

# John M Cottle

Professor of Earth Science

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## Biography

My main research interests lie in the fields of geochronology, and tectonics. I combine igneous and metamorphic petrology with high-resolution isotope geochronology (U-Th/Pb, Lu-Hf, Sm-Nd, Ar-Ar) and geochemistry to identify and constrain the temporal and spatial scale of processes that serve to modify and/or produce new continental crust. Through externally funded research in Nepal, Tibet, Antarctica, and New Zealand I have developed an appreciation for the geological complexity of high-grade terrains and the importance of using multiple approaches to unravel their tectonic evolution. I have significant mass spectrometry experience having developed new technology with staff at Nu Instruments and managed two state-of-the-art ICPMS laboratories (NIGL and UCSB). I believe my research record reflects my ability to solve complex geological problems in an innovative and dynamic way.

## Relevant Skills / Experience

Through my undergraduate and graduate studies, as well as employment at NIGL and UCSB, I have developed strong core skills in tectonics, geochemistry, structural analysis of deformed rocks, igneous and metamorphic petrology, U(-Th)/Pb geochronology and quantitative geothermobarometry.

## Education

**2008** D.Phil., University of Oxford, U.K. Thesis Title: “Timing of crustal metamorphism, melting and exhumation of the Greater Himalayan crust, Makalu, Kharta region, South Tibetan Himalaya”.

**2002** Master of Science (Geology with distinction), University of Otago, New Zealand. Thesis Title: “Magmatic evolution of a convergent margin - a Petrological study of Ross Orogeny magmatism in the Carlyon Glacier Region, southern Victoria Land, Antarctica”.

**2000** Bachelor of Science (Geology) (GPA 92), University of Otago, New Zealand. Thesis title: “Phreatomagmatic Volcanism, Pigroot Creek, East Otago, New Zealand”.

## Employment History

**July 2017 – present:** *Professor of Earth Science*, University of California, Santa Barbara CA, USA.

**March 2016 – present:** *Adjunct Associate Professor*, University of Tennessee, Knoxville, TN, USA

**July 2013 – June 2017:** *Associate Professor of Earth Science*, University of California, Santa Barbara CA, USA

**March 2009 – July 2013:** *Assistant Professor of Earth Science*, University of California, Santa Barbara CA, USA.

**November 2007 – Mar 2009:** *U-Pb Geochronology Research Scientist*, Natural Environment Research Council, National Isotope Geosciences Laboratory (NIGL), Keyworth, Notts, U.K. Responsible for assisting in running two multi-collector ICP-MS instruments as well as the installation

of a Nu Instruments AttoM single collector double focusing ICP-MS. Also involved in a variety of geochronology-based research projects including mid-crustal rocks in the Eastern Himalaya and time-scale calibration.

**October 2004 - October 2007:** *D.Phil Student*, Department of Earth Sciences, University of Oxford.

**February 2004 – September 2004:** *Survey and mapping geologist*, Institute of Geological & Nuclear Sciences Ltd New Zealand. I worked as part of the IGNS Q-MAP (Aoraki) program. My responsibilities included: compilation of previous data, producing geological maps and sample analysis in a variety of areas of the central Southern Alps of New Zealand.

**October 2002 – February 2003, October 2003 – February 2004, November – December 2005:** Employed as a *Field Guide* by Antarctica New Zealand and the University of Otago, I was charged with leading 4 scientific expeditions in the Transantarctic Mountains. My responsibilities included supervising and advising graduate students in the field, providing field safety expertise, logistical arrangements, flight planning, communication systems, First aid, navigation and route selection and travel on heavily glaciated terrain.

**November 2001 – March 2002:** As a *Geological Technician* at the Institute of Geological & Nuclear Sciences Ltd New Zealand I was responsible for compiling existing geological maps of Antarctica and designing fieldwork programs to produce a series of complete geological maps of the southern Victoria Land segment of the Transantarctic Mountains.

