DR. LEAH E. MORGAN

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Employment

United States Geological Survey, Denver
Research Geologist, 2015-present

Scottish Universities Environmental Research Centre, University of Glasgow
Research Associate, 2014

Designed and implemented (in progress) feasibility study for future deployment of neutron source for in situ $^{40}Ar/^{39}Ar$ geochronology on space missions such as Mars rover missions. Collaborated with nuclear engineers for neutron modeling, and assessed mass spectrometry, sample handling, and neutron flux and mass requirements. Performed laboratory and fieldwork in single crystal $^{40}Ar/^{39}Ar$ geochronology.

Marie Curie Intra-European Fellowship, 2011-2013

Designed protocol for measuring ^{40}K abundances in $^{40}Ar/^{39}Ar$ mineral standards to improve K-Ar dating methods. Developed and applied new method for MC-ICP-MS measurements of $^{41}K/^{39}K$ ratios in terrestrial materials; discovered terrestrial variability in $^{41}K/^{39}K$. Applied the $^{40}Ar/^{39}Ar$ method to rocks and single crystals.

Carleton College
March 2014-June 2014
Visiting Assistant Professor, Geology Department

Taught lectures and field laboratories for introduction to geology course.

Vrije Universiteit, Amsterdam
August 2009-July 2011
Postdoctoral Fellow with the Marie Curie GTSnext Network

Designed and built a noble gas pipette system for measuring quantitative abundances of ^{40}Ar in $^{40}Ar/^{39}Ar$ mineral standards by calibrating the sensitivity of multi-collector mass spectrometers to improve K-Ar methods. Lead team of engineers and electricians in design of system. Operated $^{40}Ar/^{39}Ar$ laboratory and performed laboratory and fieldwork in $^{40}Ar/^{39}Ar$ geochronology.

Education

University of California, Berkeley
Ph.D. Earth and Planetary Science, 2009
Dissertation Title: $^{40}Ar/^{39}Ar$ geochronological constraints on the timing of human biological and behavioral evolution in the Ethiopian rift
Committee: Paul Renne (advisor), Donald DePaolo, M. Steven Shackley

Applied $^{40}Ar/^{39}Ar$ geochronology to questions in human evolution and archaeology. Collected samples in remote and demanding parts of Ethiopia, prepared and analyzed samples in $^{40}Ar/^{39}Ar$ geochronology laboratory at the Berkeley Geochronology Center and electron microprobe geochemistry laboratory at UC Berkeley. Developed laser methods to extend the $^{40}Ar/^{39}Ar$ method to analyze obsidian. Safely worked with radioactive materials.

Carleton College
B.A. Geology, *cum laude,* with distinction in major, 2004

Majored in Geology (with distinction in major for excellence in senior thesis), with courses (selected) in Mineralogy, Petrology, Structural Geology, Geomorphology, Sedimentology and Stratigraphy, and Tectonics. Worked as teaching assistant for Introduction to Geology, Geomorphology, and Structural Geology. Selected as Student Departmental Advisor and participated in departmental field trips in the Midwest and western United States. Attended off-campus studies programs in the Bahamas (Carbonate Sedimentology) and Italy (field mapping).

Awards and Grants

- *Early Career Researcher Award,* Goldschmidt Conference, Prague, 2011
- *Marie Curie Intra-European Fellowship, 203,000€,* K:ACCURATE, lead-PI, 2011
- *UK Space Agency CREST-2 Grant,* KHRONOS: An $^{40}Ar/^{39}Ar$ dating instruments package for Solar System exploration, *£120,455,* Research Co-Investigator, 2013
- *NASA Science Innovation Fund, $74,632,* A Novel Approach to Potassium Stable Isotope Measurements, *collaborator*, 2012
- *NERC Argon Isotope Facility Grant, £91,204,* Timing is everything: direct calibration of Siberian Trap volcanism and mass extinction at the P-Tr boundary*, co-PI,* 2012
- *Europlanet Personal Transnational Access Grant, 10,000€,* Isotopic measurements of enriched ^{40}Ar gas for $^{40}Ar/^{39}Ar$ calibration experiments, *lead-PI*, 2011
- EARTHTIME-EU Short Visit Grant, *€1690,* European Sci. Found., *lead-PI*, July 2013
- EARTHTIME-EU Short Visit Grant, *€1690,* European Sci. Found., *lead-PI*, June 2012
- EARTHTIME-EU Short Visit Grant, *€1690,* European Sci. Found., *lead-PI*, Dec. 2012
- NERC *Tephrochronology Facility Grant, £1250*, *lead-PI*, 2012
- *NERC Tephrochronology Facility Grant, £750*, *lead-PI*, 2011
- *Stahl Endowment grant,* Archaeological Research Facility, *$3,000,* UC Berkeley, 2008
- *Francis J. Turner Award, $2,500,* UC Berkeley, 2007

