FROM THE DIRECTOR

The Yale Environmental News (YEN) was published semi-annually from the mid-1990’s through 2012. It was produced by what was then called the Yale Environmental Partnership, which was made up of the Yale Institute for Biospheric Studies, the Yale Peabody Museum of Natural History, and what is now the Yale School of the Environment. Coordinated by YIBS, the production of YEN became a major undertaking — the last issue ran to 36 pages! YEN moved online for a time, and from 2016 through 2018 YIBS disseminated “News and Updates” electronically. After that, an e-mail listserv was used for announcements. I review this history as a prelude to announcing the effort that you see before you—our new YIBS Newsletter! The idea is to broadcast — more regularly and more widely — what YIBS is up to, which, as you will see, is quite a lot. Going forward, our plan is to produce a YIBS Newsletter at the beginning of each semester. We’re excited to be sharing this with you and hope you’ll find it useful. Please send me any and all comments and suggestions. Enjoy!

Michael J. Donoghue, Sterling Professor of Ecology and Evolutionary Biology; Director of the Yale Institute for Biospheric Studies
Several YIBS-affiliated faculty (and their students) are conducting research related directly to the COVID-19 pandemic. Here we briefly highlight three of them.

**Jordan Peccia**  
*Thomas E. Golden, Jr. Professor of Chemical & Environmental Engineering*  
Our group is measuring and reporting the daily concentration of SARS-CoV-2 RNA in the wastewater of Connecticut cities. This approach is a simple, low-cost way to track COVID-19 outbreak dynamics. Although individual COVID-19 testing is critical for identifying and isolating infection, individual testing is largely prompted by symptoms and reporting often occurs after the test date. Our results indicate that virus RNA in wastewater can be a leading indicator of outbreak dynamics over compiled testing and hospital admission data and thus provide an early warning system. To learn more about genomic epidemiology and wastewater surveillance, please visit covidtrackerct.com.

**Paul Turner**  
*Rachel Carson Professor of Ecology and Evolutionary Biology*  
We have been involved in four projects related to the SARS CoV-2 virus and COVID-19 disease. Three involve bacteriophages (bacteria-specific viruses). First, we are discovering naturally occurring phages that can be used to treat antibiotic-resistant bacteria, which can cause pneumonia in COVID-19 patients. Second, lab members Ben Chan and Katie Kortright have contaminated N95 masks with phages to test methods to sterilize the PPE used by healthcare workers. Third, Katie is collaborating on a project led by Peter Raymond (YSE) that uses phages as models for expected virus densities in rivers in connection with SARS CoV-2 monitoring. We are also collaborating with Mystic Aquarium to test whether sea mammals are susceptible to infection by the SARS CoV-2 virus. Learn more at turnerlab.yale.edu.

**Virginia Pitzer**  
*Associate Professor of Epidemiology (Microbial Diseases)*  
Efforts to track the trajectory of SARS-CoV-2 transmission in the United States have been hindered by insufficient testing capabilities, changing testing policies, and inconsistent reporting practices. We have been using simulation models to explore the effect of changes in testing practices on estimates of SARS-CoV-2 transmission. We are also developing a Bayesian “nowcasting” approach that explicitly accounts for reporting delays and changes in testing practices to generate real-time estimates of new COVID-19 infections from reported cases and deaths (covidestim.org). Our approach allows for more accurate quantification of the time-varying effective reproduction number (Rt), which is a key measure of SARS-CoV-2 transmission. Timely estimates of Rt are essential for understanding the consequences of imposing or relaxing interventions on SARS-CoV-2 transmission.
YIBS CENTERS MOVING FORWARD

For many years YIBS has helped to support the operation of three important facilities that foster research on the environment: the Yale Center for Earth Observation (YCEO), the Center for Genetic Analyses of Biodiversity (CGAB), and the Yale Analytical and Stable Isotope Center (YASIC). The YIBS operational model has been to support initiatives for a finite period, thereby allowing the development of brand new projects. Accordingly, these three key research centers will now be funded primarily through the Office of the Provost. All three are in great hands and will continue to provide services of tremendous value to our community. We encourage you to explore their websites and to take full advantage of their excellent resources and expert staff.

Yale Center for Earth Observation
yceo.yale.edu

The YCEO is a centralized resource for remote sensing hardware, software, and expertise for the Yale community. YCEO is available to help in the selection, procurement, and analysis of satellite images for research. Multiple workstations in the Class of 1954 Environmental Science Center have been configured to handle the processing and graphics demands typical in remote sensing. This research and teaching lab, which has long been a YIBS-supported research center, is cosponsored by the Yale School of the Environment.