### **Awards and Scholarships**

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|---------|--|
| 2018    | Emerging Leader in Atomic Spectroscopy Award   |
| 2016-17 | Mineralogical Society of America, Distinguished Lecturer   |
| 2016    | Geological Society of America Mineralogy, Geochemistry, Petrology, Volcanology Division – Early Career Award.                                    |
| 2011    | Hellman Foundation award   |
| 2009    | UCSB Regents Junior Faculty Fellowship   |
| 2009    | Annual New Wave Laser Ablation Development prize   |
| 2007    | Tony Carswell prize for best student presentation (£200), Metamorphic Studies Group Meeting, Cambridge.  |
| 2006    | Mike Coward award for best student talk (£100) and Shell Award (£500) for best overall presentation. Tectonic Studies Group Meeting, Manchester. |
| 2005    | NERC NIGL award for U-Pb geochronology ( $\alpha$ 4+ grade, grant in kind of £32,000).   |
| 2004    | Tertiary Education Commission Bright Future Top Achiever Doctoral Scholarship  |
| 2002    | University of Otago M.Sc. Postgraduate Scholarship.  |
| 2003    | Prize for Best Poster at <i>Antarctica</i> New Zealand Annual Conference (NZ\$300)   |
| 2001    | Prize for Best Student Poster at New Zealand Geological Society Conference (NZ\$200)   |

**Current Funding:**

Proposal Title: U-Pb Thermochronology of Lower Crustal Xenoliths -- Estimating Moho Temperature in Order to Constrain Crustal Heat Production. Source of Support: NSF Petrology & Geochemistry: \$394,453

Proposal Title: Collaborative research: Andean Plutonic Perspectives on Generation, Storage, and Eruption of Rhyolite: NSF Petrology & Geochemistry: \$86,426

Proposal Title: Unlocking the Early Jurassic tectonic history of Gondwana. Source of Funding: UCSB Senate: \$14,313

Proposal Title: Developing Sustainable Water Use Systems in the Mineral Science Laboratories at UCSB. Source of Support: UCSB Sustainability Initiative: \$5325

Proposal Title: Characterizing and Modeling Crustal recycling. Source of Support: NSF Petrology & Geochemistry: \$319,885

Proposal Title: Petrologic Constraints on Subduction Termination From Lamprophyres, Ross Orogen, Antarctica. Source of Support: NSF Polar Programs: \$257,128.

Proposal Title: Acquisition of a Thermal Ionization Mass Spectrometer (TIMS) for high-precision isotopic research of the Earth's mantle, crust and oceans. Source of Support: NSF MRI: \$524,244 (not including UCSB match).

**Total current funding: \$1,601,774 USD**

**Previous Funding:**

Proposal Title: Tectonic Amalgamation of the Himalayan Middle Crust: Insight from the Kanchenjunga Himal. UCSB Faculty Senate: \$6800

Proposal Title: Evaluating mechanisms for Rare Earth Phosphate Mineralization in the Proterozoic Pinto Gneiss, Music Valley, Eastern Mojave, California. Source of Support: USGS - Mineral Resources Program: \$67,095

Proposal Title: Beyond plate tectonics: assessing the strength of the crust within large mountain belts. Source of Support: Hellman Foundation: \$35,000

Proposal Title: How Does the Mid-crust Accommodate Deformation in Large, Hot Collisional Orogens? Insight from the Himalaya-Tibet system. Source of Support: NSF Tectonics. Total Award Amount: \$368,174

Proposal Title: Polar Research: Nature and scale of magmatic segmentation in continental arcs, a case study from the Ross Orogen, Antarctica. Source of Support: NSF Polar Program. Total Award Amount: \$312,587

Proposal Title: Improving the Accuracy and Precision of Monazite and Allanite Geochronology via ID

Th-Pb Ages for Reference Materials. Source of Support: NSF Petrology & Geochemistry. Total Award Amount: \$133,321

Proposal Title: Collaborative Research: Orogen-parallel mid-crustal flow and exhumation of domes along the southern margin of the Tibetan Plateau. Source of Support: NSF Tectonics. Total Award Amount: \$41,411

Proposal Title: MRI: Acquisition of an Electron Microscope for UCSB Researchers and Educators. Source of Support: NSF – MRI. Total Award Amount: \$477,500 + \$0.6M from UCSB

Proposal Title: Testing Models of gneiss dome formation during continental collision: insight from the Himalaya. Source of Support: UCSB Academic Senate. Total Award Amount: \$5240.

