Barbara C. Ratschbacher

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**EDUCATION**

*August 2017* **Ph.D.**,University of Southern California, USA

*Title: Depth-dependent physical, chemical and temporal evolution of crustal differentiation in magmatic arcs*

Thesis advisor: Prof. Scott R. Paterson

June 2012 **Diploma (B.S, M.S.)**, Eberhard-Karls Universität Tübingen, Germany

*Title: Petrogenesis of the nepheline syenitic lujavrites within the Ilímaussaq alkaline complex, SW Greenland*

Thesis advisors: Prof. Dr. Gregor Markl and Dr. Michael Marks

**PROFESSIONAL EXPERIENCE**

2017 – present **Postdoctoral Fellow**, California Institute of Technology, USA

2014 – 2015 **Graduate Research Assistant**, USC, CA, USA

2009 – 2009 **Research Internship** at Institute for Crustal Studies, UCSB, CA, USA

2007 – 2008 **Research Assistant**, Eberhard-Karls Universität Tübingen, Germany

2006 – 2006 **Research Internship**, Naturkundemuseum, Stuttgart, Germany

**FELLOWSHIPS, GRANTS AND ACADEMIC AWARDS**

**1.** **NSF Petrology and Geochemistry Standard Grant (EAR 1841790) | *Title:*** *Fe3+/FeT Ratios in Amphiboles – A New Tool to Understand the Redox State of Arc Magmas* | In collaboration with Claire Bucholz (Caltech) and Jennifer Jackson (Caltech) | May 2019

**2.** **Geology Option Postdoc Fellowship** |*Title:**Oxidation state of the arc crustal column* | Awarded by the California Institute of Technology | October 2017

**3. NSF CIDER (Cooperative Institute for Dynamic Earth Research) grant** | *Title: Insights into the architecture of active continental arcs revealed by combined geochemical and seismic data* | December 2017

**4. WiSE (Women in Science and Engineering) Merit Award (Honoarble Mention)** | Awarded by the University of Southern California | 2016 - 2017

**5. USC Graduate School Research Enhancement Fellowship**| Awarded by the University of Southern California | 2016 - 2017

**6. NSF EarthScope Award for Geochronology Student Research** | *Title: Timescales of shallow-level pluton construction via differentiation and crystal-melt separation – implications for the volcanic-plutonic connection* | April 2016

***7.* USC Graduate Research Award** | Awarded by the University of Southern California | 2013 and 2014

***8.* GSA Graduate Student Research Grant (Outstanding Mention)** | *Title: Formation of felsic segregations in a bimodal pluton within an active continental margin setting: constrains from textures and petrology* | Awarded by the Geological Society of America | May 2013

**TEACHING EXPERIENCE**

**GEOL 464: Field Geology** | Teaching Assistant at University of Southern California *|*

*Semester-long classes and a field trip involving student-mapping trips to Argentina in cooperation with the University of La Rioja, Argentina |* January – June 2015 and 2017

**GEOL 130: Nature of Scientific Inquiry and GEOL 315: Mineralogy** | *Teaching Assistant at the University of Southern California*| Preparation, setup and introduction to lab exercises and weekend field trips  **|** August 2012 – August 2014 (4 semester)

**Mineral and Rock Identification** | *Teaching Assistant at the Eberhard-Karls Universität Tübingen, Germany* | Setting up of lab material and supervision of student exercises | October 2007 – February 2011 (7 semester)

**MENTORSHIP**

**Undergraduate Research Project in Geochemistry** of Julia Chen | Development of amphibole standards for SIMS analyses for water and hydrogen isotope compositions | Academic year 2019 – ongoing

**Undergraduate Research Project in Petrology/Geochemistry** of Leslie Insixingmay | Characteristics of early mafic magmatism in crustal reservoirs from ~ 5 to 30 km depth in the Cascades Core, Washington | Academic year 2016 – 2017

**Undergraduate Research Project in Structural Geology** of Geoffrey Degrande | Structures and kinematics of a newly discovered > 4km wide shear zone in Cuesta de Randolfo, Argentina | Academic year 2015 - 2016