Center for Genetic Analyses of Biodiversity
cgab.yale.edu

The discoveries made in the CGAB’s molecular laboratory inform work in the fields of systematics, evolutionary biology, ecology, paleontology, invasion and conservation biology, and epidemiology. Researchers have explored subjects as wide-ranging as vocal learning in birds, climatic influences on genetics, the geographic origins of invasive species, genetic diversity in endangered species, and the evolution of disease-spreading parasites. One-on-one training and workshops teach students how to select and use genetic markers and analytical tools.

Yale Analytical and Stable Isotope Center
earth.yale.edu/yasic-yale-analytical-and-stable-isotope-center

YASIC is a core facility that provides a wide range of analytical services, including measurements of stable isotopes, cations, anions, greenhouse gases, natural abundance γ-radiation, mercury, and nutrients in water or soil extracts. YASIC provides critical support for research on atmosphere, ocean, and climate dynamics, biogeochemistry and paleoceanography, ecology, evolution, and paleontology, lithosphere and surface processes, and solid earth geophysics.
Trees produce carbohydrates through photosynthesis and can store them away for later use. This “food pantry” allows sessile and long-lived trees to survive during unfavorable environmental conditions when their ability to make new carbohydrates is impaired. However, how, when, and where stored carbohydrates are used in response to stresses, such as drought, remains poorly understood. This knowledge gap hinders our ability to predict forest mortality under current and future environmental conditions, which has broad implications for understanding carbon storage and cycling in a changing world. In my studies of oaks in the laboratory of Craig Broderson (YSE), I have discovered that some species store more carbohydrates than others, which may render them more resilient to stress.

Siphonophores are jellyfish colonies that drift in open oceans worldwide. They consume a wide array of prey, from small crustaceans to fish, and even jellyfishes. Many of these organisms are either too small or too rapidly digested to be identified visually, so I am working in the laboratory of Casey Dunn (EEB) on DNA technology to quantify their prey. To identify the DNA sequences in the guts of siphonophores I collected off the coast of California, I built a reference database by sequencing many plankton species paired with specimens and photographs in the Peabody Museum of Natural History. I have discovered that rapidly digested soft-bodied animals play a much larger role in the diet of siphonophores than previously suspected. This helps us understand how siphonophores function in the ecosystems that sustain fisheries and marine mammals.
INCOMING POSTDOCS

G. EVELYN HUTCHINSON
ENVIRONMENTAL
POSTDOCTORAL FELLOWSHIPS

The newly established Hutchinson Environmental Postdoctoral Program, named in honor of G. Evelyn Hutchinson, the father of modern ecology, is intended to advance knowledge of the environment in relation to global change and to support the environmental priorities in Yale’s strategic plan for the sciences. For 2020–2022, cohorts of postdoctoral fellows, representing multiple disciplines, will focus on two broad themes

Theme 1 – Environment and Evolution

This Hutchinson cohort will focus on how species interactions are reshaped by ecological and evolutionary responses to human accelerated environmental changes.

Joey Bernhardt
Ecology and Evolutionary Biology
Fellowship dates September 2020–August 2022
Primary Mentor David Vasseur

Nathaniel Edelman
Yale School of the Environment
Fellowship dates September 2020–August 2022
Primary Mentor David Skelly

Sarah Friedman
Ecology and Evolutionary Biology
Fellowship dates September 2020–August 2022
Primary Mentor Martha Muñoz

Elizabeth Sibert
Earth and Planetary Sciences
Fellowship dates October 2020–September 2022
Primary Mentor Pincelli Hull

Jason Vleminckx
Yale School of the Environment
Fellowship dates January 2021–December 2022
Primary Mentor Liza Comita
G. EVELYN HUTCHINSON ENVIRONMENTAL POSTDOCTORAL FELLOWSHIPS

The two cohorts of Hutchinson postdocs—10 in all—will share space in the Osborne Memorial Laboratories and engage in research and synthesis activities with a network of Yale faculty mentors spanning multiple schools and departments.