Proposal Title: Unlocking 100 Million Years of Lithospheric History Recorded in the South Island of New Zealand. Source of Support: UCSB Regents Junior Faculty Fellowship. Total Award Amount: \$7500

**Total funding since arrival at UCSB: \$3,656,402 USD**

**Teaching:** I have taught upper division undergraduate courses in scientific writing, structure, geochemistry, igneous and metamorphic petrology, field studies, geochronology, thermodynamics, plate tectonics, optical mineralogy analytical methods and graduate seminars in mass spectrometry and continental tectonics. A full list of classes I have taught can be found here: <http://www.geol.ucsb.edu/faculty/cottle/COURSES.html>

**Synergistic Activities:**

18. Editorial Advisory board of Spectroscopy, 2018 –
17. Member of NSF panel, September 2017.
16. GSA Lithosphere Editorial Board, 2017 – 2019.
15. Member of NSF panel, August 2016.
14. Mineralogical Society of America, Distinguished Lecturer. 2016-17.
13. Chair of search committee for Earth Surface Processes Assistant Professor position. Department of Earth Science, UCSB. Feb 2016 –
12. Chair of search committee for Electronics Engineer staff position, Department of Earth Science, UCSB.
11. Associate Editor Tectonics, 2014 –
10. Invited participant in NSF EarthCube Geochronology Strategic Visioning Workshop (50 invited scientists). Madison, WI. October, 2013.
9. Member of NSF panel, June 2013.
8. Invited participant in NSF EarthCube Early Career Strategic Visioning Workshop (50 invited early career scientists). Washington DC. October, 2012.

7. Currently the Earth Science Department representative on the UCSB academic senate, I chair the technical staff oversight committee and am a member of departmental committees for field studies and space allocation.
6. Member of the NSF panel, October, 2011.
5. Manuscript Reviewer for: Chemical Geology, EPSL, GCA, J.Geol.Soc.London, Geological Magazine, New Zealand Journal of Geology and Geophysics, Journal Asian Earth Sciences, Precambrian Research, Tectonophysics, Geology, GSA (lithosphere, GSA Bulletin, Geology, Geosphere), Gondwana Research, J.Structural Geology, Geostandards & Geoanalytical Research, Nature Geoscience, Journal of Geology, Tectonics, J.Metamorphic Geology, Journal of Analytical and Atomic Spectroscopy, J.Petrology, Lithos, Rapid Communications in Mass Spectrometry and G-Cubed. (32 manuscripts in last 48 months).
4. Leading a community-based initiative to standardize protocols for uncertainty assessment, age reporting and data management for laser-ablation U-Th-Pb protocols.
3. Active volunteer member of Santa Barbara partners in Education – a non-profit organization that connects individuals with schools and the organizations that serve them in order to help improve public education
2. Active member of UCSB's research mentorship program, which provides and hands on research experience and mentorship to local high school students over summer.  
([www.summer.ucsb.edu/RMP/rmp](http://www.summer.ucsb.edu/RMP/rmp))
1. Appearance in the Educational Media Production: "Tree of Life - exploring the origins of Darwin's great idea" (In production) BBC Natural History Unit

**Laboratory Experience:** SEM, EPMA, XRF, XRD, SIMS, ID-TIMS, LA-ICPMS (Q, SF, MC). Currently developing a new generation single-collector 'AttoM' ICP-MS with Nu Instruments and a femtosecond laser with Photon Machines. Joint director of the UCSB LA-ICPMS Laboratory (<http://sites.google.com/site/icpgeolucsb>). **Field Experience:** Plate boundary processes: Alpine Fault New Zealand, Nepal / Tibet. Extensional tectonics: Tibet, Greece, Taupo Volcanic Zone (NZ). Granite petrogenesis: southern Victoria Land Antarctica, Fiordland (NZ), Canadian Cordillera, NW Scotland. Basaltic volcanology / LIPs: Antarctica, South Africa. Accretionary processes: South Island of New Zealand, Canadian Cordillera.

Collaborators: **(in the past 48 months):** T Ahmad (Delhi University), C Barnes (Texas Tech), M Behn (WHOI), A Carter (UCL), A Cooper (Otago), S Cox (GNS, NZ), T. Fischer, University of New Mexico), C Hetherington (Texas Tech), M. Grove (Stanford), D Grujic (Dalhousie), D. Hilton, (Scripps Institution of Oceanography), M Horstwood (NERC Isotope Geosciences Laboratory, UK), R Jamieson (Dalhousie), M Jessup (U.T. Knoxville), K Larson (Saskatoon), R Law (Virginia Tech), L.C Mantilla-Figueroa (Santander), D Newell (LANL), A Maloof (Princeton), B Schoene (Princeton), Z. Sharp, (University of New Mexico), J. Spotila, (Virginia Tech), M. Streule (Oxford University, UK), R. Tracy, (Virginia Tech), A Tulloch, (GNS, NZ), C Warren (Open University).

