

Daniel R. Green, PhD

Field Program Director & Permanent Lecturer
Department of Human Evolutionary Biology, Harvard University
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Education

- Ph.D.** May 2017
Harvard University, Department of Human Evolutionary Biology
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

- Field Program Director & Permanent Lecturer** Jul 2023 – present
Harvard University
Department of Human Evolutionary Biology
- Earth Institute Postdoctoral Fellow** Jul 2021 – Jun 2023
Columbia University
Climate School, Lamont-Doherty Earth Observatory
- Lecturer**
College Fellow Jun 2020 – Jul 2021
Associate Concentration Advisor Jun 2019 – May 2020
Harvard University
Department of Human Evolutionary Biology
- Research Associate** Jan 2017 – present
Griffith University (as of 2022)
Turkana Basin Institute (as of 2019)
National Museums of Kenya (as of 2019)
Harvard University (as of 2017)
- NIH Ruth L. Kirschstein T90 Postdoctoral Research Fellow** Jan 2017 – Jun 2019
The Forsyth Institute, Harvard School of Dental Medicine
Mineralized Tissue 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, Smith TM, Olack G, Williams IS, Colman AS, Uno KT (In Review, *Journal of Archaeological Science*) How Teeth Record and Attenuate Seasonal Signals.

Vaiglova P, Avila J, Buckley H, Galipaud JC, **Green DR**, Halcrow S, James HF, Kinaston R, Oxenham M, Paz V, Simanjukntak T, Snoeck C, Trinh HH, Williams IS, Smith TM (*Submitted, Scientific Reports*) Holocene rainfall patterns in Southeast Asia revealed by microanalysis of $\delta^{18}\text{O}$ values in human teeth.

Green DR, Winkler D, Leichliter J, Harms G, Hatt J-M, Clauss M, Tütken T (2023) Formation and Replacement of Bone and Tooth Mineralized Tissues in Green Iguanas (*Iguana iguana*) Revealed by In-Vivo Fluorescence Marking. *Integrative and Comparative Biology*, icad089, <https://doi.org/10.1093/icb/icad089>.

Green DR, Avila JN, Cote S, Dirks W, Lee D, Poulsen CJ, Williams IS, Smith TM (2022) Fine-Scaled Climate Variation in Equatorial Africa Revealed by Modern and Fossil Primate Teeth. *Proceedings of the National Academy of Sciences*, 119(35): e2123366119.

Smith TM, Austin C, Avila 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, Cover Article) 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*, 43(9):2000298.

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

Turkana Basin Institute <i>Seasonal Water Use Across Miocene Apes and Hominins</i> Awarded \$99,545	2022 – 2024
Columbia Climate Center <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 \$10,000 (research)	2022 – 2023
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	2018 – 2019

Forsyth Institute Internal Competitive T90 Application <i>Inferring toxicant exposure timing and magnitude from human deciduous teeth</i> Awarded \$144,000 (research and salary)	
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
National Science Foundation Doctoral Dissertation Improvement Grant <i>Experimental Determination of Tooth Mineralization Patterns in Ungulates for Application to Paleoseasonality Reconstruction</i> Awarded \$33,555	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

Invited Lectures

- Green DR** (2023) Dental Records from the Miocene World of Kenya. *Paleontology Section Seminar Series, The National Museums of Kenya (NMK)* (invited talk).
- Green DR** (2023) Seasonal Ecology of Primates and Hominins in the Eastern African Neogene. *New York Regional Primatology Lecture Series, The New York Consortium in Evolutionary Primatology (NYCEP)* (invited talk).
- Green DR** (2023) Coding teeth and climate in Google Colab. *Workshop on Good Statistical Practice in Archaeology, Australasian Research Cluster for Archaeological Science* (invited talk).
- Green DR** (2023) Predicting future climate with teeth. *Brown University Earth Science Department, Climate and Environment Group, Providence, Rhode Island* (invited talk).
- Green DR** (2022) Most severe struggle: seasonality in primate and human evolution. *Ohio State University, Columbus, Ohio* (invited talk).

- Green DR** (2022) Climate Variation and the Miocene Ape Afropithecus. *University of Kent, Kent, UK* (invited talk).
- Green DR** (2022) Records from the Miocene World. *For ENST 177, Vassar College* (invited talk).
- Green DR** (2022) Oxygen isotopes in teeth: exploring climate-evolution dynamics in equatorial Africa. *GCSCR & ARCHE Visiting Scholar Seminar Series, Griffith University* (invited talk).
- Green DR** (2021) Seasonal Isotope Ecology of Modern and Fossil Apes. *Division of Biology and Paleoenvironment, Lamont-Doherty Earth Observatory, Research Seminar* (invited talk).
- Green DR** (2021) Climate Variation and the Miocene Ape Afropithecus. *Museum Conservation Institute, Smithsonian, Washington DC* (invited talk).
- Green DR** (2019) Seasonal records in living and fossil teeth. *Stony Brook University, Stony Brook, NY* (invited talk).
- Green DR** (2017) Seasonal climate reconstruction from seasonality in teeth. *National Cabinet of Archaeology, Havana* (invited talk).

Abstracts and Presentations

- Green DR**, Avila JN, Cote S, Dirks W, Lee D, Poulsen CJ, Williams IS, Smith TM (2022) High-Resolution Seasonal Climate Variation in Equatorial Africa Revealed by Modern and Fossil Primate Teeth. *Annual Meeting of the American Geophysical Union, Chicago IL.*
- House A, Uno KT, Bapana S, Aaron EE, Princehouse P, Vitek N, **Green DR** (2022) Faunal Stable Isotopes Describe Eastern African Hydroclimate Across the Afro-Eurasian Collision. *Annual Meeting of the American Geophysical Union, Chicago IL.*
- Bapana S, Uno KT, House A, Areny I, Beck CC, Grossman A, Firera FM, Liutkus-Pierce C, Miller E, Nengo I, Russo GR, **Green DR** (2022) Heterogeneous Hydroclimate and Vegetation in the Middle Miocene East African Rift Valley *Annual Meeting of the American Geophysical Union, Chicago IL.*
- 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**, 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 enamelin 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, Grün 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) 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

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

<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

<i>Leakey Foundation</i> : Mpala, Kenya Short course on stable isotopes in hydrology, ecology and paleontology (Co-taught with Daeun Lee and co-funded with Erin Wessling)	2023
<i>Turkana University College</i> : MHEB 824 – Introduction to stable isotopes in ecology and paleontology	2021

Teaching Assistant

<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, Palaeogeography, Palaeoclimatology, Palaeoecology

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

Laboratory research mentor 2011 – present
Harvard University, the University of Chicago, the Forsyth Institute, the Turkana Basin Institute, Turkana University College, Columbia University

Event: Drugs and Violence at the Border 2020
Conversation with director Tiller Russell and professor Ieva Jusionyte

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

Press coverage: [Harvard Gazette](#), [History News Network](#), [Billings Gazette](#), [State of the Planet](#), [Cosmos](#), [PNAS Journal Club](#)

Additional Skills

Python; HTML; qGIS; French

References

Professor Kevin T. Uno
Columbia University

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Professor Tanya M. Smith

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Professor David R. Pilbeam

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Professor Thure E. Cerling

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Professor Daniel E. Lieberman

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