the evolution of plate tectonics. University of British Columbia, Vancouver. October 10, 2019
6. Metamorphism and the evolution of plate tectonics. University of Maryland. April 26, 2019

5. Metamorphism and the evolution of plate tectonics. Pennsylvania State University. April 5, 2019
6. Reevaluating old paradigms and exploring new frontiers in U–Pb dating of titanite and calcite. Cornell University. February 12, 2019
5. Metamorphism and the evolution of plate tectonics. Cornell University. February 11, 2019
4. Petrochronology Part 1: Titanite, thermo- or petrochronometer? | Part 2: Carbonate petrochronology, a new frontier. University of Florida. February 5, 2019
3. Ultrahigh-temperature metamorphism: The hottest rocks in the crust and how they form. Amherst College. December 3, 2018
2. The progressive emergence of modern plate tectonics: A metamorphic perspective from the Archean to today. University of Michigan. November 9, 2018
1. Petrochronology Part 1: Titanite, thermo- or petrochronometer? | Part 2: Carbonate petrochronology, a new frontier. University of Michigan. November 8, 2018

### Publications in review and in preparation

2. Garber JM, **Holder RM**, Smye AJ, Reimink JR, Feinmann MD (*in review*) The continuous and discontinuous chemical evolution of continental crust. *Earth and Planetary Science Letters*
1. Gutiérrez-Aguilar F, Hernández-Urbe D, **Holder RM** (*in review*) The Mw7.1 September 19<sup>th</sup> Puebla-Morelos (Mexico) earthquake triggered by brucite and antigorite dewatering. *Geology*

### Publications

- 19\*. Horton F, **Holder RM**, Swindle C (2021) An extensive record of orogenesis recorded in a Madagascar granulite. *Journal of Metamorphic Geology*  
\*Horton and Holder contributed equally to this work and are recognized as corresponding authors.
18. Brenner DC, Passey BH, **Holder RM**, Viete DR (2021) Clumped-isotope geothermometry and carbonate U-Pb geochronology of the Alta stock metamorphic aureole, Utah, USA: Insights on the kinetics of metamorphism in carbonates. *Geochemistry, Geophysics, Geosystems*. doi: 10.1029/2020GC009238
17. Guice GL, Ackerson MR, George FR, **Holder RM**, Burgess JL, Browning-Hanson JF, Foustoukos DI, Becker N, Viete DR (2021). The Baltimore mafic complex, Maryland: Ophiolite fragments in the Southern Appalachian Orogen. doi:10.1130/GES02289.1
16. Závada P, Štípská P, Hasalová P, Racek M, Jeřábek P, Schulmann K, Kylander-Clark A, **Holder RM** (2020) Monazite geochronology in melt-percolated UHP meta-granitoids: An example from the Erzgebirge continental subduction wedge, Bohemian Massif. *Chemical Geology*. doi:10.1016/j.chemgeo.2020.119919
15. **Holder RM**, Yakymchuck C, Viete DR (2020) Accessory Mineral Eu Anomalies in Suprasolidus Rocks: Beyond Feldspar. *Geochemistry, Geophysics, Geosystems*. doi:10.1029/2020GC009052
14. Štípská P, Schulman K, Racek M, Lardeaux JM, Hacker BR, Kylander-Clark ARC, **Holder RM**, Košuličová M (2019) Finite pattern of Barrovian metamorphic zones: interplay between thermal reequilibration and post-peak deformation during continental collision—insights from the Svratka dome (Bohemian Massif). *International Journal of Earth Sciences*. doi:10.1007/s00531-019-01788-6

