



YALE INSTITUTE FOR BIOSPHERIC STUDIES

NEWSLETTER

SPRING 2024

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A newsletter by the Yale Institute for Biospheric Studies.

For more information, please contact us at yibs@yale.edu or call 203-436-2301 fax 203-432-9927

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FSC LOGO FPO

Yale

FROM THE DIRECTORS

Welcome back for the spring semester! We hope everyone had a restful break. As usual, we have an eventful year ahead for YIBS. This semester we'll be welcoming two Bass Distinguished Visiting Environmental Scholars, Stanley Ambrose in Anthropology and Timothy Lyons in Earth & Planetary Sciences. Both will give talks in our spring seminar series (p. 8).

Through our multiple programs, we remain engaged in catalyzing novel research in the environmental sciences. Last spring, we pivoted our new seed grants program from biodiversity and ecosystem sciences to climate and climate change. With this new theme, we funded two projects, one on co-consequences of heat stress for urban mammals and another on paleofire-climate variation in Africa (p. 5). We also continued our small grants program for graduate student research and funded 32 projects (pp. 6-7).

In the fall, we funded two new Hutchinson cluster projects that will bring four new postdocs to YIBS. One project focuses on predicting responses to climate warming via behavior, physiology, genomics, and life history in amphibians and

reptiles and the other investigates how greenspace affects health in the context of energy and climate. We look forward to the arrival of the four Hutchinson postdocs as well as the new cohort of four Donnelley fellows to YIBS next year!

In addition to the programs outlined above, our expanded Summer Undergraduate Research in the Environmental Sciences (SURES) program included sixteen students last year (pp. 2-3). We just received another set of projects for next summer and are looking forward to hosting a new cohort of students to conduct research with YIBS affiliates here and in the field!

Finally, all the YIBS programs require committees to evaluate proposals, so we'd like to thank the numerous YIBS affiliates and postdocs who served on these committees last year: Mohammed Armani, Bhart-Anjan Bhullar, Paulo Brando, Richard Bribiescas, Craig Brodersen, Yen-Hua Huang, Pincelli Hull, Jennifer Marlon, Cesar Martinez-Alvarez, Martha Muñoz, Thomas Near, Nicholas O'Mara, Jordan Peccia, Virginia Pitzer, Alan Rooney, David Vasseur, and Madhusudhan Venkadesan. We are grateful to all of them for their time and expertise.

Eric Sargis and Carla Staver

SURES PROGRAM

Summer Undergraduate Research in the Environmental Sciences (SURES)

The Yale Institute for Biospheric Studies offers funding opportunities for Summer Undergraduate Research in the Environmental Sciences (SURES). Students spent 8 weeks during the summer of 2023 conducting research, analyzing data, and writing up their results with the mentorship of a YIBS-affiliated faculty member at Yale University. Research activities were supplemented with a light curriculum oriented towards building research capacity, including responsible conduct of research, statistics in R, scientific writing, and applying to graduate school/funding. In addition to their own project, students learned about the broad range of YIBS research through lab tours and discussion groups, along with behind-the-scenes tours of the Yale Peabody Museum and Marsh Botanical Garden collections. Occasional evening and weekend outings introduced students to the rich natural and cultural heritage of the Greater New Haven region. For more information about the program, please visit <https://yibs.yale.edu/sures>.

2023 SURES Fellows

RECIPIENT & AFFILIATION

PROJECT TITLE

Advisor: Derek Briggs, EPS
Madeline Dissinger, University of Alabama
Whitney Viera Ribeiro, Brown University

Quantifying Evolutionary Changes in Molluscan Prey

Advisor: Jennifer Coughlan, EEB
Gabriela Lebron, Skidmore College

How Do Plants Adapt to Extreme Environments?

Advisor: Vanessa Ezenwa, EEB
Nikita Jaisiree, Gateway Community College

The Role of Animal Behavior in Disease Avoidance

Advisor: Sara Kuebbing, YSE
Cynthia Huerta, Clarkson University
Christine Lumen, Miami Dade College

Agroforestry as a Natural Climate Solution

Advisor: Martha Muñoz, EEB
Aida Mohd Khairi, University of New Haven

Lungless Salamanders



Fellows and directors at the Horse Island research center.

DAVID HEISER



Fellows on a guided tour of Horse Island.

