



YALE INSTITUTE FOR BIOSPHERIC STUDIES

NEWSLETTER

SPRING 2023

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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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Yale

FROM THE DIRECTORS

Welcome back for the spring semester! We hope everyone had a restful and restorative winter break. We're still engaged in sparking novel research in the environmental sciences. Last spring, we solicited proposals on biodiversity and ecosystem sciences, funding two projects, one on biodiversity of Indonesian marine invertebrates and another on tropical understory herbaceous communities (p. 4). In the fall, we funded two new Hutchinson cluster projects, which will bring six new postdocs to YIBS. One project focuses on tropical forest recovery from disturbance and the other on drought tolerance in *Mimulus*.

We look forward to welcoming the six Hutchinson postdocs and a new cohort of four Donnelley fellows to YIBS next year! Our new internship program, which brings undergraduates from HBCUs, HSIs, and TCUs for lab or field research with YIBS affiliates, was piloted to great success. In 2022, the Summer Undergraduate Research in the Environmental Sciences (SURES) program brought four students to Yale (pp. 2-3). Three students



Associate Director Carla Staver and Director Eric Sargis in the YIBS offices in the newly renovated Yale Peabody Museum.

ALISON RICHARD

worked here in New Haven in EEB labs, and another did fieldwork in Malawi. We're currently in the process of advertising an expanded set of SURES projects for summer 2023. We're looking forward to hosting more students conducting research with YIBS affiliates both on campus and in the field!

Eric Sargis and Carla Staver

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 2022 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>.

2022 SURES Projects

Martha Muñoz, *Assistant Professor, EEB*

Lungless Salamanders (Plethodontidae)

Lungless salamanders are a diverse, yet poorly understood, lineage of amphibians. Participants joined an expedition to the southern Appalachian Mountains, where they engaged in field research and gathered data on habitat use, made recordings of feeding behavior, and collected salamanders. This field team brought the salamanders back to the lab at Yale. Participants then learned how to measure several physiological features of the salamanders, including water loss rates, metabolic rates, critical thermal limits, and preferred temperatures.

Jessica Thompson, *Assistant Professor, ANTH*

The Malawi Ancient Lifeways and Peoples Project (MALAPP)

MALAPP conducts archaeological excavations and paleoenvironmental reconstructions in northern Malawi. Participants in the six-week field program recovered stone artifacts, fossilized animal bones, ancient plant remains, beads, archaeological pigments, and other cultural materials dating typically to the period between ~5000-30,000 years ago. In addition to daily activities involving archaeological excavation and survey, participants spent three days at Lake Malawi, took field trips to visit local rock art localities, and spent three days at the Vwaza Marsh Game Reserve for instruction on the local ecology of the Zambezian Biome.

Thomas Near, *Chair and Professor, EEB*

Speciation and Species Discovery in Black Basses

Black Basses are iconic North American freshwater fishes and well known for their global recreational importance. This project introduced participants to bioinformatic tools and methods of phylogenetic analysis and provided training in multivariate statistics in analyzing morphological datasets. Those involved gained experience in the laboratory collecting both genomic and morphological data, specimen curation practices in the Yale Peabody Museum, and methods of data management and analysis.

Paul Turner, *Rachel Carson Professor, EEB*

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

Viruses are perhaps the most abundant and biodiverse inhabitants of Earth, particularly bacteriophages (phages), which are viruses that specifically infect bacterial species. This project expanded on collaborations with scientists at the Mystic Aquarium to discover phages in the microbiomes of cetaceans (e.g., beluga whales), pinnipeds (e.g., seals, sea lions), and possibly other marine animals. The primary goal of this research was to study whether these phages might have useful properties for therapeutic use in marine mammals, should they be infected by antibiotic-resistant bacterial pathogens (i.e., phage therapy applications).

