

Nicholas A. O'Mara, Ph.D.

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Education

- 2017–2022** **Ph.D. in Earth and Environmental Sciences**, Columbia University (New York, NY)
Focus: Paleoclimatology | Sub-focus: Oceanography, Biogeoscience
Thesis (advisor, Pratigya Polissar): *Monsoons, wildfires, and savannas: drivers of climate and ecosystem change in Northwest Africa*
- 2019** **Master of Philosophy in Earth and Environmental Sciences**
- 2017** **Master of Arts in Earth and Environmental Sciences**
Thesis (advisor, Pratigya Polissar): *Wildfire and terrestrial plant biomarkers in modern West African Margin core top sediments*
- 2013–2017** **Bachelor of Science in Geology–Chemistry**, Brown University (Providence, RI)
Departmental Honors, Magna Cum Laude
Thesis (advisor, Timothy Herbert): *An alkenone-based record of sea surface temperature and marine productivity in the southern California Current System from the Medieval Climate Anomaly to present*

Professional and Research Experience

- 2027–2030** **Upcoming Associate Research Scientist**, Department of Ecology and Evolutionary Biology, Princeton
- 2026–2027** **Postdoctoral Research Associate**, Department of Ecology and Evolutionary Biology, Princeton University
- 2022–2025** **G.E. Hutchinson Postdoctoral Research Fellow**, Yale School of the Environment, Yale Institute for Biospheric Studies
- 2020–2022** **Ph.D. Candidate**, Lamont-Doherty Earth Observatory of Columbia University
- 2017–2021** **Graduate Research and Teaching Assistant**, Lamont-Doherty Earth Observatory of Columbia University
- 2015–2017** **NOAA Hollings Scholar**
- 2016** Summer research internship (2016) at Geophysical Fluid Dynamics Laboratory, PI: John Dunne
- 2015–2017** **Undergraduate Research Assistant**, Brown University, PI: Timothy Herbert

Publications

Refereed Journal Articles:

- 2026** **O'Mara, N.A.**; de Menocal, P. B.; Uno, K. T.; Tierney, J. E.; Winckler, G.; Marlon, J.; Polissar, P.J. (2026) Fire biomarkers in marine sediments record terrestrial fire activity, *AGU Advances* (accepted)
- 2025** **O'Mara, N.A.**; de Menocal, P. B.; Uno, K. T.; Tierney, J. E.; Polissar, P.J.; (2025) Capturing vegetation gradients along the West African margin using terrestrial plant biomarkers in marine sediments, *Geochemistry, Geophysics, Geosystems* (<https://doi.org/10.1029/2025GC012274>)

- 2024** O'Mara, N.A.; Skonieczny, C.; McGee, D.; Winckler, G.; Bory, A. J.-M.; Bradtmiller, L. I.; Malaizé, B.; Polissar, P.J. (2024) Constraining Plio-Pleistocene shifts in Northwest African hydroclimate, ecosystem distributions, and marine productivity: new paleo-records across the Mid-Pleistocene Transition, *Paleoceanography and Paleoclimatology* (<https://doi.org/10.1029/2023PA004777>)
- 2024** McLean, D.; Horn, E. L.; Aguiar, S.; Barton, N.; Brown, R.; Carolin, S.; Day, C.; Kuhlmann, H.; Kutterolf, S.; Mitsunaga, B.; O'Mara, N. A.; Pacheco, J. M.; Pimentel, A.; Ramalho, R. S.; Schindlbeck-Belo, J. C.; Stoetzel, E.; Styring, A.; Uno, K. T.; Vidyarthi, V.; Xu, Y.; Smith, V. C. (2024) Opportunities to synchronise and date archaeological and climate records in Northwest Africa using volcanic ash (tephra) layers, *Libyan Studies* (<https://doi.org/10.1017/lis.2024.18>)
- 2022** O'Mara, N.A.; Skonieczny, C.; McGee, D.; Winckler, G.; Bory, A. J.-M.; Bradtmiller, L. I.; Malaizé, B.; Polissar, P.J. (2022) Pleistocene drivers of Northwest African hydroclimate and vegetation, *Nature Communications* (<https://doi.org/10.1038/s41467-022-31120-x>)
- 2019** O'Mara, N.A.; Cheung, A. H.; Kelly, C.S.; Sandwick, S.; Herbert, T. D.; Russell, J.M.; Abella-Gutiérrez, J.; Dee, S.G.; Swarzenski, P.W.; Herguera, J.C. (2019) Subtropical Pacific Ocean temperature fluctuations in the Common Era: Multidecadal variability and its relationship with Southwestern North American megadroughts, *Geophysical Research Letters* (<https://doi.org/10.1029/2019GL084828>)
- 2019** O'Mara, N.A. and Dunne, J.P. (2019) Hot spots of carbon and alkalinity cycling in the coastal oceans, *Scientific Reports* (<https://doi.org/10.1038/s41598-019-41064-w>)