Publications

20. **Morgan, L.E.,** Davidheiser-Kroll, B. Pressure disequilibria induced by rapid valve closure in noble gas extraction lines. Geochemistry, Geophysics, Geosystems, 16, doi: 10.1002/2015GC005823.
19. **Morgan, L.E.,** 2015. Noble Gas Mass Spectrometry, in: W.J., and J.W. Thompson (eds.), Encyclopedia of Geoarchaeology. Springer.
18. **Morgan, L.E.,** 2015. $^{40}Ar/^{39}Ar$ and K-Ar Geochronology, in: Gilbert, A.S. (ed.), Encyclopedia of Scientific Dating Methods. Springer.
17. Sahle, Y., **L.E. Morgan,** D.R. Braun, W.K. Hutchings. Chronological and behavioral contexts of the earliest Middle Stone Age in the Gademotta Formation, Main Ethiopian Rift*, Quaternary International,* v. 331, p. 6-19.
16. Mark, D.F., M. Petraglia, V.C. Smith, **L.E. Morgan,** D.N. Barfod, B.S Ellis, N.J. Pearce, J.N. Pal, R. Korisettar, 2014. A high-precision $^{40}Ar/^{39}Ar$ age for the Young Toba Tuff and dating of ultra- distal tephra: forcing of Quaternary climate and implications for hominin occupation of India*, Quaternary Geochronology,* v. 21, p. 90-103.
15. Sahle, Y., W.K. Hutchings, D.R. Braun, J.C. Sealy, **L.E. Morgan**, A. Negash, B. Atnafu, 2013. Earliest stone-tipped projectiles from the Ethiopian Rift date to >279,000 years ago. PLOS ONE, *v. 8, no. 11, e78092.*
14. **Morgan, L.E.,** D.F. Mark, J. Imlach, D.N. Barfod, 2013. FCs-EK: A new sampling of the Fish Canyon tuff $^{40}Ar/^{39}Ar$ neutron flux monitor, in: Jourdan, F., Mark, D., and Verati, C. (eds.), Advances in $^{40}Ar/^{39}Ar$ Dating: from Archaeology to Planetary Sciences. *Geological Society, London, Special Publications, 378.*
13. Renne, P.R., A.L. Deino, F.J. Hilgen, K.F. Kuiper, D.F. Mark, W.S. Mitchell, **L.E. Morgan,** R. Mundil, J. Smit, *2013.* Timescales of critical events around the Cretaceous-Paleogene boundary. *Science,* v. 339, p. 684-687.
12. Schoene, B., D.J. Condon, **L.E. Morgan,** N. McLean, *2013*. Precision and accuracy in geochronology. *Elements Magazine,* v.9, no.1, p. 23-28.
11. Renne, P.R., S.R. Mulcahy, W.S. Cassata,, **L.E. Morgan,** S.P. Kelley, L. Hlusko, J. Njau, *2012.* Retention of inherited Ar by alkali feldspar xenocrysts in a magma: Kinetic constraints from Ba zoning profiles. Geochimica et Cosmochimica Acta, v. 93, p. 129-142.
10. **Morgan, L.E.**, P.R. Renne, R. Galotti, G. Kieffer, M. Piperno, J.-P. Raynal, *2012.* A chronological framework for a long and persistent archeological record: Melka Kunture, Ethiopia*. Journal of Human Evolution,* v. 62, no. 1, p. 104-115.

