PHOEBE MANKIEWICZ LEDINS

INTERDISCIPLINARY SCIENTIST, URBAN GREEN INFRASTRUCTURE

GREENWICH, CT | PHOEBE.MANKIEWICZ@YALE.EDU | YALE UNIVERSITY PHD CANDIDATE, 2024

Career Objectives

I strive to understand, illustrate, and develop upon the connections and disparities between "wild" and "anthropogenic" ecologies, especially those mediated by the soil-plant-air (and microbial) continuum. My PhD research has focused on developing, testing, and implementing plant-based microbial ecosystem design strategies in the context of indoor air quality bioremediation, microbiome biodiversity, and human health outcomes. This research has included many design and analytical processes, including parametric design and rapid prototyping, shotgun metagenomic approaches to quantify microbiome / rhizosphere diversity and metabolic potential, as well as GC-Mass Spec analysis to quantify changes in indoor airstream chemistry connected to rhizosphere community metabolisms. My objectives moving forward are to develop real-world applications of sustainable human-mediated ecological cycling practices through directed environmental pressure and interdisciplinary efforts to facilitate effective long-term environmental conservation and sustainability initiatives for built ecologies.

Education

(MAY 2024) - YALE UNIVERSITY, YALE CEA | **NEW HAVEN, CT**

Interdisciplinary PhD, Architecture Science

2021 - YALE UNIVERSITY, YALE CEA | **NEW HAVEN, CT**

M.Phil., Architecture Science

2017 - RENSSELAER POLYTECHNIC INSTITUTE, CASE | **NYC, NY**

M.S., Architecture Science

2014 - MCGILL UNIVERSITY | **MONTREAL, CANADA**

B.S., Biology

Original Research

* Peer Reviewed
+ Conference

h-Index: 3
Citations: 66

+ Mankiewicz, P., Lin, E.Z., Bhattacharya, C., Hénaff, E.M., Pollitt, K.G. & Dyson, A.H. **Utilizing a Novel Method to Explore the Impact of an Active Green Wall on Airborne Biological and Chemical Contaminants.** *ISES* (Sept. 2023). Chicago, Il.

* Mankiewicz, P., Borsuk, A., Ciardullo, C., Hénaff, E. & Dyson, A. **Developing Design Criteria for Active Green Wall Bioremediation Performance: Growth Media Selection Shapes Plant Physiology, Water, and Air Flow Patterns.** *Energy & Buildings* (2022): 111913.

* + Mankiewicz, P., Ciardullo, C., Theodoridis, A., Henaff, E. & Dyson, A. **Indoor Environmental Parameters: Considering Measures of Microbial Ecology in the Characterization of Indoor Air Quality.** ASHRAE Topical Conference Proceedings. American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (2022). Athens, Greece.

* + Ciardullo, C., Theodoridis, A., Mankiewicz, P. … & Dyson, A. **Evolving Frameworks Towards Identifying Challenges and Opportunities of Indoor Vegetation Systems.** ASHRAE Topical Conference Proceedings. American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (May, 2022). Athens, Greece.

+ Mankiewicz, P., Lin, E.Z., Hénaff, E.M, Dyson, A. & Pollitt, K.P.G. **A Novel Method to Explore the Impact of Architectural Design on Biological and Non-Biological Components of the Indoor Exposome.** *ISES* (Sept., 2022). Lisbon, Portugal.

+ Mankiewicz, P., Lin, E.Z., Bhattacharya, C., Pollitt, K.P.G., Dyson, A. & Hénaff, E.M **Exploring a Novel Microbiome Sampling Technique: A Benchmark Experiment Comparing DNA Yield and Community Profiles Between PDMS and Swab Collection Methods.** *NIST* (August, 2022). Boulder, CO.

+ Pretorius, M., Mankiewicz. P., Aly-Etman, M., Novelli, N. & Dyson, A. **Exploring Visual and Nonvisual 'Biophilic' Impacts on Human Health Using Experimental Methods in Simulated Abiotic and Biotic Environments.** *IEEE*: Immersive Visualization Track. Center for Collaborative Arts and Media: (2019) Yale University.

Mankiewicz, P. **Biomechanical Ecologies: Towards Urban Air Remediation Through Indoor Environments.** RPI Thesis (Dec. 2017).

***** Icarella, J., Mankiewicz, P. & Ricciardi, A. **Negative Competitive Effects of Invasive Plants Change with Time Since Invasion.** *Ecosphere,* 6(7), Article 123 (2015).

Mankiewicz, P. – **A New Netrin Knock Out: The Next Step for Researching the Role of Netrin-1 in Both Embryonic and Adult Mice** (2013).