SURES PROGRAM

2022 SURES Fellows

Jesús Buenrostro



Heritage University

Project:

Lungless Salamanders
(Plethodontidae)

Advisor:

Martha Muñoz, EEB

“My experience this summer was a bit of everything! From personal gain and experience, stem research and working in a lab environment and in the field as well was pretty cool! I liked being able to venture out and travel a bit around the area besides doing my research, as well! Meeting new people who are too interested in a stem career! My wonderful PI who made it her mission for this to be an exceptional experience! My second advisor who was always there for me when I needed some help, advice, questions answered. Help was always there and available, which gave me a sense of comfort and hospitality. I was a bit homesick here and there but keeping myself busy helped take my mind off that feeling, which there was lots to do. Overall, very grateful for the opportunity and hospitality.”

Christian Capuno



California State
University, Stanislaus

Project:

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

Advisor:

Paul Turner, EEB

“I was raised in a rural farming town with limited opportunities for STEM, and grew up feeling stifled, that I had unrealized potential. This fellowship provided me with that big break—by immersing me in this environment, I discovered both my penchant and aptitude for research, fully confirming the career path I would pursue. SURES supported me the whole way through— from analyzing publications, to authoring my own, and lecturing on such. Through this program, you learn about the reality of full-time research, and whether it’s right for you—and for that, I recommend it highly.”

Nirvana Delev Martinez



University of La Verne

Project:

The Malawi Ancient
Lifeways and Peoples
Project (MALAPP)

Advisor:

Jessica Thompson,
ANTH

“A once in a lifetime opportunity, is more than fitting for the enriching 2 months spent in the beautiful country of Malawi, Africa. From a typical ‘California’ city girl turned backpacking, camping expert overnight, my time as a part of the Malawi Ancient Lifeways and People’s project was beyond fulfilling through the submergence learning to live day to day life as a Malawian in Lunjika village, making friends from around the world, and experiencing the importance of educating oneself of cultural evolution through archaeology. I will forever hold gratitude for the opportunity I was granted to broaden and diversify my experiences in STEM by the Yale Institute for Biospheric Studies.”

Rosangela Gutierrez



Florida International
University

Project:

Speciation and Species
Discovery in Black Basses

Advisor:

Thomas Near, EEB

“I cannot think of a better way to have spent this past summer. The YIBS SURES fellowship not only focuses on the research program, but also includes a lot of activities to keep students engaged in different ways. Every week there is a new workshop led by an expert to provide a well-rounded experience. The accommodations are great, the faculty and staff are very helpful and knowledgeable. Also, this program is structured in a way that gives students the opportunity to explore Yale.”

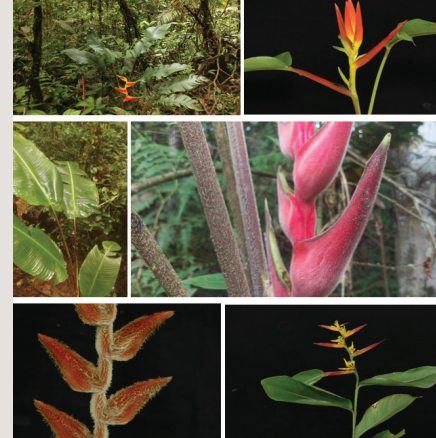
Ecosystems, biodiversity, and global change are major themes of both YIBS' mission to support research in the environmental sciences and Yale's University Science Strategy Committee (USSC) priority on Environmental and Evolutionary Sciences. This program was created to spark research that addresses themes relating to the maintenance, origins, and conservation of biodiversity, specifically at their interface with ecosystem dynamics. For more information, please visit <https://yibs.yale.edu/biodiversity-and-ecosystem-sciences-program>.



Biodiversity of Marine Invertebrates in Indonesia

Casey Dunn, *Professor EEB & Curator of Invertebrate Zoology and Informatics, YPM*

The Indonesian Archipelago is vast, with more than 17,000 islands spanning an area about the size of the continental USA. Indonesia is at the heart of the Coral Triangle, a diversity hotspot for many groups of marine organisms. This abundance and diversity of marine animals is fundamental to the Indonesian economy, culture, and well-being, and fascinating in its own right. Different explanations for this extreme diversity have been proposed. The primary challenge to teasing apart these explanations is that the biodiversity of marine invertebrates in Indonesia remains poorly described, and understood, relative to many other regions. The Yale team will work with Indonesian scientist Dr. Hagi Yulia Sugeha and her students at the National Research and Innovation Agency (BRIN) to build local capacity for biodiversity research and initiate biological inventories and population studies of multiple marine species, including jellyfish. This project includes fieldwork in Indonesia, but that is paired with multiple visits by Indonesian scientists to Yale for training, museum work, and lab work.