**Graduate<sup>†</sup>, Postgraduate\* and Post Doctoral Sponsor<sup>#</sup>:** A Cooper<sup>†</sup> (Otago), M Searle\* (Oxford), D Waters\* (Oxford), R Parrish<sup>#</sup> (NIGL), Matthew Horstwood<sup>#</sup> (NIGL).

**Thesis Advisor and Postgraduate Sponsor: (17 students):** David Riley (M.E.Sc., Oxford, now at Shell), Samuel Weatherley (M.E.Sc., Oxford, now at Canadian Geological Survey); Graham Lederer (PhD, UCSB, now at USGS); Jackie Langille (PhD, UT Knoxville, now at UNC Asheville); Amanda

Willingham (MS, UCSB now at Alaska State Survey); Graham Hagen-Peter (PhD, UCSB now at Aarhus); Bryan Norman (MS, UCSB, now at now at California State Lands Commission); Tyson McKinney (MS, UCSB now at California State Lands Commission); Jacob Poletti (MS, UCSB, now geologist at Desilva Gates); Janelle McAtamney (PhD, UCSB); Tim Diedesch (PhD, UT Knoxville, now at U. Georgia Southern); Sophie Briggs (PhD, UCSB); Demian Nelson (PhD, UCSB), Carina Edelman (MS, UCSB, now at Ninyo & Moore Geotechnical); Elizabeth Erickson (PhD, UCSB); Alex Johnson (PhD, UCSB); Nicoletta Browne (MS, UCSB). **Post Doctoral Sponsor: (3)** Dawn Kellett (UCSB, now a research scientist at Geological Survey Canada), Erin Shea (UCSB, now an Assistant Professor at U.A. Anchorage), Catherin Mottram (UCSB, now a lecturer at Portsmouth University). 21 Additional graduate student committees. **Undegraduate Thesis Advisor (12).**

## Publications

- a complete list of publications and abstracts can be found at: [www.geol.ucsb.edu/faculty/cottle/](http://www.geol.ucsb.edu/faculty/cottle/)

- \*indicates student author

## In review:

94. Schaen, A.J., Singer, B.S., Cottle, J.M., Garibaldi, N., Schoene B. Satkoski, A.M., Fournelle, J. A Textural and Mineralogical Record of Melt Extraction? During Silicic Cumulate Formation in a Young Epizonal Andean Pluton. *J. Petrology*.

93. **Cottle, J.M.** Foreword to Volume-1; "Novel Instrumentation and Applications"; Inductively coupled plasma mass spectrometry. Edited by Akbar Montaser.

92. **Cottle, J.M.** Summary of recent research in Laser-based ICP-MS Geochronology; "Novel Instrumentation and Applications"; Inductively coupled plasma mass spectrometry, 4<sup>th</sup> edition. Edited by Akbar Montaser.

91. Nelson, D.A., **Cottle, J.M.** Zircon U-Pb and Hf isotopes link the Gondwana arc record for West Antarctica, Australia, and South America. *Gondwana Research*.

90. Kellett, D.A., **Cottle, J.M.**, Larson, K.P. The South Tibetan detachment system: history, advances, definition and future directions. *Journal Geological Society Special Publication*.

89. Braden, Z., Godin, L., **Cottle, J.M.** Yakymchuk, C. Fast and furious: Late Miocene hinterland ductile thrusting and rapid exhumation, western Nepal Himalaya. *Geology*.

88. Payrola, P., Hongn, F., DelPapa, C., Aramayo, A., Pingel, H., Zeilinger, G., Georgieca, V., Sobel, E., Strecker, M., Salado Paz, N., **Cottle, J.M.** Variable spatio-temporal deformation patterns promoted by Cenozoic fault reactivation in NW Argentina. *Tectonics*.

87. Iaccarino, S., Carosi, R., Montomoli, C., **Cottle, J.M.** Constraining The Evolution Of Shear Zones In The Himalayan Mid Crust: Fusing Structural Geology And Petrochronology. *Journal of Structural Geology*.