TIMOTHY SANDREY

SURES PROGRAM

2023 SURES Fellows, continued

RECIPIENT & AFFILIATION

PROJECT TITLE

Advisor: Oswald Schmitz, YSE
Esther Yniguez, California State University –
San Bernardino

*Assessing How Historical Variation in Urban Neighborhood Housing and
Green Development is Linked to Urban Mammal Diversity*

Advisor: Karen Seto, YSE
Rachel Jones, Spelman College
Kaleab Tefera, University of Rochester

Urban Tree Canopy Project

Advisor: Carla Staver, EEB
Camila Freire, University of Campinas (UNICAMP)
Leticia Giacom, São Paulo State University (UNESP)

Plant Roots in Brazilian Savannas

Advisor: Paul Turner, EEB
Christian Capuno, California State University –
Stanislaus
Kieren Dykstra Deschenne, Brown University

*Phages in the Microbiomes of Cetaceans, Pinnipeds, and Possibly Other
Marine Animals*

Advisor: David Vasseur, EEB
Alina Garza Pizana, University of Texas at
Rio Grande Valley
Lauren Latham, Tuskegee University

Forecasting the Risk of Warming and Temperature Variability on Species



Fellows on the ferry to Horse Island.

TIMOTHY SANDREY



Fellows Leticia Giacom and Camila Freire conducting field work in Brazil.

CAMILA FREIRE

MECHANISMS AND TRAJECTORIES OF POST-DISTURBANCE RECOVERY IN TROPICAL FORESTS

Tropical forests hold over half of the world's biodiversity and play a critical role in regulating Earth's climate, but also face some of the highest rates of land-use change. More than half of the world's tropical forests are currently in a state of recovery following human disturbance. This includes secondary forests undergoing succession after deforestation for agriculture, as well as mature forests recovering from degradation from logging or recent shifts in fire regimes. While understanding the trajectories of recovery is critical for conservation and climate mitigation, two outstanding questions remain largely unanswered. First, how below and aboveground feedback influence forest recovery pathways and their biodiversity trajectories. Second, how environmental and biological filters shape forest vulnerability to compounding disturbance events associated with droughts, blowdowns, wildfires, and edge effects. Addressing these questions will advance our understanding of underlying biotic mechanisms driving successional dynamics and the potential consequences for forest functioning and biodiversity.

Postdoctoral Associates

David Herrera



David's research is focused on understanding how tropical trees survive the stresses of environmental change and the role of carbon storage dynamics in their ability to survive. In recent years, he has been conducting field experiments and measuring tree traits related to carbon dynamics mainly in Brazil.

Advisor: Paulo Brando, YSE
March 2024 to February 2026

Mareli Sanchez-Julia



Mareli uses field-based and experimental methods to explore how soil biochemistry and plant functional traits influence the composition of plant-symbiotic fungi in lowland tropical forests. She also researches the strategies that trees use to overcome nutrient limitation and the factors that mediate plant carbon allocation to belowground resource acquisition.

Advisor: Michelle Wong, EEB
May 2024 to April 2026

Anita Weissflog



Anita's research aims at understanding how plant-insect and plant-microbial interactions affect the rate and direction of tree species turnover during rainforest recovery. Such knowledge can inform active forest regeneration efforts. It may also advance our understanding of the mechanisms shaping patterns of biodiversity.

Advisor: Liza Comita, YSE
August 2023 to August 2025

SEED GRANTS PROGRAM

YIBS started a new Seed Grants Program in 2022 with a focus on biodiversity and ecosystem sciences. In 2023, the focus was shifted to climate and climate change, which are major themes of YIBS' mission to support research in the environmental sciences and Yale's University Science Strategy Committee (USSC) priority on Climate Solutions. This program was created to spark basic research that addresses themes relating to the dynamics of the climate system and its interactions with the biosphere in the past, present, and future. For more information, please visit <https://yibs.yale.edu/seed-grants>.

Co-consequences of heat stress for urban mammals

PIs: Nyeema Harris, YSE and Kai Chen, YSPH

Climate induces changes in biodiversity that can amplify public health concerns especially in urban environments. An overlooked outcome of exposure to high ambient temperature is varied animal behavior that affect human-wildlife interactions, exacerbating human-wildlife conflict. Here we use detection data compiled from camera trap surveys across 23 North American cities to investigate how heat stress metrics alter space use and activity patterns in conflict-prone mammals (e.g., deer, raccoons, and coyotes). Specifically, we obtain daily temperature data at camera locations to determine area-weighted average temperature and use general circulation models to project into 2100. With these data, we then investigate relationships to animal activity, species richness, and space use as well as apply proximity and hotspot tools to determine a zone of influence in the context of human population density. Ultimately, results from this project will identify the most vulnerable neighborhoods across North American cities to aid in designing interventions, building awareness, and promoting coexistence to ensure healthy human and wildlife populations as all urban dwellers cope with changing climates.