**RESEARCH SKILLS**

1. High-temperature/pressure experiments using a Piston-cylinder setup | California Institute of Technology, USA
2. Single–crystal Synchrotron-based Mössbauer spectroscopy to determine Fe3+/FeT ratios in amphiboles | Advanced Photon Source, Argonne National Laboratory, USA
3. Secondary-ion mass spectrometry (SIMS) of H isotope and water contents in amphiboles | California Institute of Technology, USA
4. Single mineral XRD of amphiboles | California Institute of Technology, USA
5. Sample preparation and analyses for U-Pb ID-TIMS-TEA geochronology and trace element measurements in zircon | Princeton University, USA
6. In-situ trace element LA-ICP-MS analyses of zircon, amphibole, pyroxene and titanite | University of California, Santa Barbara, USA and Texas Tech University, USA
7. Electron microprobe analyses of major elements in silicate minerals | University of California, Los Angeles, USA and Eberhard-Karls Universität Tübingen, Germany
8. Sample preparation and XRF analyses | Eberhard-Karls Universität Tübingen, Germany and Pomona College, USA

**FIELD EXPERINCE**

Famatinian Arc, Argentina | Structural Geology | 2015, 2016, 2017

North Cascades, Washington, USA | Igneous Petrology | 2013, 2015, 2016

Khantaishir Arc, Mongolia | Igneous Petrology | 2014

Talkeetna Arc, Alaska | Igneous Petrology | 2013

Sierra Nevada Arc, USA | Igneous Petrology | 2013

Ilímaussaq intrusion, Greenland | Igneous Petrology | 2011

**SERVICES, ACTIVITIES AND PROFESSIONAL AFFILIATIONS**

**Session Convener**

1. *Igneous Processes throughout the Arc Crustal Column and Oceanic Mantle* | Goldschmidt Conference, 2018, Boston, USA
2. *Dance of Arcs: Causes of Arc Migrations, Flare-ups, and Magmatic Focusing* | GSA Annual Meeting 2017, Seattle, USA
3. *Causes and Consequences of magmatic and tectonic tempos in Continental and Oceanic Arcs* | GSA Cordillera Section Meeting, 2016, Ontario, USA

**Seminar Coordinator**

1. Lithosphere Dynamic Seminar, University of Southern California | 2013 – 2014
2. Department Seminar, University of Southern California | 2014 – 2015
3. *Graduate Student Representative |* University of Southern California | 2014 – 2015

**Memberships**

Mineralogical Society of America (MSA), Geochemical Society (GS), Geological Society of America (GSA), American Geophysical Union (AGU), German Mineralogical Society (DMG), Association of Women Geoscientist (AWG), IAVCEI (International Association of Volcanology and Chemistry of Earth’s Interior)

**INVITED ORAL PRESENTATIONS**

University of Georgia, Athens, USA | Department Seminar Series | April 2019

American Museum of Natural History, New York | Seminar Series | January 2019

University of Washington, Seattle, USA | Department seminar | April 2018

Lamont-Doherty Earth Observatory, USA – Geodynamic Seminar | November 2017

California State University, Fullerton, USA – Geology Seminar | October 2017

GSA Annual Meeting 2017, Seattle | October 2017

California Institute of Technology, USA – Geoclub Seminar | January 2017

**PUBLICATIONS**

**Published:**

1. Werts, K., Barnes, C., Memeti, V., **Ratschbacher B.**, Williams, D., and Paterson S., 2019: *Hornblende as a Tool for Assessing Mineral-Melt Equilibrium and Recognition of Crystal Accumulation.* American Mineralogist, in press.
2. **Ratschbacher B.**, Paterson, S., Fischer, T., 2019: *Spatial and depth-dependent variations in magma volume addition and addition rates to continental arcs: Application to global CO2 fluxes since 750 Ma*. Geochemistry, Geophysics, Geosystems, v. 20, 6, p. 2997-3018.
3. **Ratschbacher, B.,** Keller, C. B., Schoene, B., Paterson, S. R., Anderson, J. L., Okaya, D., Putirka, K., and Lippoldt, R., 2018: *A new workflow to assess emplacement duration and melt residence time of compositionally diverse magmas emplaced in a sub-volcanic reservoir.* Journal of Petrology, v. 59, 9, p. 1787-1809.
4. Larrovere, M.A., Suzaño, N., **Ratschbacher, B.,** Sola, A., Alasino, P.H., Fuentes, M.G., Weinberg, R.F., Paterson, S.R., Becchio, R. y Finch, M.A., 2017: *Las fajas de cizalla dúctil del basamento ígneo-metamórfico del NOA.* In: Muruaga, C.M. y Grosse, P. (Eds.), Ciencias de la Tierra y Recursos Naturales del NOA. Relatorio del XX Congreso Geológico Argentino, San Miguel de Tucumán: 579-601. ISBN 9789874266668.
5. **Ratschbacher, B.**, Marks, M., Bons, P. and Markl, G., 2015: *Emplacement and geochemical evolution of highly evolved syenites investigated by a combined structural and geochemical field study: The lujavrites of the Ilímaussaq complex, SW Greenland.* Lithos, v. 231, p. 62-76.