Theme 2 — Climate and Greenhouse Gases

This Hutchinson cohort will focus on understanding the generation and management of greenhouse gases generally, but with a special emphasis on the production and control of methane in natural and human-managed systems.
GAYLORD DONNELLEY ENVIRONMENTAL POSTDOCTORAL FELLOWSHIPS

The Gaylord Donnelley Postdoctoral Fellowship supports postdoctoral associates in their research on biodiversity or a combination of environmental science with conservation and public policy. Created to honor the memory of Gaylord Donnelley, Yale Class of 1931, a conservationist dedicated to advancing research and education, the fellowship was established by Mr. Donnelley’s widow Dorothy and his son Strachan, is funded by an endowment from the Gaylord and Dorothy Donnelley Foundation and the Donnelley Family, and is administered by YIBS. These appointments are intended for individuals who have been awarded (or who soon will be awarded) a PhD degree within the past three years. Nominations are made annually by Yale faculty, who also provide mentorship and laboratory space.

Deadlines for Postdoc Nominations by Yale Faculty

Nominations for Donnelley appointments in 2021 are due on October 21, 2020.

Nominee application materials are due on November 23, 2020, and awards will be announced by December 18.

For more detailed information about the nomination and application process, please visit — yibs.yale.edu/donnelley-fellows.

Thomas Boag
Earth and Planetary Sciences
Fellowship dates October 2020–September 2022
Primary Mentor Lidya Tarhan

Advait Jukar
Anthropology
Fellowship dates June 2020–May 2022
Primary Mentor Jessica Thompson

James Lichtenstein
Yale School of the Environment
Fellowship dates September 2020–August 2022
Primary Mentor Oswald Schmitz

Natasha Picciani
Ecology and Evolutionary Biology
Fellowship dates December 2020–November 2022
Primary Mentor Casey Dunn
Established in July 2002 with a generous gift to YIBS by Edward P. Bass, the Edward P. Bass Distinguished Visiting Environmental Scholars Program brings premier scholars in any field dealing with the study of the environment, past or present, to Yale for an extended period. Scholars are nominated by YIBS Faculty Affiliates and, while in residence at Yale, scholars present seminars, interact with faculty, students, and research groups, and participate in the life of one or more academic units. In spring 2005, Dr. Rita Colwell was named the inaugural Edward P. Bass Distinguished Visiting Scholar. YIBS has hosted some 35 scholars since then.

2019–2020 Scholars

John Damuth
Research Biologist of Ecology, Evolution and Marine Biology, University of California, Santa Barbara

Michael Hochberg
Research Director, Centre National de la Recherche Scientifique, University of Montpellier, France

Susan Mazer
Professor of Ecology and Evolution, University of California, Santa Barbara; President, California Botanical Society

2020–2021 Scholars

Caroline Strömberg
Estella B. Leopold Associate Professor and Curator of Paleobotany, University of Washington

Greg Wilson
Professor, University of Washington, Department of Biology

Steven Hamburg
Chief Scientist, Environmental Defense Fund; Chief Scientific Officer, International Methane Studies

APPOINTMENT: 2019–2020

APPOINTMENT: FALL 2019

APPOINTMENT: 2019–2020

APPOINTMENT: SPRING 2021

APPOINTMENT: SPRING 2021

APPOINTMENT: 2020–2021
YIBS SMALL GRANTS PROGRAM

The YIBS Small Grants Program awards grants in all areas of biospheric studies, including but not limited to research primarily affiliated with the Yale Departments of Anthropology, Ecology and Evolutionary Biology, and Earth and Planetary Sciences, along with the Yale School of the Environment and the Yale School of Public Health. Proposals are solicited annually during the spring term and awards are announced before the completion of the term. Each year the YIBS Small Grants Program receives many more proposals than it can fund. The director of the YIBS Small Grants Program convenes a committee to review proposals and advise in making funding decisions.

