

Daniel R. Green, PhD

Postdoctoral Research Scientist, Columbia University
Climate School and Lamont-Doherty Earth Observatory
dgreen@ldeo.columbia.edu | www.danielrgreen.org | +1 (248) 250-4495
Columbia University | 61 Rte 9W, Palisades, NY 10964, United States

Education

- Ph.D.** May 2017
Harvard University, Department of Human Evolutionary Biology
Laboratory of Tanya M. Smith
Dissertation Title: *Reconstructing oxygen isotope seasonality in large herbivores through mineralization modeling, experimentation and optimization*
- A.M.** May 2012
Harvard University, Department of Human Evolutionary Biology
- B.S.** May 2008
University of Michigan
Majors in Anthropology–Zoology, History, French and Francophone Studies
Minor in Biology

Appointments

- Earth Institute Postdoctoral Fellow** July 2021 – present
Columbia University
Earth Institute
Lamont-Doherty Earth Observatory
- Lecturer**
College Fellow Jun 2020 – July 2021
Associate Concentration Advisor Jun 2019 – May 2020
Harvard University
Department of Human Evolutionary Biology
- Research Associate** Mar 2019 – present
Turkana Basin Institute
National Museums of Kenya
- NIH Ruth L. Kirschstein T90 Postdoctoral Research Fellow** Jan 2017 – Jun 2019
The Forsyth Institute, Harvard School of Dental Medicine
Mineralized Tissue Biology
- Research Associate** Jan 2017 – present
Harvard University
Department of Human Evolutionary Biology
- National Science Foundation Graduate Research Fellow** Sep 2009 – Dec 2016
Harvard University
Department of Human Evolutionary Biology
- Research Assistant** Jan 2006 – May 2006
University of Michigan
Department of Anthropology

Research Assistant

University of Michigan

Department of Ecology and Evolutionary Biology

Laboratory of Jianzhi Zhang

Oct 2003 – May 2005

Publications

Green DR, Avila JN, Cote S, Dirks W, Lee D, Poulsen CJ, Williams IS, Smith TM (in Press, *Proceedings of the National Academy of Sciences*) Fine-Scaled Climate Variation in Equatorial Africa Revealed by Modern and Fossil Primate Teeth.

Smith TM, Austin C, Ávila JN, Dirks W, **Green DR**, Williams IS, Arora M (2022) Permanent signatures of birth and nursing initiation are chemically recorded in teeth. *Journal of Archaeological Science* 1;140:105564.

Green DR, Olack G, Tütken T, Leichliter J, Winkler DE, Clauss M, Vonhof H, Colman AS (2022) A simple method for measuring blood oxygen isotope compositions. *Rapid Communications in Mass Spectrometry*, 36(7):e9256.

Smith TM, Austin C, Cook L, Dirks W, **Green DR**, Arora M (2021) Biological rhythms and chemical records in teeth reveal juvenile diet, health, and neurotoxicant exposures retrospectively. *Bioessays*, In Press.

Merceron G, Berlioz E, Vonhof H, **Green DR**, Garel M, Noûs C, Tütken T (2021) Tooth tales told by dental diet proxies: an alpine community of sympatric ruminants as a model to decipher the ecology of fossil fauna. *Palaeogeography, Palaeoclimatology, Palaeoecology* 562:110077.

Stifler CA, Jakes J, North JD, **Green DR**, Weaver JC, Gilbert PU (2021) Crystal misorientation correlates with hardness in tooth enamels. *Acta Biomaterialia* 120:124-3.

Green DR, Hardt M, Schulte F, Lee K-H, Pugach MK, Bidlack FB (2019) Mapping the Tooth Enamel Proteome and Amelogenin Phosphorylation Onto Mineralizing Porcine Tooth Crowns. *Frontiers in Physiology* 10:925.

Goodson JM, Hardt M, Hartman M-L, Alqaderi H, **Green DR**, Tavares M, Mutawa A-L, Ariga J, Soparkar P, Behbehani J, Behbehani K (2019) Salivary N1-Methyl-2-pyridone-5-carboxamide, a biomarker for uranium uptake, in Kuwaiti children exhibiting exceptional weight gain. *Frontiers in Endocrinology* 10:382.