9. Frost, S.R., H.L. Schwartz, L. Giemsch, **L.E. Morgan**, P.R. Renne, M. Wildgoose, C. Saanane, F. Schrenk, K. Harvati, *2012*. Refined age estimates and paleoanthropological investigation of the Manyara Beds, Tanzania. *Journal of Anthropological Sciences*, v. 90, p. 151-161.
8. Schwartz, H., P.R. Renne, **L.E. Morgan**, M.M. Wildgoose, P.C. Lippert, S.R. Frost, K. Harvati, F. Schrenk, C. Saanane, *2012.* Geochronology of the Manyara Beds, northern Tanzania: stratigraphy and new magnetostratigraphy and $^{40}Ar/^{39}Ar$ ages. *Quaternary Geochronology,* v. 7, no. 1, p. 48-66.
7. **Morgan, L.E.**, O. Postma, K.F. Kuiper, D.F. Mark, W. van der Plas, S. Davidson, M. Perkin, I. Villa, J.R. Wijbrans, *2011*. A metrological approach to measuring $^{40}Ar^*$ concentrations in K-Ar and $^{40}Ar/^{39}Ar$ mineral standards, Geochem. Geophys. Geosyst., v. 12, p. A0AA20, doi:10.1029/2011GC003719.
6. Renne, P.R., A.L. Deino, W.E. Hames, M.T. Heizler, S.R. Hemming, K.V. Hodges, A.A.P. Koppers, D.F. Mark, **L.E. Morgan**, D. Phillips, B.S. Singer, B.D. Turrin, I.M. Villa, M. Villeneuve and J.R. Wijbrans, *2009.* Data reporting norms for $^{40}Ar/^{39}Ar$ geochronology. *Quaternary Geochronology,* v. 4, no. 5, p. 346-352.
5. Renne, P.R., W.S. Cassata, and **L.E. Morgan**, *2009*. The isotopic composition of atmospheric argon and $^{40}Ar/^{39}Ar$ geochronology: time for a change? *Quaternary Geochronology,* v. 4, no. 4, p. 288-298.
4. Renne, P. R., **L.E. Morgan**, G. WoldeGabriel, W.K. Hart, Y. Haile-Selassie, and T.D. White, *2009*. $^{40}Ar/^{39}Ar$ Ages of the Middle Awash Late Miocene, in: Haile-Selassie, Y., and WoldeGabriel, G. (eds.), Ardipithecus kadabba: Late Miocene evidence from the Middle Awash, Ethiopia. *University of California Press, Berkeley, CA.*
3. **Morgan, L.E.**, P.R. Renne, R.E. Taylor, and G. WoldeGabriel, *2009*. Archaeological age constraints from eruption ages of obsidian: Examples from the Middle Awash, Ethiopia. *Quaternary Geochronology*, v. 4, p. 193-203.
2. **Morgan, L.E.** and P.R. Renne, *2008*. Diachronous Dawn of Africa's Middle Stone Age: New $^{40}Ar/^{39}Ar$ ages from the Ethiopian Rift. *Geology*, v. 36, no. 12, p. 967-970.
1. Gihring, T.M., L.-H. Lin, M. Davidson, T.C. Onstott, **L. Morgan**, M. Milleson, T.L. Kieft, E. Trimarco, D.L. Balkwill, and M.E. Dollhopf, *2006*. The Distribution of Microbial Taxa in the Subsurface Water of the Kalahari Shield, South Africa. *Geomicrobiology Journal*, v. 23, p. 415-430.