In Preparation/Submitted/Review:

Mitsunaga, B.A.; Dellinger, A.; Guarino, R.; McLean, D.; O'Mara, N.A.; Smolen, J.D.; Worthey, K.; Schefuß, E.; Kuhlmann, H.; Vachula, R.S.; Smith, V.; Barton, N.; Uno, K.; North African environments in the age of Homo sapiens: Pleistocene hydrology-ecology-fire-temperature influences on human evolution and development (*in review, Nature Communications*)

Mahowald, N.; Liddy, H.; Marlon, J.; Tsigaridis, K.; Winckler, G.; Hamilton, D.; Kok, J.; Sigl, M.; Abell, J.; Aboagye-Okere, A.; Adabouk Amooli, J.; Albani, S.; Bauer, S.; Beaudon, E.; Brown, H.; Chellman, N.; Cosentino, N.; Goodkin, N.; Guiterman, C.; Hantson, S.; He, C.; Intveld, A.; Kaplan, J.; Klavans, J.; Lambert, F.; Liu, H.; Loutre, M.; McConnell, J.; McGraw, Z.; Mezuman, K.; Miller, R.; O'Mara, N.A.; Ong, M.R.; Schmidt, G.; Vachula, R.; Wu, L.; Zhang, B.; Characterizing Natural Aerosol Variability and its Uncertainty in the Earth System (*in review, Atmospheric Chemistry and Physics*)

O'Mara, N.A.; Githumbi, E.N.; Bartlein, P.J.; Dabengwa, A.; Teruel, O.; Norwood, M.; Aleman, J.; A.; Marlon, J.R.; Staver, A.C. Precipitation and human activity primarily controlled African fire activity since the last glacial maximum (*in prep for Geophysical Research Letters*)

Hernandez, P.; Russell, J. M.; Staver, A. C.; Strydom, T.; Wadehra, R.; O'Mara, N. A.; Karp, A. T.; Analyzing PAH Concentrations in Experimental Burn Plot Soils to Improve Reconstructions of Savanna Fires (*in prep for Organic Geochemistry*)

O'Mara, N.A.; de Menocal, P. B.; Uno, K. T.; Tierney, J. E.; Polissar, P.J.; The role of fire in Northwest African ecosystem transitions during the last deglaciation to late-Holocene (*in prep.*)

Research Grants and Support

- 2026-2030** National Science Foundation Fire Science Innovations through Research and Education (FIRE). Collaborative research: "Mapping global fire activity since the Last Glacial Maximum for improved fire modeling and management." **Co-PIs:** Carlos Staver (Princeton University) and Jenn Marlon (Yale University). Grant contributor: Nicholas O'Mara used to support upcoming Associate Research Scientist appointment at Princeton University. **(\$1,519,023)**