86. Mosolf, J.G., Gans, P.B., Wyss, A.R., **Cottle, J.M.**, Flynn, J.F. Late Cretaceous to Miocene magmatism and upper crustal deformation in the Principal Cordillera, central Chile: Evidence of protracted arc volcanism and implications for Andean tectonics. *GSA Bulletin*.
85. Mazza, S.E., Mako, C., Law, R.D., Caddick, M.J., Krabbendam, M., **Cottle, J.M.** Thermobarometry of the Moine and Sgurr Beag thrust sheets, northern Scotland. *Journal of Structural Geology*.
84. Briggs, S.I., **Cottle, J.M.**, Smit, M.A. Record of Gondwana breakup in New Zealand from Lu-Hf garnet geochronology of the Alpine Schist. *Journal of Metamorphic Geology*.
83. \*Soucy La Roche, R., Godin, L., **Cottle, J.M.**, Kellett, D.A. Preservation of the early evolution of the Himalayan middle crust in foreland klippen: insights from the Karnali klippe, west Nepal. *Tectonics*.
82. Mottram, C.M., **Cottle, J.M.**, Kylander-Clark, A.R.C. Along-strike variations in titanite U-Pb petrochronology support eastward younging in the core of the Himalaya. *Geology*.
81. Larson, K.P., Asghar, A., Shrestha, S., Soret, M., Ahmad, R., **Cottle, J.M.** Constraining the timing of metamorphism and deformation in the Swat valley, northern Pakistan: A case study from the Loe Sar dome. *Lithos*.
80. \*Brillo, V.M., Simms, A., Steinmann, J., **Cottle, J.M.** Age, Provenance, and Facies Architecture of an arid-land fluvial system in equatorial Pangaea: The Cloud Chief Formation in western Oklahoma, U.S.A. *Sedimentary Geology*.
79. Langille, J.M., Corrado, J., Seward, G., **Cottle, J.M.** Strain partitioning and displacement constraints of Acadian transpression across the Burnsville shear zone near Asheville, North Carolina, USA
78. \*Babazadeh, S., Ghorbani, M.R., **Cottle, J.M.**, Bröcker, M., D'Antonio, M., Ahmadi, P., & Mazzeo, F.C. Orogenic Late Oligocene and post-collisional Late Miocene U–Pb LA-ICP-MS ages for zircons from the central Urumieh-Dokhtar magmatic arc of Iran. *Lithos*.
77. \*Asghar A., Larson, K.P., **Cottle, J.M.**, Smit, M.A., Shrestha, S., Faisal, S. The Evolution of the Southern Asian Margin: P-T-t Paths from the Hindu Kush, Chitral, NW Pakistan. *Lithos*.
76. \*Diedesch, T.F., Jessup, M.J., **Cottle, J.M.**, & Zheng, L. Barrovian metamorphism and ductile extension accompanied by near-isothermal decompression in Lhagoi Kangri dome, south central Tibet *Journal of Metamorphic Geology*.

**Published:**

75. Bate Tibang, E.E., Suh, C.E., **Cottle, J.M.**, Ateh, K.I., Tiabou, A.F., Nche, L.A., Che, V.B., Vishiti., A. 2017. Petrology and geochronology of felsic volcanics in the Sabga area (Bamenda Highlands): implications for age variation along the Cameroon Volcanic line. *Journal of Geosciences* 62, 231-246. Doi: 10.3190/jgeosci.247.