13. **Holder RM**, Viete DR, Brown M, Johnson TE (2019) Metamorphism and the evolution of plate tectonics. *Nature*. doi: 10.1038/s41586-019-1462-2
12. **Holder RM**, Hacker BR, Seward GGE, Kylander-Clark ARC (2019) Interpreting titanite U–Pb dates and Zr thermobarometry in high-grade rocks: empirical constraints on elemental diffusivities of Pb, Al, Fe, Zr, Nb, and Ce. *Contributions to Mineralogy and Petrology*. doi:10.1007/s00410-019-1578-2
11. Hacker BR, Kylander-Clark ARC, **Holder RM** (2019) REE partitioning between monazite and garnet: Implications for petrochronology. *Journal of Metamorphic Geology*. doi:10.1111/jmg.12458
10. **Holder RM**, Hacker BR (2019) Fluid-driven resetting of titanite following ultrahigh-temperature metamorphism in southern Madagascar. *Chemical Geology*. doi:10.1016/j.chemgeo.2018.11.017
9. **Holder RM**, Sharp ZD, Hacker BR (2018) LinT, a simplified approach to oxygen-isotope thermometry and speedometry of high-grade rocks: An example from ultrahigh-temperature gneisses of southern Madagascar. *Geology*. doi:10.1130/G40207.1
8. **Holder RM**, Hacker BR, Horton F, Rakotondrazafy AFM (2018) Ultrahigh-temperature osumilite gneisses in southern Madagascar record combined heat advection and high rates of radiogenic heat production in a long-lived high-temperature orogen. *Journal of Metamorphic Geology*. doi:10.1111/jmg.12316
7. Peřestý V, Lexa O, **Holder RM**, Jerabek P, Racek M, Štípská P, Schulmann K, Hacker B (2016) Metamorphic inheritance of Rheic passive margin evolution and its early Variscan overprint in the Teplá-Barrandian Unit, Bohemian Massif. *Journal of Metamorphic Geology*. doi:10.1111/jmg.12234
6. Štípská P, Powell R, Hacker BR, **Holder RM**, Kylander-Clark ARC (2016) Uncoupled U/Pb and REE response in zircon during the transformation of eclogite to mafic and intermediate granulite (Blanský les, Bohemian Massif). *Journal of Metamorphic Geology*. doi:10.1111/jmg.12193
5. Horton F, Hacker BR, Kylander-Clark ARC, **Holder RM**, Jöns N (2016) Focused radiogenic heating of middle crust caused ultrahigh temperatures in southern Madagascar. *Tectonics*. doi:10.1002/2015TC004040
4. **Holder RM**, Hacker BR, Kylander-Clark ARC, Cottle JM (2015) Monazite trace-element and isotopic signatures of (ultra)high-pressure metamorphism: examples from the Western Gneiss Region, Norway. *Chemical Geology*. doi:10.1016/j.chemgeo.2015.04.021
3. Hacker BR, Kylander-Clark ARC, **Holder RM**, Andersen T, Peterman E, Walsh E, Munnikhuis J (2015) Monazite response to ultrahigh-pressure subduction from U-Pb dating by laser-ablation split-stream ICP-MS. *Chemical Geology*. doi:10.1016/j.chemgeo.2015.05.008
2. Štípská P, Hacker BR, Racek M, **Holder RM**, Kylander-Clark ARC, Schulmann K, Hasalová P (2015) Monazite Dating of Prograde and Retrograde P–T–d paths in the Barrovian Terrane of the Thaya Window, Bohemian Massif. *Journal of Petrology*. doi:10.1093/petrology/egv026
1. Broussolle A, Štípská P, Lehmann J, Schulmann K, Hacker BR, **Holder RM**, Kylander-Clark ARC, Hanžl P, Racek M, Hasalová P, Lexa O, Hrdličková K, Buriánek D (2015) P–T–t–D record of crustal-scale horizontal flow and magma assisted doming in the SW Mongolian Altai. *Journal of Metamorphic Petrology*. doi:10.1111/jmg.12124