Smith TM,* Austin C*, **Green DR***, Joannes-Boyau R*, Bailey S, Dumitriu D, Fallon S, Grün R, James HF, Moncel M-H, Williams IS, Wood R, Arora M (2018) Wintertime stress, nursing, and lead exposure in Neanderthal children. *Science Advances* 4: eaau9483 *These authors contributed equally to this work.

Green DR, Smith TM, Green GM, Bidlack FB, Tafforeau P, Colman AS (2018) Quantitative reconstruction of seasonality from stable isotopes in teeth. *Geochimica et Cosmochimica Acta* 235:483–504.

Green DR, Olack G, Colman AS (2018) Determinants of blood water $\delta^{18}\text{O}$ variation in a population of experimental sheep: implications for paleoclimate reconstruction. *Chemical Geology* 485:32-43.

Green DR, Green GM, Bidlack FB, Colman AS, Tafforeau P, Smith TM (2017) Synchrotron imaging and Markov Chain Monte Carlo reveal tooth mineralization patterns. *PLoS ONE* 12(10): e0186391.

Cho S, Huang ZY, **Green DR**, Smith DR, Zhang J (2006) Balancing selection generates trans-species polymorphisms at the complementary sex-determination locus of honey bees. *Genome Research* 16:1366-1375.

Research Funding

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|---|-------------|
| Turkana Basin Institute <i>Seasonal Water Use Across Miocene Apes and Hominins</i> Awarded \$99,545 | 2022 – 2024 |
| Leakey Foundation <i>Comparative and proximate chimpanzee oxygen isotope ecology as a model for hominin and paleoclimatic patterns</i> Awarded \$24,767 | 2022 – 2024 |
| Earth Institute Postdoctoral Research Fellowship Earth Institute at Columbia University – competitive fellowship <i>How does orbital forcing affect rainfall seasonality? A case study in the Pleistocene East African Rift System with implications for human evolution.</i> Awarded \$157,000 (research and salary) | 2021 – 2023 |
| Australian Research Council Discovery Project <i>Constructing robust climate proxies to explore human and primate evolution</i> Jointly awarded with Tanya Smith and Ian Williams. Grant total \$349,765 | 2021 – 2023 |
| Australian Academy of Science Regional Collaborations Programme <i>Tracing Ancient Environments During the Peopling of Southeast Asia</i> Jointly awarded with Tanya Smith, Ian Williams and Hallie Buckley, and Tanya Smith as lead PI. Grant total \$79,000 | 2019 – 2021 |
| American School of Prehistoric Research <i>Systematics of east African fossil herbivore dentitions through neural network-based image processing</i> Awarded \$3,500 | 2019 |
| National Institutes of Health Postdoctoral Training Fellowship Forsyth Institute Internal Competitive T90 Application <i>Inferring toxicant exposure timing and magnitude from human deciduous teeth</i> Awarded \$144,000 (research and salary) | 2018 – 2019 |
| Forsyth Institute Pilot Grant <i>Inferring toxin exposure timing and magnitude from deciduous teeth</i> Awarded \$7,830 | 2017 – 2019 |
| Leakey Foundation General Grant <i>Plio-Pleistocene Seasonal Precipitation through isotopes in Bovid molars, West Turkana</i> Awarded \$12,000 | 2014 – 2017 |
| Wenner-Gren Foundation Dissertation Grant <i>Experimental Reconstruction of Seasonal Rainfall for Paleoclimate Research</i> Awarded \$18,810 | 2014 – 2016 |