Coexistence of Tropical Understory Herbaceous Plant Communities

Simon Queenborough, *Musser Director, TRI & Senior Lecturer & Research Scientist, YSE*

The coexistence of hundreds of sympatric species within tropical forests remains an unsolved problem. Most studies have focused on trees. However, fitness (the net integrated result of growth, survival, and reproduction across its entire life cycle) is hard to estimate for such long-lived organisms. In contrast, most herbaceous plants complete their life cycle in much less time. Thus, estimating the direct effects of factors driving population growth rates and fitness (rather than proxies such as growth or mortality) is much more tractable. This project will monitor the distribution and population dynamics of a suite of herbaceous understory plant species over two years throughout a large environmentally variable 25-ha forest plot. We will link variation in local abiotic (topographic habitat, soil nutrients, water, and light availability) and biotic (local conspecific and heterospecific herb density, and local tree neighborhood) factors with functional trait data (seed size, specific leaf area and size) to (i) determine variation in population growth rates and (ii) to address the relative importance of spatiotemporal variation in these factors for mechanisms of coexistence and patterns of diversity.

Several YIBS postdoctoral associates receive job offers every year, and here we highlight two of them. Congratulations to these Gaylord Donnelley fellows on their next positions!



Cesar Martinez-Alvarez

Cesar Martinez-Alvarez

*Gaylord Donnelley Postdoctoral Associate, YSE
Assistant Professor, Department of Political Science,
University of California, Santa Barbara*

After completing his postdoctoral position at the Yale School of the Environment, Cesar will join the faculty in the Political Science department at the University of California, Santa Barbara, where he will continue developing a research and teaching program centered on the most pressing environmental challenges in the Global South. Cesar's teaching will focus on environmental politics and policy, quantitative methods, and comparative politics. His research program centers around three broad themes, including the role of local communities in ecosystem conservation, the political and societal impacts of extractive industries, and the political economy of climate change in the Global South. In doing so, he hopes to contribute to building a network of scholars, students, and practitioners in the United States and Latin America interested in global environmental issues.



Maya Stokes

Maya Stokes

*Gaylord Donnelley Postdoctoral Associate, EEB
Assistant Professor, Department of Earth, Ocean, & Atmospheric Science,
Florida State University*

Maya Stokes is a geomorphologist turned evolutionary biologist, fascinated by connections between Earth surface processes and the evolution of life. As a Donnelly Postdoctoral Fellow at Yale, she worked with the Near lab to investigate how the rivers of the southeast United States have changed over time, influencing the distribution and evolution of freshwater fish. As a geomorphologist, Maya uses field observations, remote sensing data, and numerical models of river erosion. Then, she compares her findings to information about evolution inferred from DNA sequence datasets. After leaving YIBS, Maya joined the faculty at Florida State University in the Department of Earth, Ocean, and Atmospheric Science in January 2023. Her research lab at FSU will continue to work on questions at the intersection of geomorphology and evolutionary biology with a focus on understanding geologic mechanisms of speciation in the southeast United States – a freshwater biodiversity hotspot.

YIBS 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 2023, visit <https://yibs.yale.edu/research/yibs-small-grant-program>.

The following are the recipients and projects awarded grants in 2022 in the Departments of Anthropology (ANTH), Ecology & Evolutionary Biology (EEB), and Earth & Planetary Sciences (EPS) within the Graduate School of Arts and Sciences (GSAS), and the Yale School of the Environment (YSE). A very special thanks to the Small Grants Program Co-Directors, Casey Dunn and Craig Brodersen, for the time and effort they dedicated to this program in 2022.