- 2023–2025** **Yale Institute for Biospheric Studies.** Collaborative Research: “*Paleofire-climate variation in Africa: data-model comparisons since the Last Glacial Maximum for improved estimation of wildfire in the Earth system.*” **Co-PIs:** Jennifer Marlon and Carla Staver; grant contributor: Nicholas O’Mara used to support postdoctoral researcher appointment. **(\$199,400.00)**
- 2018–2020** **Columbia University Climate Center.** Collaborative Research: “*Assessing the role of fire in the African Humid Period transitions: a novel biomarker approach to paleo-fire reconstruction.*” **Co-PIs:** Nicholas O’Mara, Pratigya Polissar, and Peter de Menocal. **(\$10,285.62)**
- 2015–2017** **NOAA Hollings Fellowship**
- Undergraduate fellowship which provided tuition support for two years (\$20,000/year) and a research internship in the interposed summer (\$7,500). My research project was done at the NOAA Geophysical Fluid Dynamics Laboratory under the guidance of Dr. John Dunne. My work focused on calculating global burial fluxes of calcium carbonate in coastal marine environments and was eventually published in Nature Scientific Reports. **(\$47,500)**
- 2015** **Brown University Undergraduate Teaching and Research Award**
- Undergraduate summer fellowship to conduct research. My project in Prof. Timothy Herbert’s lab focused on using algal produced alkenones to reconstruct changes in ocean temperatures and productivity off the coast of Baja California Sur, Mexico to explore climate drivers and marine ecosystem responses over the last 2000 years. This project later developed into my senior thesis and then a paper in *Geophysical Research Letters*. **(\$2,500)**

National and International Conferences

Talks:

- 2023** **O’Mara, N. A.;** Polissar, P. J.; deMenocal, P. B; Uno, K. T; Winckler, G.; Tierney, J. E.; D’Andrea, W. J.; McManus, J. M.; Bartlein, P. J.; Githumbi, E. N.; Daniau, A. L.; Staver, A. C.; Marlon, J. R. **(2023)** Reconstructing continental-scale spatial vegetation and fire patterns in Africa: towards a pan-African Last Glacial Maximum record. *AGU Fall Meeting 2023*.
- 2023** **O’Mara, N. A.;** Uno, K. T; deMenocal, P. B.; Winckler, G.; Tierney, J. E.; Polissar, P. J **(2023)** Capturing wildfire and vegetation gradients along the West African margin in marine sediments: a biomarker approach. *INQUA Congress 2023*.
- 2022** **O’Mara, N. A.;** Uno, K. T; deMenocal, P. B.; Tierney, J. E.; Polissar, P. J. **(2022)** Characterizing Fire Regimes of Northwest African Savannas from the Last Glacial Maximum to the Late Holocene. *AGU Fall Meeting 2022*.
- 2021** **O’Mara, N. A.;** Skonieczny, C.; McGee, D; Winckler, G.; Polissar, P. J.; Malazé, B.; Bory, A. J.-M. **(2021)** The Northwest African Monsoon through the (ice) ages: new evidence for low-latitude drivers of monsoon rainfall, vegetation and dust flux over the past 1.1 million years. *AGU Fall Meeting 2021*
- 2020** **O’Mara, N. A.;** Skonieczny, C.; McGee, D; Winckler, G.; Polissar, P. J.; Malazé, B.; Bory, A. J.-M. **(2020)** Disconnected drivers of Late Pleistocene Northwest African hydroclimate and vegetation. *AGU Fall Meeting 2020*
- 2017** **O’Mara, N.A.;** Kelly, C. S.; Herbert, T. D.; Abella-Gutiérrez, J.; Herguera, J. C. **(2017)** A 1200-year alkenone-based reconstruction of sea surface temperature and marine productivity in the southern California Current System from the Medieval Climate Anomaly. *AGU Fall Meeting 2017*.
- 2017** **O’Mara, N. A.;** Kelly, C. S.; Herbert, T. D.; Abella-Gutiérrez, J.; Herguera, J. C. **(2017)** Analyzing forced and internal variability in last millennium subtropical eastern Pacific climate

using an alkenone-derived record of SST and productivity variability. *Northeast GSA Spring 2017*.

- 2016** **O'Mara, N. A.** and Dunne, J. P. (2016) Spatially Explicit Models of Carbon and Alkalinity Cycling in the Coastal Oceans. *AGU Fall Meeting 2016*.