74. Hagen-Peter, G.A., **Cottle, J.M.** 2017. Evaluating the relative roles of crustal growth versus reworking through continental arc magmatism: A case study from the Ross orogen, Antarctica. *Gondwana Research* (invited article).
73. Nelson, D.A., **Cottle, J.M.** 2017 Long term geochemical and geodynamic segmentation of the paleo-Pacific margin of Gondwana: insight from the Antarctic and adjacent sectors. *Tectonics*.
72. **Cottle, J.M.**, Stearns, M.A. 2017. Application of Split Stream Single Shot Laser Ablation Split Stream to Accessory Phase Petrochronology. *AGU Monograph* (invited article).
71. Schaen, A.J., **Cottle, J.M.**, Singer, B.R., Keller, C.B., Garibaldi, N., Schoene, B. 2017. Complementary crystal accumulation and rhyolite melt segregation in a late Miocene Andean pluton. *Geology*.
70. Larson, K.P., Piercey, S. **Cottle, J.M.** 2017. Preservation of a Paleoproterozoic Rifted Margin in the Himalaya: Insight from the Ulleri-Phaplu-Melung Orthogneiss. *Geoscience Frontiers*.
69. Tofelde, S., Schildgen, T., Savi, S., Pingel, H., Wiskert, A.D., Bookhagen, B., Wittmann, H., Alonso, R.N., **Cottle, J.M.**, Strecker, M.R. 100-kyr fluvial fill terrace cycles since the Middle Pleistocene in the southern Central Andes, Toro Basin, NW Argentina. *Earth and Planetary Science Letters*.
68. Larson, K.P., Camacho, A., **Cottle, J.M.**, Buckingham, H.A., Coutand, I., Ambrose, T.K., Rai, S.M. Cooling, exhumation and kinematics of the Kanchenjunga Himal, Far East Nepal. *Tectonics*.
67. \*Braden, Z., Godin, L., **Cottle, J.M.** 2017. Segmentation and rejuvenation of the Greater Himalayan sequence in western Nepal revealed by in situ U-Th/Pb monazite petrochronology. *Lithos*.
66. \*Babazadeh, S., Ghorbani, M.R., Bröcker, M., D'Antonio, M., **Cottle, J.M.**, Gebbing, T., Mazzeo, F.C., & Ahmadi, P. Late Oligocene-Miocene mantle upwelling and interaction inferred from undepleted mantle signatures in the gabbroic to granitic rocks from south Ardestan, Urumieh-Dokhtar magmatic arc, Iran. *International Geology Review*.
65. Larson, K.P., **Cottle, J.M.**, Lederer, G., McAtamney, J., Rai, S.M. 2017. Elucidating the Structural Framework of East-Central Nepal. *GSA Geosphere*.
64. \*Hagen-Peter, G.A., **Cottle, J.M.** 2016 Synchronous alkaline and subalkaline magmatism in the Ross orogen, Antarctica: Insights into magmatic sources and processes within a continental arc. *Lithos*. doi: 10.1016/j.lithos.2016.07.032
63. Woodhead, J., Horstwood, M.S.A., **Cottle, J.M.** 2016. LA-ICPMS isotope geochemistry and geochronology of the geological record. *Elements*. doi: 10.2113/gselements.12.5.317
62. \*Diedesch, T.F., Jessup, M.J., **Cottle, J.M.**, & Zheng, L. 2016. Tectonic evolution of the middle crust in southern Tibet from structural and kinematic studies in Lhagoi Kangri gneiss dome. *GSA Lithosphere*.