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| National Science Foundation Doctoral Dissertation Improvement Grant <i>Experimental Determination of Tooth Mineralization Patterns in Ungulates for Application to Paleoseasonality Reconstruction</i> Awarded \$19,855 | 2012 – 2014 |
| National Science Foundation Graduate Research Fellowship <i>A New Isotopic Sampling Method Combining Microtomography and Histology: Signal Distortion through Sampling Technique and Diagenesis</i> Awarded \$90,000 (salary) | 2011 – 2014 |
| Harvard University Committee on African Studies Summer Research Grant <i>Plio-Pleistocene Seasonal Precipitation through isotopes in Bovid molars, West Turkana</i> Awarded \$5,000 | 2012 |
| European Synchrotron Radiation Facility Research Award <i>Determination of Enamel Mineralization Pattern by Scans of Successive Developmental Stages With Application for Study of Paleoecology</i> Awarded: 3 days beam time, est. \$10,000/day | 2012 |

Abstracts and Presentations

- Green DR**, Olack G, Smith TM, Williams IS, Lewis JS, Harmand S, Uno KT, Colman AS (2022) Seasonal carbon and oxygen isotope compositions from Lomekwi in the Turkana Basin, Kenya. *The Annual Meeting of the Paleoanthropology Society*, Denver, CO (presentation).
- Green DR**, Avila JN, Dirks W, Williams IS, Smith TM (2022) Diverse monsoon seasonality in eastern Africa recorded by papionin tooth enamel $\delta^{18}O$. *91st Annual Meeting of the American Association of Physical Anthropologists*, Denver, CO (poster).
- Green DR**, Avila JN, Cote S, Dirks W, Lee D, Poulsen CJ, Williams IS, Smith TM (2021) Seasonal Isotope Ecology of Modern and Fossil Apes. *Division of Biology and Paleoenvironment, Lamont-Doherty Earth Observatory, Research Seminar* (presentation).
- Green DR**, Cote S, Dirks W, Williams IS, Smith TM (2021) Climate Variation and the Miocene Ape *Afropithecus*. *Museum Conservation Institute, Smithsonian, Washington DC* (presentation).
- Green DR**, Smith TM, Arora M, Austin C (2020) Trace metal compositions in forming teeth reflect both mineralization and diet. *The Society of Vertebrate Paleontology 80th Annual Meeting*, Virtual, October 12-16, 2020 (presentation).
- Merceron G, Berlioz E, Vonhof H, **Green DR**, Garel M, Noûs C, Tütken T (2020) Ground Truthing Dental Ecological Proxies On A Modern Alpine Community Of Sympatric Ruminants. *The Society of Vertebrate Paleontology 80th Annual Meeting*, Virtual, October 12-16, 2020 (presentation).
- Green DR**, Cote S, Dirks W, Reid DJ, Williams IS, Smith TM (2020) Seasonal Isotope Ecology in the East African Miocene Ape *Afropithecus*. *89th Annual Meeting of the American Association of Physical Anthropologists*, Los Angeles, CA and online, April 15-18, 2020 (presentation).
- Green DR**, Cote S, Williams IS, Smith TM (2019) High resolution paleoenvironmental records from East African fossil apes. *20th International Union for Quaternary Research Congress*, Dublin, Ireland, July 25-31, 2019 (presentation).