Evolving Manuscripts

Mankiewicz, P., Bhattacharya, C., Dyson, A.H. & Hénaff, E.M. **Growing Indoor Environmental Infrastructure: Designing for Microbial Diversity with Implications for Pollutant Metabolism and Human Health.** (Submitted to: *Research Directions: Biotechnology Design*)

Mankiewicz, P., Lin, E.Z., Bhattacharya, C., Pollitt, K.J.G., Dyson, A.H. & Hénaff, E.M. **Designing a Passive Environmental Microbiome Sampling Alternative to Active Swab-Based Methods.** (Target Journal: *ISME*)

Mankiewicz, P., Lin, E.Z., Bhattacharya, C., Dyson, A.H., Hénaff, E.M. & Pollitt, K.J.G. **Characterizing Interrelationships Between Microbiome and Chemical Components of the Exposome: An Interdisciplinary Passive Sampling Approach.** (Target Journal: *Environmental Science & Technology*)

Mankiewicz, P., Ciardullo, C., Welch, C., Lee, D., Hénaff, E.M., Pollitt, K.J.G. & Dyson, A.H., **Developing Design Criteria for Active Green Wall Bioremediation Performance: Impacts of Airflow Direction and Plant Life History.** (Target Journal: *Energy & Buildings*)

Current Position

YALE UNIVERSITY. JAN. 2018 - PRESENT

Center for Ecosystems + Architecture (Yale CEA)

- PhD Candidate: Conduct interdisciplinary experiments in collaboration with Prof. Anna Dyson and a multi-institutional interdisciplinary team. Design, prototype, build, and assess the influence of air flow through plant walls, Active Phytoremediation Systems (AMPS), on metrics of indoor environmental quality using both air quality and microbial measurements such as GC-Mass Spectroscopy and shotgun metagenomics
- Assist Prof. Anna Dyson and the multi-disciplinary teams involved in U.S. and International projects, especially those involving design components applying biological solutions to air quality, thermal, or food security issues
- Assist in performance assessment and maintenance of the large-scale AMPS installation (green wall) at an emergency call center (PSAC II) in the Bronx, NY
- Collaborator on the Ecological Living Module (ELM) on the NYC UN Plaza

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Awards

2023, Macmillan International Dissertation Research Fellowship: Designing with Life: Characterizing Human Interactions with Active Green Infrastructure as a Mechanism to Shape Indoor Environmental Inequality and Mitigate Environmental Injustice

2020-2021, 4th Place: Holcim Foundation for Sustainable Construction, Next Generation, North America. "Pure Inhale", Plant-based design module research

2019, Winner: NY Access Cities Open Innovation Call to Reduce Air Pollution and Urban Heat Island Effect

2016, Waterfront Alliance, City of Water Day *in Your Neighborhood* Grant

Technical Skills

SOFTWARE

- ✓ Adobe Illustrator, InDesign, Photoshop
- ✓ ArcGIS
- ✓ ImageJ
- ✓ Microsoft Word, Excel, PowerPoint
- ✓ R
- ✓ Rhino/Grasshopper

ANALYSIS

- ✓ Data Analysis & Statistics (Spatial, Multivariate)
- ✓ Data Visualization
- ✓ Diagram Design
- ✓ Metagenomic

FIELD

- ✓ Airborne Chemical Sampling (Novel & Traditional Sensors, eg. VOCs, PAHs, CO_2)
- ✓ Identification (Plants, Macro-Invertebrates, Phytoplankton, Zooplankton)
- ✓ Microbiome Sampling (Swabs, Filtration, Novel Sensors)
- ✓ Migratory Bird Collection (Mist Net, Banding, Fat Class)
- ✓ Rapid Prototyping & Fabrication
- ✓ Sediment Coring (Russian Peat Auger, Gouge)
- ✓ Water Analysis (Dissolved Oxygen, Salinity, Turbidity)
- ✓ Water Sampling (Ekman Grab, Gravity Corer, VanDorn Depth)

LABORATORY

- ✓ Cell/Tissue Culture
- ✓ Dissecting/Compound Scope
- ✓ DNA Extraction
- ✓ Electrophoresis
- ✓ Embryo Dissection
- ✓ Flow-Through Chamber AQ Studies
- ✓ Fluorescent Live Cell Imaging
- ✓ Immunohistochemistry
- ✓ Microtome sectioning
- ✓ PCR
- ✓ Pollen Grain Identification/Analysis
- ✓ Sterile Technique
- ✓ Western Blot

Professional Experience

TEACHING FELLOW, AUG – DEC 2019 – 2021

Yale University, *Yale Center for Ecosystems + Architecture (Yale CEA)*

- Assisted Prof. Anna Dyson in teaching and grading for the *"Environmental Design"* course including over 50 Masters of Architecture students
- Designed and presented three-hour lectures on bioclimatic design where recurring topics included design applications of soil science, plant ecophysiology, microbiology, and airborne chemical exposure
- Taught a weekly discussion section on the application of class material to the bio-climatic ecology of Lake Atitlan Guatemala specifically: organized design workshops and met with students independently to review their designs