Coyote from Detroit camera survey (one of the cities and surveys included in this project).

APPLIED WILDLIFE ECOLOGY (AWE) LAB, YALE SCHOOL OF THE ENVIRONMENT

Paleofire-climate variation in Africa: data-model comparisons since the Last Glacial Maximum for improved estimation of wildfire in the Earth system

PIs: Jennifer Marlon, YSE and Carla Staver, EEB

Fire activity is a major Earth system process, with strong feedbacks to both biosphere and atmosphere, but global climate models continue to fall short in accurately predicting future carbon cycle and climate changes from fires. Paleofire data from lake and marine sediment cores extend satellite and historical records of past fires enabling the evaluation and improvement of Earth system models under diverse environmental conditions. This project will produce new paleoecological records of highly fire-prone grassy ecosystems in Africa. Funding will also support collaboration with a Kenyan scholar to compile and synthesize existing paleoecological records into a global database from which we will construct global estimates of biomass burning since the Last Glacial Maximum, 21,000 years ago. The improved estimates of African and global fire activity will be compared with model outputs to improve estimates of pre-industrial fire emissions. Accurate fire emissions estimates are essential for understanding modern-day aerosol forcing and carbon storage in ecosystems, which can in turn support better policy and decision making about a wide range of climate change mitigation and adaptation options.

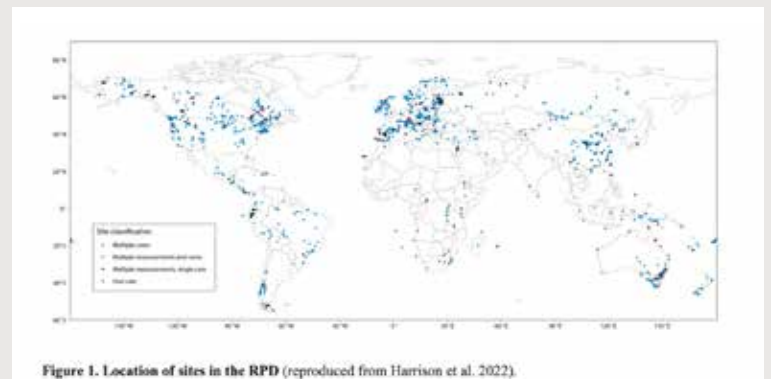


Figure 1. Location of sites in the RPD (reproduced from Harrison et al. 2022).

Location of sites in the global paleofire database (reproduced from Harrison et al. 2022).

SMALL GRANTS PROGRAM

Each year, YIBS solicits and evaluates grant proposals from Master's and PhD students from across the University who are engaged in research related to the biosphere. For more information about the YIBS Small Grants Program, including the schedule for 2024, visit <https://yibs.yale.edu/research/yibs-small-grant-program>. The following are the recipients and projects awarded grants in 2023 in the Departments of Anthropology (ANTH), Ecology & Evolutionary Biology (EEB), and Earth & Planetary Sciences (EPS), School of Engineering and Applied Science (SEAS), and the Yale School of the Environment (YSE). A special thanks to the Small Grants Program Co-Directors, Craig Brodersen and Bhart-Anjan Bhullar for the time and effort they dedicated to this program in 2023.