- Smith TM, **Green DR**, Williams IS (2019) Weekly oxygen isotope measurements in teeth reveal environmental variation. *20th International Union for Quaternary Research Congress*, Dublin, Ireland, July 25-31, 2019 (presentation).
- Pugach MK, Jang JY, **Green DR**, Depalle B, Bidlack FB (2019) Investigating potential roles of ameloblastin and enamel in enamel development. *The 13th International Conferences on the Chemistry and Biology of Mineralized Tissues*, Montebello, Quebec, October 20-25, 2019.
- Smith TM, Austin C, **Green DR**, Joannes-Boyau R, Bailey S, Dumitriu D, Fallon S, Grün R, James HF, Moncel M-H, Williams IS, Wood R, Arora M (2019) Tales teeth tell: wintertime stress, nursing, and lead exposure in Neanderthal children. *88th Annual Meeting of the American Association of Physical Anthropologists*, Cleveland, OH, March 27-30, 2019 (presentation).
- Green DR**, Hardt M, Schulte F, Lee K-H, Pugach MK, Bidlack FB (2018) Mapping amelogenesis proteins in an expanded enamel proteome. *Gordon Research Conference on Biomineralization*, New London, NH (poster).
- Depalle B, Pugach MK, Jang JY, **Green DR**, Yaskell T, Bidlack FB (2018) The Role of Amelogenin for pH Buffering during Amelogenesis. *Gordon Research Conference on Biomineralization*, New London, NH.
- Smith TM, **Green DR**, Austin C, Arora M, Grun R, Williams I (2018) Environmental variation and nursing history revealed by sensitive high resolution ion microprobe (SHRIMP) analyses of oxygen isotopes. *87th Annual Meeting of the American Association of Physical Anthropologists*, Austin, TX, April 10-14, 2018.
- Green DR**, Colman AS (2017) How tooth isotope sample number and location affect seasonality reconstruction. *Society of Vertebrate Paleontology annual meeting*, Calgary (presentation).
- Green DR**, Colman AS, Green GM, Tafforeau P, Bidlack F, Smith TM (2017) Seasonal climate reconstruction from seasonality in teeth. *National Cabinet of Archaeology*, Havana (presentation).
- Green DR**, Colman AS, Green GM, Tafforeau P, Bidlack F, Smith TM (2017) New Tooth Growth Model for Studying Ancient Climate. *Goldschmidt annual meeting*, Paris (presentation).
- Green DR**, Colman AS (2017) Phosphate-water $\delta^{18}\text{O}$ offset revision improves paleoclimatic reconstructions. *American Association of Physical Anthropologists annual meeting*, New Orleans (poster).
- Smith TM, Austin C, **Green DR**, Arora M (2017) Trace element studies support rapid tooth enamel mineralization at the enamel-dentine junction. *86th Annual Meeting of the American Association of Physical Anthropologists*, New Orleans, LA, April 19-22, 2017.
- Green DR**, Colman AS, Green GM, Bidlack F, Tafforeau P, Smith TM (2016) Experimental water switch in sheep improves models for seasonal climate reconstruction. *American Association of Physical Anthropologists annual meeting*, Atlanta (poster).
- Green DR**, Colman AS, Green GM, Tafforeau P, Bidlack F, Smith TM (2015) Seasonal climate reconstruction with isotopes and synchrotron X-rays. *Cleveland Museum of Natural History Paleoecology Symposium*. Cleveland, OH (poster)
- Green DR**, Green GM, Colman AS, Tafforeau P, Smith TM (2015) Synchrotron x-ray imaging and MCMC support seasonal climate reconstruction. *American Association of Physical Anthropologists annual meeting*, St. Louis, MO (poster)
- Green DR**, Green GM, Tafforeau P, Weaver J, Colman AS, Smith TM (2014) Synchrotron imaging helps reconstruct mineralization patterns, and ancient climate. *Gordon Conference on Biomineralization*, New London, NH (poster)

- Green DR**, Green GM, Smith TM, Tafforeau P (2013) Microtomographic assessment of mineralization patterns to inform isotope paleoenvironmental reconstruction. *American Association of Physical Anthropologists annual meeting*, Knoxville, TN (poster)
- Green DR**, Weaver J, Smith TM (2012) Quantitative Density with micro-Computed tomography: mapping mineralization. *Society of Integrative and Comparative Biology: Division of Vertebrate Morphology annual meeting*. Amherst, MA (presentation)
- Green DR**, Glowacka H, Schwartz GT, Reid DJ, Martin LB, Smith TM (2011) Developmental Variation in Great Ape Molar Crowns. *American Association of Physical Anthropologists annual meeting*, Minneapolis, MN (poster)
- Smith TM, Zermeno JP, **Green DR**, Reid DJ, Tafforeau P (2011) Daily secretion rates, prism paths, and cuspal formation times in hominoid molars. *15th International Symposium on Dental Morphology, Newcastle, UK, August 24-27, 2011*.
- Green DR**, Braun J, Morgan M, Pilbeam D, Tuross N, Smith TM (2010) Integrating carbon and oxygen isotope signals: seasonality in the Siwaliks, Pakistan. *Society of Integrative and Comparative Biology: Division of Vertebrate Morphology annual meeting*. Cambridge, MA (presentation)