2019 Doctoral Dissertation Improvement Award Recipients

<table>
<thead>
<tr>
<th>RECIPIENT</th>
<th>PROJECT TITLE</th>
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<tbody>
<tr>
<td>Kelly Aho, YSE</td>
<td>Controls on GHG evasion from streams and rivers</td>
</tr>
<tr>
<td>Mary Burak, YSE</td>
<td>Spatial-Genetic Applications for Apex Predator Conservation in a Changing Ecosystem</td>
</tr>
<tr>
<td>Paul Burow, YSE</td>
<td>Social and Cultural Impacts of Native and Nonnative Species on Great Basin Landscapes and Livelihoods</td>
</tr>
<tr>
<td>Alejandro Damian Serrano, GSAS, EEB</td>
<td>Identifying the diets of siphonophores in the Offshore Northern California Current Ecosystem</td>
</tr>
<tr>
<td>Daniel Gaskell, GSAS, EPS</td>
<td>Constraining ontogenetic controls on planktonic foraminiferal metabolism and stable isotopes by live culturing in Bermuda</td>
</tr>
<tr>
<td>Stephen Gaughran, GSAS, EEB</td>
<td>Modelling fitness effects in endangered and abundant seal species</td>
</tr>
<tr>
<td>Christopher Hebdon, GSAS, Anthropology</td>
<td>Swidden-fallow Agroforestry Knowledge in Ecuador: Farmer and Governmental Perspectives</td>
</tr>
<tr>
<td>Nicolas Mongiardino Koch, GSAS, EPS</td>
<td>Phylogenetics as a key to the macroevolutionary history of sea urchins</td>
</tr>
<tr>
<td>Jasmina Weimann, GSAS, EPS</td>
<td>Characterizing phylogenetic information retained in Metazoan protein fossilization products</td>
</tr>
<tr>
<td>Wen Zhou, YSE</td>
<td>The new concessionary regimes of Gabon, Central Africa retained in Metazoan protein fossilization products</td>
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</tbody>
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Stephen Gaughran (GSAS, EEB)
Doctoral Dissertation Improvement Grantee —

“I used the YIBS Doctoral Dissertation Improvement Award to do whole genome sequencing of nine Weddell seals and ten Northern elephant seal samples. YIBS funding has allowed me to add these two additional species as comparisons to the Hawaiian monk seal, an endangered species that only lives in the waters surrounding the Hawaiian Islands.”

Alexie Millikin (GSAS, EPS)
Doctoral Pilot Grantee —

“As a YIBS Doctoral Pilot Grantee, I sailed to remote areas in the northern Svalbard archipelago for my PhD research. I spent a month mapping field relationships of early Neoproterozoic rock units and measuring over 4-km of previously unstudied stratigraphy at the meter-scale.”
2019 Doctoral Pilot Award Recipients

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Kristy Barnes, YSE</td>
<td>Identifying and Quantifying Nutrient Vectors of Rangifer Migration</td>
</tr>
<tr>
<td>Asa Cameron, GSAS, Anthropology</td>
<td>Crafting the nomadic state: Isotopic perspectives into pastoral practices and mobility in Mongolia from the Late Bronze Age through the Xiongnu Period.</td>
</tr>
<tr>
<td>Cassandra Clark, YSPH</td>
<td>Evaluating the utility of spatial and activity-based exposure metrics for use in assessing exposure to carcinogens from unconventional oil and gas development in drinking water</td>
</tr>
<tr>
<td>Danica Doroski, YSE</td>
<td>Urban Forest Stand Dynamics and Restoration Pathways</td>
</tr>
<tr>
<td>Erica Evans, GSAS, EPS</td>
<td>Investigating the influence of ice sheet substrate on accelerated melting: Faster flows on bedrock or regolith?</td>
</tr>
<tr>
<td>Ava Ghezelayagh, GSAS, EEB</td>
<td>Do Fishes Diversify Faster in Freshwater? A Comparative Analysis of Ostariophysi and Percomorpha</td>
</tr>
<tr>
<td>Chelsea Jack, GSAS, Anthropology</td>
<td>Hemp: An American Revival</td>
</tr>
<tr>
<td>Vanna Choo Sze Koh, GSAS, Anthropology</td>
<td>Territory Making: The Creation of Land and Social Relations in Singapore</td>
</tr>
<tr>
<td>Manon Lefevre, YSE</td>
<td>Birth Control as an Environmental Priority: Interrogating the link between overpopulation and climate change in Madagascar</td>
</tr>
<tr>
<td>Alexie Millikin, GSAS, EPS</td>
<td>Proterozoic environmental change and drivers of early eukaryotic diversification</td>
</tr>
<tr>
<td>Katherine Orrick, YSE</td>
<td>Theoretical Framework for Human-Wildlife Conflict</td>
</tr>
<tr>
<td>Chantal Parker, GSAS, EEB</td>
<td>Species delimitation and phylogenetic analysis of Trematomus (Notothenioides: Nototheniidae) using restriction site associated DNA sequencing</td>
</tr>
<tr>
<td>Mansa Srivastav, GSAS, EEB</td>
<td>Testing biogeographic patterns in the Himalayan-Tibetan mountain system using the plant lineage Lonicera</td>
</tr>
<tr>
<td>Daniel Stadmauer, GSAS, EEB</td>
<td>Single-Cell Transcriptomics of Opossum Pregnancy</td>
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2019 Masters Research Award Recipients