## Invited Conference Talks

7. **Holder RM**, Hacker BR, Seward GGE, Kylander-Clark ARC (2021) Interpreting titanite U–Pb dates and Zr thermometry in high-grade rocks: Empirical estimates of elemental diffusivities. 17th International Conference on Thermochemistry
6. **Holder RM**, Viete DR, Brown M, Johnson TE (2021) Paired metamorphism and the evolution of plate tectonics. GSA Connects
5. **Holder RM**, Hacker BR (2021) Fluid-driven resetting of titanite following (ultra)high-temperature metamorphism. Goldschmidt Conference
4. **Holder RM**, Yakymchuk C (2019) Monazite Eu anomalies beyond feldspar: Constraining the timescales of deep crustal heat and mass transfer. AGU Fall Meeting
3. **Holder RM**, Yakymchuk C (2019) Monazite Eu anomalies: Beyond feldspar. EGU General Assembly
2. **Holder RM**, Hacker BR, Ryb U (2018) Linking high- and low-temperature processes in the crust with U–Pb dating of carbonate rocks and minerals. Goldschmidt Conference
1. **Holder RM**, Hacker BR, Kylander-Clark ARC, Nuriel P, Roberts N (2017) Directly dating deformation by U–Pb carbonate LA-ICP-MS. Goldschmidt Conference

### Other Conference Abstracts

31. Rodríguez-Mustafa AM, Blakemore D, **Holder RM**, Simon AC (2021) The timing of mineralization in the Mina Justa IOCG system, Peru: Insights from in situ U-Pb MC-ICP-MS ages for apatite, magnetite and titanite. SEG Annual Meeting
30. Blakemore D, Rodríguez Mustafa MA, Simon AC, **Holder RM**, Del Real I, Reich M, Barra F, Thompson JFH, Hames WE (2021) The Temporal Evolution of the Candelaria Iron Oxide - Copper - Gold (IOCG) System, Chile: Insights from in situ U-Pb LA-MC-ICP-MS of Apatite, Magnetite, Titanite and Ar-Ar of Actinolite. SEG Annual Meeting
29. Ben-Israel M, Ryb U, **Holder RM**, Kylander-Clark ARC (2021) U-Pb dating and clumped isotopes constraints on massive-dolomite formation environments. Goldschmidt Conference
28. Gutiérrez-Aguilar F, Hernández-Urbe D, **Holder RM**, Condit C (2021) The Mw7.1 September 19th Puebla-Morelos (Mexico) earthquake triggered by brucite and antigorite dewatering. EGU General Assembly
27. **Holder RM**, Viete DR, Brown M, Johnson T (2020) Metamorphism and the evolution of plate tectonics. AGU Fall Meeting
26. Garber JM, **Holder RM**, Smye A, Reimink JR, Feineman MD (2020) The punctuated continuum of plate tectonics revealed by global igneous rocks. AGU Fall Meeting
25. Becker NA, Browning-Hanson JF, **Holder RM**, Nelson WR, Burgess JL, Viete DR (2020) Geochemical progression in lavas and shallow intrusives of the Appalachian–Caledonian Leka Ophiolite Complex, Norway. GSA Annual Meeting
24. Guice GL, Ackerson MR, Holder RM, George FR, Browning-Hanson JF, Burgess JL, Foustoukos DI, Becker NA, Nelson WR, Viete DR (2020) The Baltimore Mafic Complex, Maryland: ophiolite fragments in the southern Appalachian Orogen? GSA Annual Meeting
24. Viete DR, **Holder RM** (2020) Accretionary orogenesis in the Lake Superior region, USA: modern-like tectonics during the Paleoproterozoic. EGU General Assembly
23. Burgess J, Becker NA, **Holder RM**, Piccoli PM, Viete DR (2020) Geochemical and thermobarometric constraints on the Perry Hall and tectonically associated gneisses from the