Posters:

- 2026** Restivo, N.; Hernandez, P.; Sackett, E.; Zhou, Y.; Russell, J. M.; Saver, A. C.; Strydom, T.; Mauceri, A.A.; **O'Mara, N. A.**; Karp, A. T.; (2026) Calibrating Molecular Proxies for Fires in Savannas. *Midwest Geobiology Symposium 2026*.
- 2026** Ochocki, M.; Stoetzel, E.; **O'Mara, N. A.**; Wainwright, J.; Carolin, S.; Barton, N.; Bouzouggar, A.; Blumenthal, S.; Styring, A.; (2026) Environment and cultural transitions: New insights from isotopic analysis of rodent tooth enamel at Taforalt Cave. *UK Archaeological Sciences Conference 2026*.
- 2025** **O'Mara, N.A.**; de Menocal, P. B.; Uno, K. T.; Tierney, J. E.; Polissar, P.J.; (2025) New insights into reconstructing past wildfires: calibrating fire biomarker proxies in marine sediments using random forest models. *AGU Annual Meeting 2025*
- 2025** Mitsunaga, B. M.; Dellinger, A.; **O'Mara, N. A.**; Smolen, J.; McLean, D.; Schefuß, E.; Kuhlmann, H.; Vachula, R.; Smith, V.; Barton, B.; Uno, K. (2025) The Paleoenvironmental context for *Homo sapiens* evolution and development in Northwest Africa: Moroccan hydrology, vegetation, fire, and temperature dynamics in the Late Pleistocene. *AGU Annual Meeting 2025*
- 2024** **O'Mara N. A.**; Githumbi, E. N.; Bartlein, P. J.; Daniau, A.; Teruel O.; Norwood, M.; Staver, A. C.; Marlon, J. R.; (2024) Towards a holistic perspective on African fire history: integrating multiple proxies and timescales to assess paleofire change in African ecosystems. *AGU Annual Meeting 2024*
- 2023** Bartlein, P. J.; Marlon, J. R.; **O'Mara, N.A.** (2023) Paleofire reconstructions from sedimentary charcoal analyses: review and improvement of the approaches for decomposing, compositing, and synthesizing record. *AGU Fall Meeting 2023*.
- 2023** Hernandez, P.; Russell, J. M.; Strydom, T.; Wadehra, R.; **O'Mara, N. A.**; Staver, A. C.; Karp, A. T. (2023) Analyzing PAH Concentrations in Experimental Burn Plot Soils to Improve Reconstructions of Savanna Fires. *AGU Fall Meeting 2023*.
- 2023** **O'Mara, N. A.**; Skonieczny, C.; McGee, D.; Winckler, G.; Bory, A. J.-M.; Bradtmiller, L. I.; Malaizé, B.; Polissar, P. J.; (2023) Northwest African monsoon strength, ecosystem variability and wind patterns during the Mid-Pleistocene Transition. *INQUA Congress 2023*
- 2023** Bartlein, P.; Marlon, J. R.; **O'Mara, N.A.**; (2023) Biomass burning in North America during the Last Glacial-Interglacial Transition. *INQUA Congress 2023*
- 2019** **O'Mara, N. A.**; Polissar, P. J.; Uno, K. T.; deMenocal, P. B.; Tierney, J. E. (2019) Wildfire and Terrestrial Plant Biomarkers in Modern West African Margin Core Top Sediments. *AGU Fall 2019*.
- 2018** **O'Mara, N. A.**; Polissar, P. J.; Uno, K. T.; Phelps, S. R.; Buzeta, R. K.; deMenocal, P. B. (2018) The Role of the Greenland-Scotland Ridge in Stepwise Cooling of the Nordic Seas from the Middle to Late Miocene. *AGU Fall Meeting 2018*.
- 2016** Kelly, C. S.; **O'Mara, N. A.**; Herbert, T. D.; Abella-Gutiérrez, J.; Herguera, J. C. (2016) Shifting Climate Modes and a Warm Little Ice Age: Paleo Productivity and Temperature Determinations. *AGU Fall Meeting 2016*.
- 2015** Kelly, C. S.; **O'Mara, N. A.**; Herbert, T. D.; Abella-Gutiérrez, J.; Herguera, J. C. (2015) Understanding Abrupt, Natural Climate Variability Post-Industrial Revolution from the

Subtropical Eastern Pacific: A Novel High Resolution Alkenone-derived Sea Surface Temperature Record. *AGU Fall Meeting 2015*.

- 2015** Kelly, C. S.; Herbert, T. D.; **O'Mara, N. A.**; Abella-Gutiérrez, J.; Herguera, J. C. (2015) Investigating Subtropical Pacific Multidecadal Variability: A 500-Year History of Ocean Surface Temperature and Productivity from Baja California, Mexico. *Northeast GSA Spring 2015*.

