

# Daniel R. Green, PhD

Field Program Director & Permanent Lecturer  
Department of Human Evolutionary Biology, Harvard University  
[dgreen@ldeo.columbia.edu](mailto:dgreen@ldeo.columbia.edu) | [www.danielrgreen.org](http://www.danielrgreen.org) | [ORCID](https://orcid.org/) | +1 (248) 250-4495  
11 Divinity Ave, MA 02138, United States

## Education

---

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

## Appointments

---

<b>Field Program Director &amp; Permanent Lecturer</b> <i>Harvard University</i> Department of Human Evolutionary Biology	Jul 2023 – present
<b>Earth Institute Postdoctoral Fellow</b> <i>Columbia University</i> Climate School, Lamont-Doherty Earth Observatory	Jul 2021 – Jun 2023
<b>Lecturer</b> <b>College Fellow</b> <b>Associate Concentration Advisor</b> <i>Harvard University</i> Department of Human Evolutionary Biology	Jun 2020 – Jul 2021 Jun 2019 – May 2020
<b>Research Associate</b> <i>Griffith University</i> (as of 2022) <i>Turkana Basin Institute</i> (as of 2019) <i>National Museums of Kenya</i> (as of 2019) <i>Harvard University</i> (as of 2017)	Jan 2017 – present
<b>NIH Ruth L. Kirschstein T90 Postdoctoral Research Fellow</b> <i>The Forsyth Institute, Harvard School of Dental Medicine</i> Mineralized Tissue Biology	Jan 2017 – Jun 2019
<b>National Science Foundation Graduate Research Fellow</b> <i>Harvard University</i> Department of Human Evolutionary Biology	Sep 2009 – Dec 2016
<b>Research Assistant</b> <i>University of Michigan</i> Department of Anthropology	Jan 2006 – May 2006

**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, 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, 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.

Stiffler 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

---

<b>Turkana Basin Institute</b> <i>Seasonal Water Use Across Miocene Apes and Hominins</i> Awarded \$99,545	2022 – 2024
<b>Columbia Climate Center</b> <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
<b>Leakey Foundation</b> <i>Comparative and proximate chimpanzee oxygen isotope ecology as a model for hominin and paleoclimatic patterns</i> Awarded \$24,767	2022 – 2024
<b>Earth Institute Postdoctoral Research Fellowship</b> 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
<b>Australian Research Council Discovery Project</b> <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
<b>Australian Academy of Science Regional Collaborations Programme</b> <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
<b>American School of Prehistoric Research</b> <i>Systematics of east African fossil herbivore dentitions through neural network-based image processing</i> Awarded \$3,500	2019
<b>National Institutes of Health Postdoctoral Training Fellowship</b>	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)	
<b>Forsyth Institute Pilot Grant</b> <i>Inferring toxin exposure timing and magnitude from deciduous teeth</i> Awarded \$7,830	2017 – 2019
<b>Leakey Foundation General Grant</b> <i>Plio-Pleistocene Seasonal Precipitation through isotopes in Bovid molars, West Turkana</i> Awarded \$12,000	2014 – 2017
<b>Wenner-Gren Foundation Dissertation Grant</b> <i>Experimental Reconstruction of Seasonal Rainfall for Paleoclimate Research</i> Awarded \$18,810	2014 – 2016
<b>National Science Foundation Doctoral Dissertation Improvement Grant</b> <i>Experimental Determination of Tooth Mineralization Patterns in Ungulates for Application to Paleoseasonality Reconstruction</i> Awarded \$33,555	2012 – 2014
<b>National Science Foundation Graduate Research Fellowship</b> <i>A New Isotopic Sampling Method Combining Microtomography and Histology: Signal Distortion through Sampling Technique and Diagenesis</i> Awarded \$90,000 (salary)	2011 – 2014
<b>Harvard University Committee on African Studies Summer Research Grant</b> <i>Plio-Pleistocene Seasonal Precipitation through isotopes in Bovid molars, West Turkana</i> Awarded \$5,000	2012
<b>European Synchrotron Radiation Facility Research Award</b> <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, Aoron 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  $\delta^{18}\text{O}$ . *91<sup>st</sup> 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

---

<b>Learning the Earth with Artificial Intelligence and Physics (LEAP)</b> Columbia University – Google Partnership	2022
<b>Harvard University Instructor Training</b> The Derek Bok Center for Teaching and Learning	2013, 2014
<b>East Turkana Geological Field School</b> National Science Foundation, Turkana, Kenya Directors: Thure Cerling, PhD and Frank Brown, PhD	2011
<b>Stable Isotope Biogeochemistry and Ecology Short Course</b> 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

---

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

## Public Outreach, Service and Mentorship

---

<b>Reviewer</b> <i>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</i>	2016 – present
<b>Wikipedia</b> editor authored 60+ articles, including on the Turkana Basin, with more than 4 million pageviews	2011 – present
<b>Laboratory research mentor</b> Harvard University, the University of Chicago, the Forsyth Institute, the Turkana Basin Institute, Turkana University College, Columbia University	2011 – present
<b>Event: Drugs and Violence at the Border</b> Conversation with director Tiller Russell and professor Ieva Jusionyte	2020
<b>Harvard University</b> Eliot House Resident Tutor focus on biology, graduate school applications, Marshall, Rhodes, and Fulbright fellowships, research experiences and funding.	2012 – 2016
<b>Harvard University</b> undergraduate laboratory research mentor	2009 – 2016
<b>Harvard Museum of Comparative Zoology</b> Volunteer	2011 – 2013
<b>University of Michigan</b> Society of Biology Students Co-President	2007 – 2008
Press coverage: <a href="#">Harvard Gazette</a> , <a href="#">History News Network</a> , <a href="#">Billings Gazette</a> , <a href="#">State of the Planet</a> , <a href="#">Cosmos</a> , <a href="#">PNAS Journal Club</a>	

## Additional Skills

---

Python; HTML; qGIS; French

## References

---

**Professor Kevin T. 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 R. Pilbeam**

*Harvard University*  
Henry Ford II Professor of Human Evolution  
Department of Human Evolutionary Biology  
Graduate Committee Member  
+1 (617) 495-4736  
pilbeam@fas.harvard.edu

**Professor Thure E. Cerling**

*University of Utah*  
Francis Brown Presidential Chair  
Department of Geology & Geophysics  
+1 (801) 581-7062  
thure.cerling@utah.edu

**Professor Daniel E. Lieberman**

*Harvard University*  
Edwin M. Lerner II Professor of Biological Sciences  
Department of Human Evolutionary Biology  
Graduate Committee Member  
+1 (617) 495-5479  
danlieb@fas.harvard.edu