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<thead>
<tr>
<th>RECIPIENT</th>
<th>PROJECT TITLE</th>
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<tbody>
<tr>
<td>Emma Allen, YSPH</td>
<td>Molecular epidemiology of hookworm and schistosomiasis co-infection in the Ashanti Region, Ghana.</td>
</tr>
<tr>
<td>Lorena Benitez, YSE</td>
<td>The Spatial Distribution of Elephant Trails in Kibale National Park, Uganda.</td>
</tr>
<tr>
<td>Seth Inman, YSE</td>
<td>Avifauna Distribution in the Albertine Rift</td>
</tr>
<tr>
<td>Xinyi Li, YSE</td>
<td>Big Data Analysis of Montane Geography and Urban Land Use Change in Nepal since 1988</td>
</tr>
<tr>
<td>Mary Schoell, YSE</td>
<td>Reconstructing the history of coastal wetland migration at Hammonasset Beach State Park</td>
</tr>
</tbody>
</table>

Cassandra Clark (YSPH)
Doctoral Pilot Grantee—
“For three months, I conducted fieldwork in Belmont County, Ohio, measuring drinking water concentrations of chemicals related to oil and gas activities.”

Xinyi Li, (YSE)
Master’s Awardee—
“The YIBS grant helped me with my MESc thesis research project on the urbanization process in Nepal. My work will help to inform area-specific land use and urban planning policies, assist vulnerability assessment and hazard management and offer basic urbanization data necessary to other environmental studies.”
Each year YIBS sponsors or co-sponsors multiple events related broadly to the environment and biodiversity. Here we highlight three examples from 2019–2020, two of which were organized by Edward P. Bass Distinguished Visiting Environmental Scholars.

NOVEL APPROACHES TO COMBATING THERAPEUTIC RESISTANCE

*November 18, 2019*

YIBS sponsored a special evening of lectures by preeminent scholars on new approaches to solving some of the most serious health issues of the 21st century: antibiotic resistance in treating pathogenic bacteria and chemotherapeutic resistance in treating cancers. This event was organized by Bass Visiting Environmental Scholar Michael Hochberg of the University of Montpellier.

INTERNATIONAL SOCIETY OF TROPICAL FORESTERS 2020

*January 30–February 1, 2020*

The United Nations Decade on Ecosystem Restoration begins in 2021, with new goals that reflect the mounting threats faced by tropical forests and their inhabitants, and the essential role of forests in combating climate change. This symposium organized by the International Society of Tropical Foresters focused on why restoration is necessary, on what is being restored, and on who will benefit (or not) from restoration efforts.

MACHINE LEARNING WORKSHOP

*June 29–June 30, 2020*

In collaboration with scientists in the Yale Peabody Museum of Natural History, Bass Visiting Environmental Scholar Susan Mazer of the University of California, Santa Barbara, organized a workshop focused on developing new approaches and collaborative teams to leverage machine-learning in the detection, analysis, and interpretation of functional traits on digitized images of herbarium specimen.
YIBS (VIRTUAL) FRIDAY-NOON
SEMINAR SERIES, FALL 2020

For Zoom links and more information about YIBS Seminars & Lectures please visit — yibs.yale.edu/seminars-lectures

September

11  Nate Edelman, Hutchinson Fellow, YSE
   *The Evolutionary Impact of Hybridization*

18  Tom Near, EEB
   *Genomics of adaptive radiation in Antarctic fishes*

25  Aaron Dollar, Mechanical Engineering
   *TBD*

October

2   Advait Jukar, Donnelley Fellow, Anthropology
    *The past, present, and future of megafaunal extinction research in India*

9   Maria Rebolleda-Gomez, Donnelley Fellow, EEB
    *Using simple metabolic rules to predict changes in microbial communities*

16  Taylor Maavara, Hutchinson Fellow, YSE
    *Rivers in the Anthropocene: Modeling large-scale human-driven changes to nutrient and carbon cycles in inland waters*

23  David Watts, Anthropology
    *Primate behavior, TBD*

30  Yong Zhou, Hutchinson Fellow, EEB
    *Measuring underground carbon in savannas*

November

6   Catherine Davis, Donnelley Fellow, EPS
    *Paleoceanography, TBD*

13  Elizabeth Sibert, Hutchinson Fellow, EPS
    *The Missing Miocene Mass Extinction*

20  Joey Bernhardt, Hutchinson Fellow, EEB
    *Linking individual performance to population persistence in a changing world*

December

4   Kealoha Freidenburg, YSE
    *A natural history of amphibians in suburbia*