**In review:**

1. **Ratschbacher B.**, Cawood, T., Larrovere, M. A., Alasino, P.H. Paterson S., Lusk, A.D., Memeti V.: Strain softening in the ≥ 6 km-wide Randolfo mylonite zone in Famatinian peraluminous granites, Argentina. Journal of Structural Geology.
2. Lusk, A. D., **Ratschbacher. B.**, Larrovere, M. A., Alasino P. H., Memeti, V., Paterson S.R*.: Deformation and Upper-Crustal Architecture of the Ordovician Famatinian Arc in the Sierra de Narváez and the Sierra de Las Planchadas, NW Argentina*. Journal of South American Earth Sciences.

**In preparation:**

1. **Ratschbacher B.,** Chen J., Bucholz C.E.: Amphibole water contents and hydrogen isotope compositions: Evaluating
2. Delph J., Shimizu K., **Ratschbacher B.,** Rasmussen D.J., Pu X.,: *Insights into the architecture of active arcs revealed by combined geochemical and seismic data.* To be submitted to JGR Solid Earth Special volume: Merging Geophysical, Petrochronological and Modeling Perspectives to Understand Large Silicic Magma Systems.
3. **Ratschbacher B.,** Bucholz C.E., Jackson J.M., Solomatova N.V.:*Single-crystal synchrotron-based Mössbauer spectroscopy study of volcanic amphiboles.* To be submitted to American Mineralogist.
4. **Ratschbacher B.,** Bucholz C.E., Jackson J.M.: *High-spatial resolution of Fe3+/FeT ratios in volcanic amphiboles as a function of mineral composition, magmatic oxygen fugacity and post-crystallization processes.* To be submitted to Contributions to Mineralogy and Petrology.
5. **Ratschbacher, B., Keller, C.B., Ardill, K., Schoene, B., Paterson S., Putirka K.: Petrogenesis of contemporaneous bimodal plutonism in a shallow-crustal Cordilleran magma reservoir. To be submitted to the Journal of Petrology.**