Invited Talks

- 2026** **New York University Gallatin School (2026)**, Guest lecture entitled “How are fires changing now and how have they changed in the past?” in course “Ancient Extremes in Nature” lead by VAP Jonathan Lambert
- 2025** **Columbia University/Cornell University**, Characterizing Historical and Paleoclimate Aerosol Radiative Effects Workshop (2025): Changes in biomass burning in Africa since the last glacial: a new synthesis of burning on the fire continent
- 2024** **Rowan University** Colloquium Series (2024): Plio-Pleistocene history of the Northwest African Monsoon: drivers and ecological consequences of environmental change
- 2024** **University of Bern** Climate of the past and societal responses to environmental changes conference (2024): From glacial to Green Sahara to the post-industrial world: fire interactions with climate, vegetation, and human land use change in African ecosystems
- 2023** **Brown University** Climate Division Lunch Bunch Seminar Series (2023): Organic geochemical techniques for reconstructing Northwest African paleoclimate and paleofires
- 2022** **Yale University** Institute for Biospheric Studies Weekly Seminar Series (2022): A biomarker approach to reconstructing paleofires in African savannas

Academic Honors and Awards

- 2022** **Kenneth and Linda Ciriacks Graduate Fellowship in Earth and Environmental Sciences**
- 2019** **National Science Foundation Graduate Research Fellowship Honorable Mention**
- 2017** **Elected to Sigma Xi Scientific Research Honor Society**
Associate member – elected by Brown University science faculty
- 2017** **Senior Award for Outstanding Research, Academics, and Service**
Award given to graduating senior(s) in Brown University’s Department of Earth, Environmental and Planetary Sciences who have conducted excellent undergraduate research, maintained a high GPA in the sciences, and showed continued dedication to the departmental community.
- 2017** **National Science Foundation Graduate Research Fellowship Honorable Mention**
- 2016** **Sarah LaMendola Award for Outstanding Potential in Undergraduate Research**
Recognizes undergraduate students who demonstrate outstanding potential for research, as selected by the faculty of the Department of Earth, Environmental and Planetary Sciences at Brown University.
- 2015** **National Oceanic and Atmospheric Administration (NOAA) Hollings Scholar Award**
Undergraduate scholarship and fellowship in oceanic and atmospheric science, research, technology, and education.
- 2015** **Brown Undergraduate Teaching and Research Award (UTRA)**
Award provided by Brown University to undergraduates to fund a summer research project under the guidance of a faculty member.

Teaching Experience and Training

Graduate Teaching Assistant—Columbia University:

- 2020** Earth's Environmental Systems: The Climate System, Profs: Suzana Camargo and Galen McKinley
- 2019** Earth's Environmental Systems: The Climate System, Profs: Arlene Fiore and Galen McKinley

Undergraduate Teaching Assistant—Brown University:

- 2017** Evolution of a Habitable Planet, Prof: Timothy Herbert
- 2016** Stratigraphy and Sedimentation, Prof: James Russell
- 2015** Physical Processes in Geology, Profs: Karen Fischer and Jan Tullis
- 2014** Estuarine Oceanography, Prof: Warren Prell

Pedagogical Training:

- 2022–present** **Yale University Poorvu Center Certificate of College Teaching Preparation**
A wide-ranging training program in pedagogy and classroom practices for college-level instruction. Example selected seminars: *Course Design*, *Mental Health in the Classroom*, *Practicing Anti-racist Pedagogy*, *Using Technology Equitably*, among others.

Fieldwork Experience

- 2023** **Taforalt Cave (Grotte des Pigeons), Morocco**
I assisted an archaeological excavation of a cave in the Middle Atlas Mountains periodically occupied by hunter gather groups throughout the late Pleistocene and Holocene. My role was as an organic geochemist collecting samples for paleoclimate and paleofire reconstructions to synergize with other archaeological and anthropological being conducted at the site.
- 2022** **Kruger National Park, South Africa**
I participated in a savanna burn experiment focused on determining the controls of daily weather on fire characteristics (e.g., temperature, rate of spread, and vegetation consumption). I co-lead a charcoal collection portion of the experiment investigating the impacts of burn conditions on charcoal production and dispersal.