Early Grants

RECIPIENT & AFFILIATION	PROJECT TITLE
Frannie Adams, YSE	<i>Influences of brackish river water salinity gradients on greenhouse gas fluxes of disturbed and undisturbed mangrove ecosystems</i>
Namrata Ahuja, EEB	<i>An exploration of the local diversity in the Atlantic</i>
Robert Anderson, EEB	<i>The effects of climate change on plant community composition in western Wyoming, and implications for wildlife migration</i>
Henry Camarillo, EEB	<i>Evolutionary biomechanics of feeding performance in lungless salamanders (Family: Plethodontidae)</i>
Jonathan Gewirtzman, YSE	<i>Toward biological understanding and ecosystem scale quantification of methane emissions from temperate forest trees</i>
Emma Grover, YSE	<i>Influence of developmental stage and life history on leaf traits in tropical rain forest trees</i>
Janey Lienau, YSE	<i>Ground beetle nitrogen cycling in eastern temperate forests</i>
Urmila Mallick, YSE	<i>Differentiating livestock- and wildlife-mediated soil carbon storage in Botswana's Makgadikgadi landscape</i>
Cameron McKenzie, YSE	<i>Vertical niche differentiation as a driver of epiphyte diversity in a neotropical premontane cloud forest</i>
Sydney Nelson, YSE	<i>Measuring prevalence and distribution of ranavirus in a meta-population of wood frogs (<i>Lithobates sylvatica</i>) in a suburban setting</i>
Oluwatobi Oso, EEB	<i>Developmental anatomy and evolution of overwintering buds in <i>Viburnum</i></i>
Josh Randall, EEB	<i>Phenotypic plasticity and evolution in <i>Viburnum</i> following glacial recession</i>
Rachel Renne, YSE	<i>Investigating shrub-grass interactions in big sagebrush ecosystems</i>
Abby Skwara, EEB	<i>A novel statistical approach to predict the structure-function landscape of ecological systems</i>
Julia Wood, EEB	<i>Phylogeography and systematics of Percidae using ultraconserved elements</i>
Joseph Zailaa, YSE	<i>Investigating the drivers of evaporative leaf water loss in diverse native-California species</i>



Janey Lienau, MEd '23, YSE

"Sample processing is still ongoing, but I developed a deeper love for conducting my own field work and being outside. I hope this leads to some new insight to how nitrogen cycles through the soil food web in eastern temperate forests."

YIBS SMALL GRANTS PROGRAM

Late Grants

RECIPIENT & AFFILIATION	PROJECT TITLE
Yara Alshwairikh, YSE	<i>Past, present and future adaptation: forecasting future climate risk from the genomes of wood frogs</i>
Brooke Bodensteiner, EEB	<i>Do viviparous lizards and snakes face a heightened risk from climate change?</i>
Nicholas Brown, ANTH	<i>Assessing pre-Hispanic Late Holocene change in domesticated camelid diet and mobility at the high-altitude archaeological site of Chawin Punta in the Andes of Pasco, Peru</i>
Anri Chomentowska, EEB	<i>Investigating the evolution of syndromes: life history, mating system, and environmental niche of a desert-alpine lineage in the plant family Montiaceae</i>
Alexa Duchesneau, ANTH	<i>White-faced capuchin (Cebus capucinus) Nutritional Goals, Life History and Fitness in a Changing Climate</i>
Diego Ellis Soto, EEB	<i>Responses of birds and mammals to ENSO allow iterative forecasting of species responses to climatic events in the Galapagos</i>
Caleb Gordon, EPS	<i>Evaluating the interplay of limb anatomy and extinction risk in the fossil record of aquatic reptiles</i>
Spencer Irvine, ANTH	<i>Morphometric analysis of primate hips and knees in relation to leaping behavior</i>
Kelsey Jenkins, EPS	<i>The early evolution and radiation of reptiles</i>
Katherine Meier, YSE & ANTH	<i>Fruits and floods: gorilla, chimpanzee, and elephant diets in a seasonally-flooded peat swamp forest</i>
Lauren Mellenthin, EEB	<i>Stiffness of senescing: determining adult medusae age of Long Island Sound jellyfish species (Cyanea capillata) using material properties</i>
Nathalie Sommer, YSE	<i>Animal-driven soil biogeochemical cycles under climate variability</i>
Daniel Stadtmauer, EEB	<i>A spatially-resolved view of the evolution of cellular niches in the endometrium of viviparous mammals</i>
Shoko Yamada, ANTH	<i>Toxicity, remediation, and land transformations in post-industrial Japan</i>