Service

- Session convener, Goldschmidt 2014, AGU 2010, 2012, EGU 2011
- Reviewer, PLOS ONE, *Journal of the Geol. Soc., Nature Geoscience, Geology, Journal of Human Evolution, Quaternary Geochron., Chem. Geology, Geo. et Cosmo. Acta*
- Dissertation committee member, *VU Amsterdam*, 2012
- Corresponding secretary, Sigma Xi, UC Berkeley Chapter, 2005-2009

Teaching Experience

- Visiting Assistant Professor, Introduction to Geology, Carleton College, spring 2014
- Demonstrator, Field Mapping on the Isle of Arran, University of Glasgow, 2012
- Lecturer, Advanced Geochronology, Vrije Universiteit, 2010, 2011
- Guest Lecturer:
  Earth History, CU Boulder, 2015
  Human Evolution course, Universiteit Leiden, 2010
  GTSnext Mass Spectrometry Workshop, 2010
  Paleobiology Course, Carleton College, 2008
  Introductory Chemistry Course, Peralta College, 2008
  Geoarchaeological Science Course, UC Berkeley, 2007
- Graduate Student Instructor, UC Berkeley:
  Earthquakes in your backyard, 2009

Origin and Genesis of Rocks (Petrology), 2007, 2008
Field Studies in Northern Arizona, 2006
Stratigraphy & Earth History, 2005

- Laboratory Assistant, numerous courses, Carleton College, 2001-2004

Invited Talks (selected)

- China University of Geosciences, Wuhan, 2015
- Nanjing University, School of Earth Sciences, 2015
- Colorado State University, Department of Geosciences, 2015
- Wayne State University, Department of Geology, 2015
- Keynote, Stable Isotope Tracers of Magmatic Processes, Goldschmidt 2014
- EARTHTIME-China Inaugural Meeting, Beijing, 2013
- Numerous EARTHTIME and EARTHTIME-EU workshops, 2010-2013
- Stone Age Institute, University of Indiana Bloomington, 2013
- University of Kansas, Geology Department, 2013
- University of Oxford, Research Lab. for Archaeology & the History of Art, 2013
- Berkeley Geochronology Center, *Facility Seminar,* 2012
- Universiteit Leiden, *van Leeuwenhoek Lecture*, 2011
- Centre de Recherches Pétrographiques et Géochimiques, Nancy, France, 2011
- Universiteit Leiden, *Faculty of Archaeology Seminar,* 2010
- Universiteit Utrecht, *Paleomagnetic Laboratory Seminar,* 2010
- Scottish Universities Environmental Research Centre, *Facility Seminar,* 2009
- Vrije Universiteit, *Faculty of Earth & Life Science Seminar,* 2009

Abstracts

30. Morgan, L.E., B. Davidheiser-Kroll, K. Kuiper, J. Wijbrans, D.F. Mark, 2015. Metrologically-calibrated ^{40}Ar concentrations and ages of mineral standards used in ^{40}Ar/^{39}Ar geochronology. *American Geophysical Union Fall Meeting,* San Francisco.
29. Davidheiser-Kroll, B. L.E. Morgan, M. Munk, N.H. Warner, S. Gupta, R. Slaybaugh, P. Harkness, D.F. Mark, 2015. Instrumentation development for planetary in situ ^{40}Ar/^{39}Ar geochronology. *American Geophysical Union Fall Meeting,* San Francisco.
28. Munk, M., R. Slaybaugh, K. Van Bibber, **L. Morgan**, B. Davidheiser-Kroll, D. Mark, 2015. Design and feasibility study of a compact neutron source for extraterrestrial geochronology applications. *Joint International Conference on Mathematics and Computation (M&C), Supercomputing in Nuclear Applications (SNA), and the Monte Carlo (MC) Method,* Nashville, Tennessee.
27. **Morgan, L.E.**, J. Higgins, B. Davidheiser-Kroll, N. Lloyd, J. Faithfull, R. Ellam, 2014. Potassium isotope geochemistry and magmatic processes. Invited Keynote, *Goldschmidt Conference,* Sacramento.
26. **Morgan, L.E.**, B. Davidheiser-Kroll, M. Munk, K. van Bibber, P. Harkness, M. Lee, I. Wright, S. Gupta, D. Mark, 2014. Instrumentation development for planetary in situ ^{40}Ar/^{39}Ar geochronology. *Goldschmidt Conference,* Sacramento.
25. **Morgan, L.E.**, M. Tappa, R. Ellam, D. Mark, J. Higgins, J. Simon, 2013. Potassium isotopic compositions of NIST potassium standards and ^{40}Ar/^{39}Ar mineral standards. *American Geophysical Union Fall Meeting,* San Francisco.
24. **Morgan, L.E.,** N. Lloyd, R. Ellam, J. Simon, M. Tappa, 2013. Potassium Stable Isotopic Compositions Measured by High-Resolution MC-ICP-MS. *Goldschmidt Conference,* Florence.
23. **Morgan, L.E.,** Y. Sahle, 2013. Refined chronology of the earliest Middle Stone Age at Gademotta, Ethiopia. *William Smith Meeting 2013: The first century of Isotope Geochronology: the legacy of Frederick Soddy and Arthur Holmes,* Geological Society London.