Early Grants

RECIPIENT & AFFILIATION	PROJECT TITLE
Nathalie Alomar, EEB	<i>Hidden dimensions of diversity in woodland salamanders</i>
Aishwarya Bhandari, YSE	<i>Snow leopard (Panther uncia) density site in Ladakh, India</i>
Seung Hee Chae, SEAS	<i>Investigating the feasibility of using nanobubble-enabled advanced oxidation</i>
Andie Creel, YSE	<i>National recreation demand modeling</i>
Arun Dayanandan, YSE	<i>Harnessing novel forest successional trajectories of mixed-species forest plantation systems to mitigate climate change impacts</i>
Lisa Freisem, EPS	<i>Early development of the mid- and hindbrain in saurians</i>
Gabriel Gadsden, YSE	<i>Drivers of neighborhood rodent communities and their zoonotic pathogens in Philadelphia</i>
Stacey Gerasimov, EPS	<i>Investigating a link between supercontinent breakup, carbon cycle dynamics, and the diversification of animal life</i>
Elly Goetz, EPS	<i>Investigating the molecular diversity of foraminiferal propagules in the Arctic using eDNA metabarcoding</i>
Gryphen Goss, EPS	<i>Dynamic behavior of the Svalbard-Barents Sea Ice Sheet during the Mid-Pleistocene</i>
Vincent Haller, YSE	<i>Modelling forest biomass for Redd+ at local scale – a pilot study in evergreen forests of the Chiloe Island, Chile</i>
Arata Honda, EEB	<i>A mysterious marsupial medley in New Guinea's forest canopy</i>
Noah Houpt, EEB	<i>The influence of niche construction on the repeatability of evolution in bacteria</i>
Swathi Nachiar Manivannan, EEB	<i>Characterizing phenotypic differences of Vibrio cholerae in external and host environments</i>
Elizabeth Nowlin, YSE	<i>Assessing how historical variation in urban neighborhood housing and greenspace development is linked to contemporary mammal biodiversity in cities</i>
Emmanuel Oduro Takyi, EEB	<i>Determinants of variations in fire-induced tree mortality in a savanna biome</i>



Vincent Haller, YSE

Modelling forest biomass for Redd+ at local scale – a pilot study in evergreen forests of the Chiloe Island, Chile: “YIBS funding was applied for funding the field work in Chile during the summer, in which forest inventory plots were measured as ground truthing data for the remote sensing-based forest carbon model.”



Helen Stone, Microbiology

Phenotypic adaptation of viruses to seasonal fluctuations in temperature: “Sampling is ongoing, but YIBS funding will be used to sequence bacteriophage genomes isolated across seasons.”

SMALL GRANTS PROGRAM

Early Grants, continued

RECIPIENT & AFFILIATION	PROJECT TITLE
Kate Pippenger, EPS	<i>Reconstructing the mid-Paleozoic evolution of bioturbation in the Great Basin</i>
Gino Rivera Bulnes, YSE	<i>Spatial distribution of human-carnivore interactions in Ica Valley</i>
Will Rogers, EEB	<i>How do infections affect prey responses to predator cues?</i>
Silvina Slagter, EPS	<i>Testing the use of Ge/Si ratios as a proxy for the fossilization of Earth's earliest animal ecosystems</i>
Helen Stone, Microbiology	<i>Phenotypic adaptation of viruses to seasonal fluctuations in temperature</i>
Samantha Tracy, YSE	<i>Corticosteroid and thyroid hormone as biochemical markers of temperature induced stress in <i>Rana sylvatica</i></i>
Sam Wilson, YSE	<i>Remote sensing investigations of the Big Sagebrush Ecoregion</i>

Late Grants

RECIPIENT & AFFILIATION	PROJECT TITLE
Logan Billet, YSE	<i>Ranavirus die-off timing and synchrony: does pathogen accumulation play a role?</i>
Scott Carpenter, YSE	<i>The future of a migration pathway and winter forage bank: examining the effects of climate change and grazing on the stability of big sagebrush plant communities</i>
Annie Haws, EPS	<i>Metamorphic carbon dioxide fluxes to the atmosphere: implications for long-term climate evolution and anthropogenic carbon sequestration</i>
Aishwarya Iyer, YSE	<i>Residential buildings in urban India: energy efficiency and thermal comfort in the future</i>
Inhyeong Jeon, SEAS	<i>Thermosensitive polymers for control of surface interactions in sustainable small-scale water treatment systems</i>
Julia Laterza Barbosa, EEB	<i>Does arboreality influence the evolution of hydrothermal physiology in neotropical frogs?</i>
Kate McNally, ANTH	<i>Newfoundland ghost nets: fathoming commercial fisheries and the debris of empire</i>
Alexie Millikin, EPS	<i>Re-Os geochronology & stratigraphy of the Transvaal Supergroup: assessing the link between oxygenation and climatic change during the early Paleoproterozoic</i>
Liam Taylor, EEB	<i>Social development, plumage development, and the evolution of adolescence in a colony-nesting seabird (<i>Herring Gulls, Larus argentatus</i>)</i>



Alexie Millikin, EPS

Re-Os geochronology & stratigraphy of the Transvaal Supergroup: assessing the link between oxygenation and climatic change during the early Paleoproterozoic: “After producing an exciting radiometric age from sedimentary rocks that hold evidence for the initial oxygenation of Earth’s atmosphere, the YIBS dissertation improvement grant has allowed me to undertake important geochemical and petrographic investigation to validate this result.”