TEACHING FELLOW, JAN – MAY 2019

Yale University, *College of Environmental Studies*

- Assisted Dr. Craig Brodersen in teaching and grading for the *"Trees: Environmental Biology & Global Significance"* course including 92 undergraduate students
- Lead multiple "plant identification" field trip walking tours with students around New Haven
- Responsible for teaching a weekly discussion section Hands-on activities included plant and tree identification, microscope work, discussion/review of course content

RESEARCHER, AUG 2016 – DEC 2017

Rensselaer Polytechnic Inst., *Center of Architecture, Science and Ecology (CASE)*

- Designed, budgeted, built, and conducted "Living Lab" experiments determining the CO_2 remediation potential active indoor air bioremediation systems in the context of Volatile Organic Compound remediation (eg. publications & thesis above)
- Coordinated student research, including design-builds of bioremediation systems
- Wrote and edited sections of the CASE reports for a NYC Department of Design and Construction grant on interdisciplinary experiments determining the impact plant-based walls have on environmental quality and human inhabitant cognitive function

AMERICORPS VISTA, NOV 2014 – DEC 2016

Department of the Interior, *The Harlem River Working Group*

- Planned and coordinated community outreach events with private sector/non-profit, local, and Federal Government partners to raise awareness of environmental initiatives along the Harlem River ("Canoeing the Harlem", "City of Water Day")
- Conducted GIS modeling of storm-water flow using USGS contour data and the ArcGIS hydrology toolset to inform the placement of storm-water capture systems
- Developed a web application introducing community members to the GIS storm-water data collection process

CONSERVATION CREW LEADER, JUNE – AUG 2014

The Student Conservation Association, *The Great Sand Dunes National Park & The Blue Ridge Parkway*

- Lead trail crews into U.S. National parks to conduct projects designed to enhance environmental preservation, trail maintenance, and visitor safety
- Crew tasks included: invasive species removal, clearing deadfalls from foot trails (*US Forest Service, Cross-Cut Saw Class B* certified), trail restoration and stabilization, and split rail fence construction
- Ensured all operational and logistical deployment requirements were completed (eg. crew training, navigation, provisioning, wilderness medical services)

NEURO-LAB TECHNICIAN, SEPT – JUNE 2010 – 2014

Montreal Neurological Institute, *TEK Neurology Laboratory*

- Planned and executed experiments (eg. immunohistochemistry, tissue culture, Western blot) to support personal and associated graduate student research
- Continuously and reliably genotyped laboratory mice using Polymerase Chain Reaction (PCR) techniques for long standing and newly developed genetic lines

Responsible for laboratory logistical requirements (eg. equipment procurement, inventory)

WILDERNESS CANOE TRIP LEADER, JUNE – AUG 2012 – 2013

Camp Wabun

- Planned and guided age-appropriate wilderness canoe trips (7-21 days) for children in a variety of ages (10-15 years)
- Supervised and conducted wilderness and survival training and education sessions (eg. shelter construction/maintenance, axe and saw utility, water treatment)

RIVER ECOLOGY WET-LAB ASSISTANT, MAY – JUNE 2011

The River Project

- Collected, compiled, and analyzed daily water quality metrics (eg. DO, salinity)

- Developed and implemented age-appropriate educational materials for students regarding the ecology of the Hudson River (eg. the salt wedge phenomenon, brackish water ecology, sampling techniques, aquatic flora and fauna identification)

SOIL SCIENCE INTERN, MAY – AUG 2009

New York City Soil and Water Conservation District, *New York City Urban Soils Institute*

- Collected, compiled, and analyzed geospatially tagged soil survey data for Bronx Parks (i.e., soil texture, pH, and other relevant characteristics on a depth gradient)
- Provided soil data which was subsequently implemented in the NYC soil survey, providing GIS data to scientists and policy makers (eg. soil drainage patterns, possible park use)

Career-Related Courses

YALE UNIVERSITY:

- Air Quality & Energy
- Built Environment Plant Ecophysiology
- Design Data Biology
- Environment and Human Health
- Multivariate Statistics for Environmental Science
- Plant Ecophysiology
- Soil Science

RENSSELAER POLYTECHNIC INSTITUTE:

- Built Ecologies 1 & 2
- Doctoral Seminar: Closed Worlds
- Design Research Studio
- Environmental History & Theory
- Interdisciplinary Research Studio
- Material Systems and Production

MCGILL UNIVERSITY:

- Advances in Aquatic Ecology
- Animal Diversity
- Basic Genetics
- Cell Biology & Metabolism
- Developmental Biology
- Ecological Dynamics & Evolution
- Ecology of Species Invasions
- Freshwater Invertebrate Ecology
- GIS: Natural Resource Management I, II
- Historical Ecology Techniques
- Limnology
- Neural Basis of Behavior
- Trees: The Ecology & Evolution
- Wildlife Conservation