22. Renne, P.R., A.L. Deino, F.J. Hilgen, K.F. Kuiper, D.F. Mark, W.S. Mitchell, **L.E. Morgan,** R. Mundil, J. Smit, C.J. Sprain, 2013. Timing of critical events around the Cretaceous-Paleogene boundary. *Volcanism, Impacts and Mass Extinctions: Causes and Effects*, The Natural History Museum, London.
21. **Morgan, L.E.,** N. Lloyd, R. Ellam, J. Simon, *2012,* Potassium stable isotopic compositions measured by high-resolution MC-ICP-MS. *American Geophysical Union Fall Meeting,* San Francisco.
20. Renne, P.R., A.L. Deino, F.J. Hilgen, K.F. Kuiper, D.F. Mark, **L.E. Morgan,** J. Smit. Implications of new $^{40}Ar/^{39}Ar$ data for the Cretaceous-Paleogene boundary. *American Geophysical Union Fall Meeting,* San Francisco.
19. Wijbrans, J.R., K.F. Kuiper, **L.E. Morgan**, M. Klaver, P.Z. Vroon. Application of the $^{40}Ar/^{39}Ar$ technique to date the Minoan Tuff, Santorini. *American Geophysical Union Fall Meeting,* San Francisco.
18. **Morgan, L.E.,** B. Davidheiser, K.F. Kuiper; J.R. Wijbrans, *2011,* The effects of acid treatment and sample preparation on $^{40}Ar/^{39}Ar$ ages. *American Geophysical Union Fall Meeting,* San Francisco.
17. Barfod, D.N., D.F. Mark, **L.E. Morgan,** T. Tomkinson; F. Stuart; J. Imlach; D. Hamilton, *2011,* The Thermo Scientific HELIX-SFT noble gas mass spectrometer: (preliminary) performance for $^{40}Ar/^{39}Ar$ geochronology. *American Geophysical Union Fall Meeting,* San Francisco.
16. **Morgan, L.E.**, D.F. Mark, K.F. Kuiper, O. Postma, I.M. Villa, J.R. Wijbrans, *2011,* Improving the accuracy of the $^{40}Ar/^{39}Ar$ geochronmeter. Mineralogical Magazine, Vol. 75 (3) p. 1404. *Award lecture at Goldschmidt Conference,* Prague.
15. Mark, D.F., **L.E. Morgan,** *2011,* The Manicouagan Impact Crater: A Site for Testing the Accuracy of Revisions to the K-Ar System. Mineralogical Magazine, Vol. 75 (3), p. 1501. *Presenting speaker at Goldschmidt Conference,* Prague.
14. Mark, D.F., **L.E. Morgan,** *2011,* Testing the accuracy of recent revisions to the age of Fish Canyon sanidine and the K-Ar decay constants using high-precision U-Pb and Ar/Ar ages for the Manicouagan impact event. *European Geosciences Union Annual Meeting,* Vienna.
13. **Morgan, L.E.**, K.F. Kuiper, D.F. Mark, O. Postma, I.M. Villa, J.R. Wijbrans, *2010,* First-principles calibration of $^{40}Ar/^{39}Ar$ mineral standards and complete extraction of $^{40}Ar^*$ from sanidine. *European Geosciences Union Annual Meeting,* Vienna.
12. **Morgan, L.E.**, K.F. Kuiper, D.F. Mark, O. Postma, I.M. Villa, J.R. Wijbrans, *2010,* First-principles calibration of $^{40}Ar/^{39}Ar$ mineral standards and complete extraction of $^{40}Ar^*$ from sanidine. *American Geophysical Union Fall Meeting,* San Francisco.