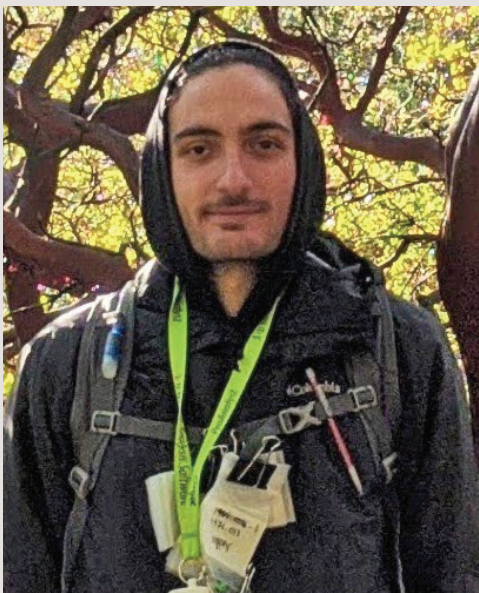
Yara Alshwairikh, PhD '24, YSE

"The award allowed me to support the cost of sequencing hundreds of DNA samples of my wood frog samples."



Caleb Gordon, PhD '23, EPS

"I have used YIBS-funded CT scans to compare the anatomy of reptiles with and without interdigital webbing. I am presenting the preliminary results of this work at next week's international vertebrate paleontology conference (SVP 2022)."



Joseph Zailaa, PhD '25, YSE

"Preliminary data I collected on water loss from leaves in response to temperature treatments has shown interesting patterns that conflict with those from a similar study done in a tropical ecosystem. This has led me to want to further investigate what the potential leaf anatomy drivers of the observed pattern are and to do so, I will continue this project using leaves I collected during my YIBS-funded field campaign this summer which will hopefully shed light on why my findings in temperate plant species show a different pattern than those from tropical habitats."

YIBS FRIDAY SEMINAR SERIES SPRING 2023, 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>



Erin Saupe examining the ammonite pavement, Lyme Regis, UK.

ERIN SAUPE



Gregory Wilson Mantilla: Mammals such as *Purgatorius mckeeveri* evolved into different niches in the aftermath of the dinosaur extinctions.

ANDREY ATUCHIN



Mohammed Armani: Kogyae Strict Nature Reserve.

MOHAMMED ARMANI

February

- 3** Lucas Weaver, NSF Postdoctoral Research Fellow, EEB, University of Michigan
Landscape change and climatic warming as potential drivers of early mammalian macroevolution
- 10** Michelle Spicer, NSF Postdoctoral Research Fellow, YSE
Assembly in the air: drivers of plant diversity in temperate and tropical forest canopies
- 17** Erin Saupe, Associate Professor of Paleobiology, University of Oxford & YIBS Bass Scholar
The emergence of latitudinal diversity gradients
- 24** Jenn Coughlan, Assistant Professor, EEB
*The genetic basis of life history adaptation in *Mimulus**

March

- 3** Kostas Tsigaridis, Research Scientist, Columbia Climate School
The role of volcanoes in the Earth system and beyond
- 31** Paul Turner, Rachel Carson Professor of EEB; Director of Quantitative Biology Institute
A conversation about the Yale Quantitative Biology Institute

April

- 14** Gregory Wilson Mantilla, Professor of Biology, University of Washington & YIBS Bass Scholar
Ecological radiations of mammals before and after the K/Pg mass extinction
- 21** Sappho Gilbert, PhD Candidate, Yale School of Public Health & YIBS Science Communication Fellow
Harvest trail access and resultant grocery sales trends in Nunavut, Canada
- 28** Mohammed Armani, YIBS Hutchinson Postdoctoral Associate, EEB
Trajectories of vegetation change across the forest-savanna boundary of West Africa