61. Larson, K.P., Kellett, D.A., **Cottle, J.M.**, King, J., Lederer, G., Rai, S.M. 2016. Anatexis, Cooling, And Kinematics During Orogenesis: Miocene Development Of The Himalayan Metamorphic Core, East-Central Nepal. *GSA Geosphere*. doi:10.1130/GES01293.1
60. \*Poletti, J. **Cottle, J.M.**, Hagen-Peter, G. 2016. Petrochronologic Constraints on the Origin of the Mountain Pass Carbonatite and Ultrapotassic intrusive Suites, California. *Journal of Petrology*. doi: 10.1093/petrology/egw050
59. \*Soucy La Roche, R., Godin, L., **Cottle, J.M.**, Kellett, D.A. 2016. Direct shear fabric dating constrains Early Oligocene onset of the South Tibetan Detachment in the western Nepal Himalaya. *Geology*. doi: 10.1130/G37754.1
58. Pingel, H., Mulch, A., Alonso, R.N., **Cottle, J.M.**, Hynek, S.A., Poletti, J., Rohrman, A., Schmitt, A.K., Stockli, D.F., Strecker, M.R. 2016. Surface uplift and convective rainfall along the southern Central Andes (Angastaco Basin, NW Argentina). *Earth and Planetary Science Letters*, 440, 33-42. doi:10.1016/j.epsl.2016.02.009
57. Jessup, M.J., Langille, J.M., **Cottle, J.M.**, Ahmad, T. 2016. Crustal thickening, Barrovian metamorphism, and exhumation of mid-crustal rocks during doming and extrusion: Insights from the Himalaya, NW India. *Tectonics*, 34. doi: 10.1002/2015TC003962.
56. \*Stearns, M.A., **Cottle, J.M.**, Hacker, B.R., Kylander-Clark, A.R.C. 2016. Extracting thermal histories from the near-rim zoning in titanite using coupled U-Pb and trace-element depth profiles by single-shot laser-ablation split stream (SS-LASS) ICP-MS. *Chemical Geology*, 422, 13-24. doi:10.1016/j.chemgeo.2015.12.011
55. \*Hagen-Peter, G. **Cottle J.M.**, Smit, M.A. 2016. Coupled garnet Lu-Hf and monazite U-Pb geochronology constrain early convergent margin dynamics in the Ross orogen, Antarctica. *Journal of Metamorphic Geology*. DOI: 10.1111/jmg.12182.
54. \*Gibson, R., Godin, L., Kellett, D.A., **Cottle, J.M.**, Archibald, D. 2016. Deformation variability along strike of the central Himalayan lower metamorphic core: Strain and geochronologic analyses. *GSA Bulletin*. doi:10.1130/B31328.1
53. \*Samperton, K.M., Schoene, B., **Cottle, J.M.**, Keller, B.C., Crowley, J.L., Schmitz, M.D. 2015. Magma emplacement, differentiation and cooling in the middle crust: integrated zircon geochronological–geochemical constraints from the Bergell Intrusion, Central Alps. *Chemical Geology*, 417, 322-340.
52. Larson, K.P., Ambrose, T.K., Webb, A.A., **Cottle, J.M.**, Shrestha, S. 2015. Reconciling Himalayan Midcrustal Discontinuities: The Main Central Thrust System. *Earth and Planetary Science Letters*, 429, 139-146.
51. **Cottle, J.M.**, Larson, K.P., Kellett, D.A. 2015. How Does the Mid-crust Accommodate Deformation in Large, Hot Collisional Orogens? A review of recent research in the Himalayan Orogen. *Journal of Structural Geology*, 78, 119-133. doi:10.1016/j.jsg.2015.06.008. Invited Review Article.

50. Nagy, C., Godin, L., Antolin, B., **Cottle, J.M.**, Archibald, D. 2015. Mid-Miocene Initiation of Orogen-Parallel Extension, NW Nepal Himalaya. *GSA Lithosphere*. doi: 10.1130/L425.1
49. \*Streit, R.L., Burbank, D.W., Strecker, M.R., Alonso, R.N., **Cottle, J.M.**, & Kylander-Clark, A.R. 2015. Controls on intermontane basin filling, isolation, and incision on the margin of the Puna Plateau, NW Argentina (~23°S). *Basin Research*. doi: 10.1111/bre.12141
48. \*Faisal, S., Larson, K.P., King, J., & **Cottle, J.M.** 2015. Rifting, subduction and collisional records from pluton petrogenesis and geochronology in the Hindu Kush, NW Pakistan. *Gondwana Research*, . doi:10.1016/j.gr.2015.05.014
47. \*Holder, R.M., Hacker, B.R., Kylander-Clark, A.R., **Cottle, J.M.**, 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.
46. **Cottle, J.M.**, Searle, M.P., Jessup, M.J., Crowley, J.L., & Law, R.D. 2015. Rongbuk Re-visited: Geochronology of Leucogranites in the Footwall of the South Tibetan Detachment System, Everest Region, Southern Tibet. *Lithos*. doi:10.1016/j.lithos.2015.03.019.
45. \*Ambrose, T.K., Larson, K.P., Guilmette, C., **Cottle, J.M.**, Buckingham, H., Rai, S. 2015. Lateral extrusion, underplating and out-of-sequence thrusting within the Himalayan metamorphic core, Kanchenjunga, Nepal. *GSA Lithosphere*. doi: 10.1130/L437.1
44. Larson, K.P. & **Cottle, J.M.** 2015. Initiation of crustal shortening in the Himalaya. *Terra Nova*. doi/10.1111/ter.12145.
43. \*McKinney, S.T., **Cottle, J.M.**, Lederer, G. 2015. Evaluating Rare Earth Element (REE) mineralization mechanisms in Proterozoic gneiss, Music Valley, California. *GSA Bulletin*. doi:10.1130/B31165.1
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**Recent invited talks:**

January 2018. *Frontiers in Laser Ablation Geochronology*. Plenary Lecture. 2018 Winter Conference on Plasma Spectrochemistry

November 2017. *Frontiers in Laser Ablation Petrochronology*. University of Tomsk.