Synergistic Activities

Leadership:

- 2025** **AGU Annual Meeting Session Lead Convener and Chair**
Sessions (PP23B, E, D): Paleo- and Historical Perspectives on Fire in the Earth System
- 2024** **AGU Fall Meeting Session Lead Convener and Chair**
Sessions (PP21E, PP23F): Paleo- and Historical Perspectives on Fire in the Earth System
- 2023** **Geosciences Education & Mentorship Support (GEMS)**
I mentor undergraduates and master's students navigate the PhD program application process.
- 2023–2024** **Yale Environmental Leadership and Mentoring (ELM) Certificate Program**
The Yale ELM program is a nine-month certificate in effective and leadership and mentoring practices.
- 2023–Present** **Paleofire Mapping in Africa Project Intern Lead**
As part of a YIBS funded seed grant I oversee and coordinate multiple undergraduate interns from several institutions working on various aspects of the project from lab-based analyses to database construction and management.
- 2023** **AGU Fall Meeting Session Co-convener and Chair**

Session PP039: Reconstructing Regional Hydrologic Changes Across Climatic Boundaries in the Recent Past

Session PP032: Paleo and Historical Perspectives on Fire in the Earth System

2015–2016 Brown DEEPS Undergraduate Group (DUG) Co-President

I facilitated a community for students to share ideas, seek academic advice, and learn about classes, research opportunities, and careers in geological sciences through organized events.

2015–2016 Brown DEEPS Iceland Spring Break Field Trip Organizer

I co-organized and fundraised an educational spring break trip to Iceland, focusing on magmatism, geothermal energy, plate tectonics, and glaciology to supplement classroom learning.

2015–2016 Brown Matched Advising Program for Sophomores (MAPS) Mentor

I guided a sophomore on academic decisions, course selection, concentration declarations, and summer research and internship opportunities.

Reviewer for academic journals:

Nature Geoscience; Science Advances; Nature Communications; Paleoceanography and Paleoclimatology; Geophysical Research Letters; Environmental Research Letters; Organic Geochemistry; Geochemistry, Geophysics, Geosystems; Palaeogeography, Palaeoclimatology, Palaeoecology; Journal of Paleolimnology; Earth System Dynamics; The Holocene; Quaternary Science Reviews, Earth and Space Science; Computers and Geoscience; CATENA

Volunteering and Service:

2022–2026 Yale Institute for Biospheric Studies (YIBS) grant and poster reviewer

I regularly review grant applications for graduate student projects funded through YIBS. Additionally, I serve as a poster session reviewer for symposia held by the institute.

2023–present Regeneron Westchester Science & Engineering Fair (WESEF) volunteer judge

I serve as a judge for an annual high school science fair assessing projects within the environmental sciences.

2022–present American Geophysical Union Fall Meeting OSPA judge

I serve as a judge for graduate and undergraduate conference presentations participating the Outstand Student Presentation Award program at the annual AGU Annual meeting.

2020–2022 Science Fridays visiting science educator

I gave annual guest lectures to a fifth-grade class about paleoclimate at PS 205, Brooklyn, NY via virtual tours of the Lamont-Doherty Earth Observatory Core Repository.

2018 Upper Nyack Elementary Science Fair

I operated a booth to teach students grades 1–4 about plankton and paleoceanography.

2018–2019 American Museum of Natural History Sun and Earth Day

I operated a booth and taught members of the public about glacial flow and the geological history of glaciers in New York City.

2018–2019 NYC Submerge

I ran a booth to teach children and parents alike how past climate conditions can be uncovered by examining sediment from the bottom of the ocean.

2017–2019 Lamont-Doherty Earth Observatory Open House

2017 – I helped run a tour of the LDEO Core Repository to show local community members how we can study the Earth's past using sediment cores.

2018 – I designed and ran a booth teaching the public about the science of reconstructing Earth's past climate with organic-based proxies from marine sediment.

2019

– I ran a demonstration of how lake sediment cores are taken to serve as archives of the Earth's climate history.

Date of Preparation:

October 12, 2026