Liam Taylor, EEB

Social development, plumage development, and the evolution of adolescence in a colony-nesting seabird (*Herring Gulls, Larus argentatus*): “I was able to continue research at my long-term field site, a remote seabird breeding colony in the Bay of Fundy. In addition to behavioral observations and plumage experiments with gulls, fieldwork led to new collaborations about avian disease outbreaks in the regions.”

YIBS FRIDAY SEMINAR SERIES SPRING 2024, 3 PM (EASTERN)

For seminar location details and Zoom/Panopto links, more information about YIBS lectures and events, or to join our mailing list, visit <https://yibs.yale.edu/seminars-lectures>



Inflorescence of an Australian daisy in the glasshouse.

HENRY ARENAS CASTRO

January

- 26** Stanley Ambrose, Professor of Anthropology, University of Illinois & YIBS Bass Scholar
The view from underground: Geobiology, African ecology, and climate change

February

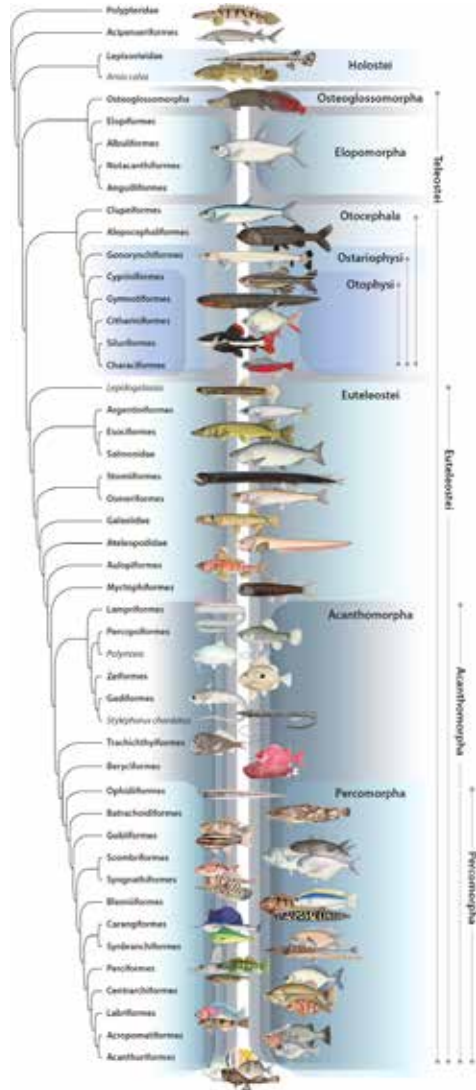
- 2** Pauline Raimondeau, Hutchinson Postdoctoral Associate, EEB
Evolutionary genomics of self-incompatibility in the olive family
- 9** Kai Chen, Assistant Professor of Epidemiology (Environmental Health), YSPH; Deputy Faculty Director, Yale Center on Climate Change and Health
Climate Epidemiology: How to assess the health impacts of climate changes
- 16** Vanessa Tonet, Hutchinson Postdoctoral Associate, YSE
A matter of leaf and death: what kills plants during drought
- 23** Kat Schroeder, Donnelley Postdoctoral Associate, EPS
Ontogenetic niche shift as a driver of community structure and diversity of non-avian dinosaurs

March

- 1** Henry Arenas Castro, Hutchinson Postdoctoral Associate, EEB
Mate choice after mating and pollination

April

- 5** David Herrera Ramírez, Hutchinson Postdoctoral Associate, YSE
How carbon storage strategies influence disturbance survival and recovery of mature trees in the tropics
- 12** Thomas Near, Professor and Chair of EEB; Bingham Oceanographic Curator of Ichthyology, Yale Peabody Museum; Head of Saybrook College
Challenges and solutions in converting phylogenies to taxonomies in ray-finned fishes
- 26** Timothy Lyons, Distinguished Professor of Biogeochemistry, University of California, Riverside & YIBS Bass Scholar
Lakes in crisis: The global challenge of shrinking lakes in arid and semi-arid regions – causes, consequences, and lessons learned from the Salton Sea



Phylogenetic tree of the major living lineages of ray-finned fishes.

THOMAS NEAR AND ALEX DORNBURG