Training Programs

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| Learning the Earth with Artificial Intelligence and Physics (LEAP) Columbia University – Google Partnership | 2022 |
| Harvard University Instructor Training The Derek Bok Center for Teaching and Learning | 2013, 2014 |
| East Turkana Geological Field School National Science Foundation, Turkana, Kenya Directors: Thure Cerling, PhD and Frank Brown, PhD | 2011 |
| Stable Isotope Biogeochemistry and Ecology Short Course University of Utah Stable Isotope Ratio Facility for Ecological Research Directors: Jim Ehleringer, PhD and Thure Cerling, PhD | 2010 |

Teaching Experience

Lecturer, Head instructor

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| <i>Harvard University</i> , Department of Human Evolutionary Biology: | |
| Introduction to Human Evolution – Sophomore Concentration Tutorial | 2021 |
| Graduate Introduction to the Hominin Fossil Record | 2021 |
| Graduate Proseminar, Introduction to Human Evolution (co-taught) | 2019 |
| Climate Change and Human Evolution | 2018, 2020 |

Lecturer, Instructor

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| <i>Turkana University College</i> : | |
| MHEB 824 – Introduction to stable isotopes in ecology and paleontology | 2021 |

Teaching Assistant

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| <i>Harvard University</i> , Department of Human Evolutionary Biology: | |
| Introduction to Human Evolution – Sophomore Concentration Tutorial | 2015, 2017 |
| Human Evolutionary Anatomy | 2012 |

Teaching Assistant

Turkana Basin Institute & SUNY Stony Brook, Field School:
Geology, Ecology, Paleontology, Archaeology, Evolution and Anatomy 2011

Honors and Awards

Harvard University Certificate of Distinction in Teaching 2012, 2020
Italian Institute for Philosophical Studies Warburg Seminar Award 2009
University of Michigan Aix-en-Provence Travel Award 2006 – 2007
University of Michigan Biological Station Academic Scholarship 2006
University of Michigan Honors Program 2003 – 2008

Public Outreach, Service and Mentorship

Reviewer 2016 – present
Geochimica et Cosmochimica Acta, Chemical Geology, Quaternary International, FeBS Federation of European Biochemical Societies Journal, Journal of Archaeological Science, BMC Biology, the Leakey Foundation

Wikipedia editor 2011 – present
authored 60+ articles, including on the Turkana Basin, with more than 4 million pageviews

Forsyth Institute undergraduate laboratory research mentor 2017

Harvard University Eliot House Resident Tutor 2012 – 2016
focus on biology, graduate school applications, Marshall, Rhodes, and Fulbright fellowships, research experiences and funding.

Harvard University undergraduate laboratory research mentor 2009 – 2016

Harvard Museum of Comparative Zoology Volunteer 2011 – 2013

University of Michigan Society of Biology Students Co-President 2007 – 2008

Additional Skills

Python; HTML; qGIS; French

References

Professor Kevin Uno
Columbia University
Associate Research Professor
Lamont-Doherty Earth Observatory
Postdoctoral Research Adviser
+1 (845) 365-8308
kevinuno@ldeo.columbia.edu

Professor Tanya M. Smith
Griffith University
Professor

Australian Research Centre for Human Evolution
Doctoral Research Adviser
+61 (0)7 3735 7496
tanya.smith@griffith.edu.au

Professor David Pilbeam

Harvard University
Henry Ford II Professor of Human Evolution
Department of Human Evolutionary Biology
Graduate Committee Member
(617) 495-4736
pilbeam@fas.harvard.edu

Professor Daniel Lieberman

Harvard University
Edwin M. Lerner II Professor of Biological Sciences
Department of Human Evolutionary Biology
Graduate Committee Member
(617) 495-5479
danlieb@fas.harvard.edu

Professor Thure Cerling

University of Utah
Francis Brown Presidential Chair
Department of Geology & Geophysics
(801) 581-7062
thure.cerling@utah.edu