11. **Morgan, L.E.**, K.F. Kuiper, D.F. Mark, O. Postma, I.M. Villa, J.R. Wijbrans, *2010,* First-principles calibration of $^{40}Ar/^{39}Ar$ mineral standards. *12th Intnl. Conference on Thermochronology,* Glasgow.
10. Frost, S.R., K. Harvati, C. Saanane, L. Giemsch, F. Schrenk, **L.E. Morgan**, P.R. Renne, M.M. Wildgoose, H. Schwartz, *2010,* Preliminary report of new research on the Lake Manyara Beds, Arusha Region, Tanzania. *American Journal of Physical Anthropology,* Supplement 50, 108.
9. Zeeden, C., A. Fischer, **L. Morgan,**, K. Kuiper, F. Hilgen, L. Lourens, J. Wijbrans, *2009*, GTSnext - activities in the Netherlands. *NSG Symposium,* Amsterdam, The Netherlands.
8. Renne, P.R., **L.E. Morgan** and W.S. Cassata, *2009*, Argon Isotope Anomalies in Lavas, *Geochimica et Cosmochimica Acta Supplement S,* 73(13), A1090.
7. Renne, P.R., **L.E. Morgan** and W.S. Cassata *2008*, The Isotopic Composition of Atmospheric Argon and K-Ar Based Geochronology, *Eos Trans. AGU,* 89(53), Fall Meet. Suppl., Abstract V13A-2105. Poster.
6. **Morgan, L.E.**, and P. Renne, and J.M. Watkins *2007*, $^{40}Ar/^{39}Ar$ dating of volcanic glass, *Eos Trans. AGU,* 88(52), Fall Meet. Suppl., Abstract V31G-05, Oral.
5. **Morgan, L.E.**, and Renne, P. *2007*, New $^{40}Ar/^{39}Ar$ age constraints for Middle Stone Age Archaeology at Gademotta and Kulkuletti, Ethiopia, Denver Annual Meeting, *Geological Society of America,* Oct. 28-31, Oral.
4. **Morgan, L.E.**, J. Watkins, P.R. Renne, M. Manga, M.S. Shackley, M.C. Martin *2006*, High-Resolution Synchrotron-Source FTIR measurements of hydration rinds on

volcanic glasses as applied to archaeology, *Eos Trans. AGU,* 87(52), Fall Meet. Suppl., Abstract V31D-0626, Poster.

3. **Morgan, L.E.**, P.R. Renne, G. WoldeGabriel, and T.D. White, *2005*, Geochronology and geochemistry of volcanic glasses associated with early Homo sapiens in Ethiopia, *Eos Trans. AGU,* 86(52), Fall Meet. Suppl., Abstract U43A-0822, Poster.
2. **Morgan, L.E.**, T.M. Gihring, D.P. Moser, M. Dollhopf, D.L. Balkwill, M. M. Davidson, T.C. Onstott, S.M. Pfiffner, and J.L. Macalady *2004*, Microbial evidence for sulfur cycling in the deep subsurface of the Witwatersrand Basin, South Africa, *Eos Trans. AGU,* 85 (17), Jt. Assem. Suppl., Abstract 841A-26, Poster.
1. Parris, A., A. Bosley, P. Bierman, A. Lini, A. Noren, A. Lord, A. Conlan, and **L.E. Morgan,** *2001*. Grain by Grain: Holocene Storms and Hillslope Erosion in New England. Boston Annual Meeting, *Geological Society of America,* Nov. 5-8, Poster.