- Baltimore area piedmont, Maryland. Joint NE–SEGSA section meeting CANCELED due to pandemic
21. **Holder RM**, Hacker BR, Kylander-Clark ARC, Cottle JM (2020) Dating continental subduction and exhumation with monazite in the Western Gneiss Region, Norway. Joint NE–SE GSA section meeting CANCELED due to pandemic
  20. Becker NA, Browning-Hanson J, **Holder RM**, Nelson WR, Burgess JL, Viète DR (2020) Geochemical progression in lavas and shallow intrusives of the Appalachian–Caledonian Leka ophiolite complex, Norway. Joint NE–SE GSA section meeting CANCELED due to pandemic
  19. Viète DR, **Holder RM** (2019) Modern-style metamorphism in the Paleoproterozoic: A product of stochasticity in ‘time to subduction initiation’ within ocean basins? GSA Annual Meeting
  18. **Holder RM**, Hacker BR, Kylander-Clark ARC, Seward GGE (2019) Interpreting titanite U–Pb dates and Zr temperatures in high-grade rocks: Empirical constraints on elemental diffusivities. GSA Annual Meeting
  17. **Holder RM**, Hacker BR (2018) Prolonged fluid-driven resetting of titanite following ultrahigh-temperature metamorphism in southern Madagascar. AGU Fall Meeting
  16. Swindle C, **Holder RM** (2018) Mechanisms of granulite formation in an archetypal accretion-to-collision orogen: pseudosections and monazite petrochronology from southern Madagascar. AGU Fall Meeting
  15. Viète DR, **Holder RM** (2018) Geodynamics of (U)HT granulite metamorphism: a view from ‘accessory’ terranes. Granulites and Granulites Conference
  14. **Holder RM**, Hacker BR (2018) Interpreting titanite U–Pb dates and Zr temperatures in granulites: Empirical estimates of elemental diffusivities. Granulites and Granulites
  13. **Holder RM**, Hacker BR (2017) Titanite chronology, thermometry, and speedometry of ultrahigh-temperature (UHT) calc-silicates from south Madagascar: U–Pb dates, Zr temperatures, and lengthscales of trace-element diffusion. AGU Fall Meeting
  12. **Holder RM**, Hacker BR (2017) Titanite petrochronology of ultrahigh-temperature (UHT) calc-silicates from southern Madagascar: laser-ablation split-stream ICP-MS spot analyses, depth profiles, and quantified trace-element x-ray maps. EGU General Assembly
  11. **Holder RM**, Hacker BR (2016) The importance of intracrustal magmatic heat advection in large hot orogens: the Ediacaran-Cambrian ultrahigh-temperature domain of southern Madagascar. AGU Fall Meeting
  10. Hacker BR, Kylander-Clark ARC, **Holder RM**, Nuriel P (2016) U–Pb dating of Calcite by LA-ICPMS. AGU Fall Meeting
  9. **Holder RM**, Hacker BR, Kylander-Clark ARC, Everson A (2016) Development of calcite reference materials for *in-situ* U–Pb dating and trace-element analysis. GSA Annual Meeting
  8. **Holder RM**, Hacker BR (2016) Intracrustal magmatic heat advection in the Ediacaran UHT domain of Madagascar. GSA Annual Meeting
  7. **Holder RM**, Hacker BR, Horton F (2015) Protracted high-grade metamorphism in southern Madagascar: P-T-t paths of the Anosyen, Androyen, and Ikalamavony domains. Granulites and Granulites Conference
  6. **Holder RM**, Hacker BR, Kylander-Clark ARC, Cottle JM (2014) Monazite trace-element and isotopic signatures of high-pressure metamorphism: examples from the Western Gneiss Region, Norway. AGU Fall Meeting



5. Perestý V, **Holder RM**, Lexa O, Racek M, Jerábek P (2014) Petrochronological and structural arguments for upper plate thickening and relamination of the lower plate buoyant material in the Variscan Bohemian Massif. EGU General Assembly
4. **Holder RM**, Hacker BR, Kylander-Clark ARC (2013) Monazite Petrochronology from the UHP Western Gneiss Region, Norway. AGU Fall Meeting
3. **Holder RM**, Hacker BR, Kylander-Clark ARC (2013) Monazite Petrochronology from the UHP Western Gneiss Region, Norway. GSA Annual Meeting
2. Perestý V, **Holder RM**, Lexa O, Racek M, Hacker BR (2013) Polyphase tectonometamorphic evolution of the Teplá Crystalline Complex: New structural, petrological, and geochronological data. GeoPilsen Conference
1. Hacker BR, Kylander-Clark ARC, Horton F, **Holder RM** (2013) Applying U/Th-Pb and trace-element LASS petrochronology to understanding high-temperature metamorphism. GSA Annual Meeting

### **Software and code**

Python code for Al-in-orthopyroxene thermobarometry corrected for retrograde Fe–Mg diffusion (after Pattison et al., 2003). [github.com/rmholdergeo/batchRCLC](https://github.com/rmholdergeo/batchRCLC)