October 2017. The Metamorphic and Magmatic History of the Ross Orogen in Southern Victoria Land, Antarctica. 3rd Interdisciplinary Antarctic Earth Sciences meeting, Washington

September 2017. Linking texture, time and temperature: an example from the Everest Himalaya. Oxford University, Dave Waters Symposium.

March 2017. From Rags to Richs: Rare Earth Element Mineralization In the Western USA. University of Johannesburg.

March 2017. Taking The Pulse of the Himalaya: Insight Into Orogenesis From The Roof Of The World. University of Cape Town.

March 2017. From Rags to Richs: Rare Earth Element Mineralization In the Western USA. Namibian Geological Survey.

March 2017. Taking The Pulse of the Himalaya: Insight Into Orogenesis From The Roof Of The World.. University of Namibia.

March 2017. Taking The Pulse of the Himalaya: Insight Into Orogenesis From The Roof Of The World. James Madison.

March 2017. Taking The Pulse of the Himalaya: Insight Into Orogenesis From The Roof Of The World. William and Mary.

February 2017. Taking The Pulse of the Himalaya: Insight Into Orogenesis From The Roof Of The World. West Chester.

February 2017. Taking The Pulse of the Himalaya: Insight Into Orogenesis From The Roof Of The World. University of Missouri, Columbia.

February 2017. Taking The Pulse of the Himalaya: Insight Into Orogenesis From The Roof Of The World. Albion College,

February 2017. Taking The Pulse of the Himalaya: Insight Into Orogenesis From The Roof Of The World. South Dakota School of Mines & Technology,

March 2016. How Does the Mid-crust Accommodate Deformation in Large, Hot Collisional orogens? Insight from the Himalaya-Tibet system. Invited: UT Austin.

February 2016. How Does the Mid-crust Accommodate Deformation in Large, Hot Collisional orogens? Insight from the Himalaya-Tibet system. Invited: UBC Vancouver.

May 2015 Plenary talk “Advances in Isotope ratio measurements” North American Laser Ablation Conference.

October 2014 Invited talk at Earthscope Geochronology workshop: “U-Pb Geochronology High spatial resolution studies” GSA, Vancouver

August 2013 Frontiers in Laser Ablation U-Th/Pb Petrochronology Invited: Goldschmidt Meeting, Florence,

October 2013. How Does the Mid-crust Accommodate Deformation in Large, Hot Collisional Orogens? Insight from the Himalaya-Tibet system Invited: GSA Annual meeting, Denver.

May 2014. How Does the Mid-crust Accommodate Deformation in Large, Hot Collisional orogens? Insight from the Himalaya-Tibet system Invited: UC Riverside.

Micro-sampling of low Pb (“young”) monazite – options, restrictions and potential. Keynote talk GSA Annual Meeting, Minneapolis.

Quantifying the transition from orogen-normal to orogen-parallel crustal flow in the Himalaya Invited: USC.

Unraveling the Subduction Dynamics of the Ross Orogen: Insight from the Koettlitz Glacier region. Invited: McMurdo Station Science Lecture Series

Quantifying the transition from orogen-normal to orogen-parallel crustal flow in the Himalaya Invited: Department of Earth and Environmental Sciences, Lehigh.

Recent advances in in-situ Monazite petrochronology Keynote: 2012 Structural Geology and Tectonics Forum, Williams College.

Monazite petrochronology by laser ablation split stream inductively coupled plasma mass spectrometry (LASS-ICPMS) Goldschmidt Meeting, Montréal.

How Does the Mid-crust Accommodate Deformation in Large, Hot Collisional orogens? Insight from the Himalaya-Tibet system. Invited: University Nevada, Reno

How Does the Mid-crust Accommodate Deformation in Large, Hot Collisional orogens? Insight from the Himalaya-Tibet system Invited: SCRIPPS, University of California, San Diego

Accessory phase geochronology by laser ablation split stream inductively coupled plasma mass spectrometry (LASS-ICPMS) Invited: Texas Tech

Frontiers in Laser Ablation U-Th/Pb Petrochronology Invited: Goldschmidt Meeting, Florence

How Does the Mid-crust Accommodate Deformation in Large, Hot Collisional Orogens? Insight from the Himalaya-Tibet system. Invited: GSA Annual meeting, Denver

## Referees

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