**Conference contributions:**

1. **Ratschbacher B.**, Bucholz C.E., Jackson J.M., Solomatova N.V. (2019): *Fe3+/FeTratios in volcanic amphiboles determined by single-crystal synchrotron Mössbauer spectroscopy as a function of mineral composition, magmatic oxygen fugacity and post-crystallization processes.* Poster presentation at the AGU Fall meeting 2019, San Francisco, USA.
2. **Ratschbacher B.**, Bucholz C.E., Jackson J.M., Solomatova N.V., Sosa E. (2019): *Variations in Fe3+/FeT ratios in igneous amphiboles as a function of oxygen fugacity in hydrous arc magmas.* Poster presentation at the GeoMünster meeting 2019, Münster, Germany.
3. **Ratschbacher B.,** Bucholz C.E., Jackson J.M., Solomatova N.V. (2018): *Variations in Fe3+/FeT in amphibole as a function of magmatic oxygen fugacity and mineral composition.* Poster presentation at AGU Fall Meeting 2018, Washington D.C.
4. **Ratschbacher B.,** Paterson S., Fischer T.P. (2018): *Magma addition rates in continental arcs: A new protocol of calculation and global implications.* Talk at the Goldschmidt conference 2018, Boston, USA.
5. Delph J., Shimizu K., Rasmussen D.J., **Ratschbacher B.**, Pu X. (2018): *A geochemical and seismic search for deep, active MASH zones.* Invited oral presentation at the Goldschmidt conference 2018, Boston, USA.
6. Werts K., Barnes C.G., Memeti V., Paterson S., **Ratschbacher B**., Williams D. (2018): *Volcanic versus Plutonic Hornblende: Tools for Discerning Crystal Accumulation and Melt Loss.* Oral presentation at the Goldschmidt conference 2018, Boston, USA.
7. **Ratschbacher B.,** Cawood T., Lusk A., Larrovere M., Rock C., Alasino P., Paterson S., Memeti V. (2018): *Strain localization mechanisms (or lack thereof) in a ~10 km wide, syn- to post-magmatic mylonite zone in the Famatinian arc.* Poster presentation at the EGU meeting, Vienna, Austria.
8. Pu X., Delph J.R., Shimizu K., Rasmussen D.J., **Ratschbacher B.** (2017): *Where do arc magmas differentiate? A seismic and geochemical search for active, deep crustal MASH zones.* Poster presentation at the AGU meeting, 2017, New Orleans.
9. **Ratschbacher B.**, Paterson S., Alasino P., Larrovere M., Cao W., Okaya D. (2017): *Depth-dependent changes in deformation and magmatism in the Famatinian arc. Argentina: Implications for isostatic responds and mountain building*. Invited talk at GSA Annual Meeting, Seattle, USA.
10. Attia, S., Paterson S., Ardill K., Martinez A., **Ratschbacher B.**, Cao W., Cottle J. (2017): *Upper crustal Evolution during an arc flare-up: Integrating sedimentary, volcanic, and plutonic records of the Triassic-early Jurassic continental arc upper crustal section, eastern-central Sierra Nevada, CA*. Poster presentation at the GSA Annual Meeting, Seattle, USA.
11. Cawood T., Paterson S., **Ratschbacher B.**, Lusk A., Larrovere M., Alasino P., Rick C., Memeti V. (2017): *Strain (de)-localization in the ~ 10 km wide Cuesta de Randolfo mylonite zone, Famatinian arc.* Poster presentation at the GSA Annual Meeting, Seattle, USA.
12. Larrovere M., Paterson S., Alasino P., **Ratschbacher B.**, Lusk A., Cawood T. (2017): *Architecture of a crustal scale ductile shear zone system in a hot orogen: the Ordovician Famatinian orogen, NW Argentina.* Oral presentation at the GSA Annual Meeting, Seattle, USA.
13. Hartman S., Paterson S., **Ratschbacher B.** (2017): *A revised loading and exhumation model for the Swakane biotite gneiss, Cascades Crystalline Core (CCC), WA: Implications for Mesozoic Tectonics.* Poster presentation at the GSA Annual Meeting, Seattle, USA.
14. Lusk A., Paterson S., **Ratschbacher B.**, Larrovere M., Alasino P., Memeti V., Cawood T., Hernandez R. (2017): *Deformation of the uppermost Famatinian orogen: Mapping and structural analysis from the Sierra de Narváez and Sierra de Las Planchadas, NW Argentina*. Poster presentation at the GSA Annual Meeting, Seattle, USA.
15. Alasino P., Memeti V., **Ratschbacher B.**, Larrovere M., Paterson S., Lusk A., Cawood T. (2017): *Geochemical architecture and evolution of the Famatinian magmatic arc crustal section in NW Argentina.* Poster presentation at the GSA Annual Meeting, Seattle, USA.
16. Memeti V., Paterson S., Alasino P., **Ratschbacher B.**, Larrovere M., Ardill K., Cawood T., Lusk A., Insixiengmay L. (2017): *Igneous architecture at the top of the Famatinian arc, NW Argentina.* Poster presentation at the GSA Annual Meeting, Seattle, USA.
17. **Ratschbacher B.**, Keller B., Schoene B., Paterson S., Anderson L., Okaya D., Putirka K., Lippoldt R. (2017): *Time scales of construction and compositional evolution of a bimodal shallow crustal magma reservoir and implications for differentiation in the upper crust*. Poster presentation at the IAVCEI Scientific Assembly 2017, Portland, USA.
18. **Ratschbacher B.,** Paterson S., Anderson L. (2016): *Investigating magmatic and tectonic processes from 5 to 30 km depth in a thick continental magmatic arc, ~ 90 Ma magmatism in the Cascades, Washington, USA.* Poster presentation at the EMC conference 2016 in Rimini, Italy.
19. **Ratschbacher B.,** Degrande G., Larrovere M., Paterson S. and Alasino P. (2016): *A > 4 km wide ductile shear zone in the Cuesta de Randolfo: Late-stage strain localization in the Famatinian orogeny, Argentina*. Poster presentation at GSA Cordillera Section Meeting, Ontario, USA