

Nic Lee

Design. Computation. Sustainability.

nah6cz@mit.edu
niclee.co
434.906.7428

Education

Doctorate in Media Arts and Sciences
Mit Media Lab, Expected May 2023

Masters in Media Arts and Sciences
MIT Media Lab, May 2020
Thesis - Designing for the Endless
Ecosystem GPA - 4.0/4.0

**Masters in Design Studies,
Technology**
Harvard GSD, May 2018
Thesis - The Virtual Animate: A
General Approach to Modeling Growth
Processes in Designed Environments
GPA - 4.0/4.0

BS in Biomedical Engineering
University of Virginia, May 2016
High Distinction

BA in Neuroscience
University of Virginia, May 2016
Distinguished Major with Distinction

Awards

**MIT Martin Family Fellowship for
Sustainability**
2022

Kaufman Teaching Development Program
2022

Fastcompany's World Changing Ideas
Mediated Matter Group, 2020

**Fastcompany's Most Innovative Sustainability
Projects, Finalist**
Mediated Matter Group, 2020

Dezeen Sustainable Design of the Year
Mediated Matter Group, 2019

Dezeen Design Project of the Year
Mediated Matter Group, 2019

**Harvard MDes Research and Development
Award**
Nic Lee, 2018

UVa Neuroscience Distinguished Major
Nic Lee, 2016

UVa Dean's List
Nic Lee, 2013, 2014, 2015, 2016

Research Statement

I design systems that enable humans to sustainably cooperate with ecosystems. Each year, humans produce 300 million tons of plastic. We recycle less than 10% of this material. During this time, the earth's forests produce over 200 times as much matter and recycle half of the previous year's production. My work uses computational tools to bridge the gap between these two worlds and bring the power and sustainability of the natural world to human systems and the built environment.

My research combines computational design, digital fabrication, material development and thermodynamic simulation in order to create end to end pipelines for sustainable construction. I transition fluidly between the wet- lab, the workshop, and digital environments, collaborating with a team of interdisciplinary researchers to create products that have been sent to the International Space Station and displayed in the Museum of Modern Art.

In the past, I have built software pipelines for operating custom 3D printers that allow for the world's most abundant natural materials to be used for additive manufacturing, analyzed the behavior of vital pollinators by reconstructing CT scans of honeybee comb, and programmed microcomputers that incubated bacteria in orbit around the earth. My doctoral research centers on the framework of Endless Ecosystems in which we cooperate with and learn from ecosystems to create sustainable sources of matter and energy.

Research Experience

MIT Media Lab
Cambridge, MA

PhD Candidate and Researcher
2021 - present

- Conducted research on computational design, sustainable materials, and landscape ecology in an interdisciplinary setting with collaborators from civil engineering, materials science, and architecture.
- Managed the budget and research agenda for ongoing research on sustainable materials.
- Led the design, fabrication, display and documentation of the prototypical architectural structure Aguahoja III, First displayed in the San Francisco Museum of Modern Art's exhibition Nature X Humanity.
- Published research on additive manufacturing with novel sustainable materials and developed a library of sustainable functional materials.
- Pursued research funding through the authorship of external NSF and non-profit grants and internal fellowships and prizes as well as proposals to industrial partners.
- Collaborated with curators at the San Francisco Museum of Modern Art for the exhibition Nature X Humanity to model the real-time degradation of the structure Aguahoja I, the display of Aguahoja II and the display of Synthetic Apiary II.
- Participated in peer-review for the Journal of the Mechanical Behavior of Biomedical Materials.

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Invited Talks

Invited Speaker for EmTech
MIT Tech Review, 2021

Invited Speaker for TechFocus
School of Seeing, 2021
TechFocus 4

**MIT Media Lab Fall Members Meeting
Mediated Matter Keynote**
MIT Media Lab, 2019
On behalf of Neri Oxman

**MIT Media Lab Spring Members
Meeting, Mediated Matter Keynote**
MIT Media Lab, 2019
On behalf of Neri Oxman

**Conference presentation on Multi-
Material Printing of Multi Lengthscale
Bio-composite Membranes in
Barcelona**
International Association for Shell and
Spatial Structures, 2019

Selected Press

[Neri Oxman champions “new values
in the art of building”](#)
The Economist, 2022

[Biopolymer Aguahoja III pavilion
shows how “we can begin to redesign
our built structures as if they were
grown” writes Neri Oxman](#)
Dezeen, 2022

[Neri Oxman introduces the latest
Synthetic Apiary for Honeybees](#)
Dezeen, 2021

[This crazy sculpture is made by an
MIT-engineered machine that 3D
prints biopolymers to replace plastic](#)
Fast Company, 2020

[MEDIATED MATTER GROUP
PRESENTS 3D PRINTED
AGUAHOJA: “WHERE THE GROWN
AND THE MADE UNITE”](#)
3D Printing Industry, 2019

Research Experience, cont.

Mediated Matter Group

Cambridge, MA

Research Assistant at the MIT Media Lab

2017 - 2021

- Created software pipelines for additive manufacturing, design, and development of sustainable, multi-material printing methods.
- Published and patented findings and methods related to the additive manufacturing of biopolymers, self-contained experiments during space-flight, and the building strategies of honeybees.
- Collaborated on apiculture, CT scan reconstruction, and shape analysis of honey bee comb for the Synthetic Apiary II project first displayed at the San Francisco Museum of Modern Art.
- Led the arrangement and display of Aguahoja at the Museum of Modern Art exhibition *Material Ecology*.
- Led design, fabrication, and display of the prototypical architectural structure Aguahoja II for display at the Cooper Hewitt Smithsonian Design Museum Triennial.
- Collaborated with curators on the design, fabrication, and display of exhibitions in the Museum of Modern Art, Centre Pompidou, the San Francisco Museum of Modern Art, and the Cooper Hewitt Smithsonian Design Museum.
- Operated robotic digital design systems for the fabrication of Aguahoja at the MIT Media Lab.
- Led research opportunities for undergraduate and high-school students studying design, biology, and engineering.

University of Virginia, Neuroscience

Charlottesville Virginia

Undergraduate Research Assistant

September 2012 to May 2016

- Conducted in-vivo experimentation on the sensory pathways that govern synchronized social behavior and group decision making processes.
- Modeled and quantified cooperative swarm behavior for the co-authorship of a publication in *Cell*.

Teaching Experience

MIT Media Lab

Cambridge, MA

Instructor, Teaching Assistant, Mentor

2021 - present

- Developed curriculum for the January term class *Critical Perspectives on Sustainability* at the MIT Media Lab.
- Provided teaching assistant for Professor Danielle Wood in the systems architecture class Space Technology for the Sustainability Leader.
- Mentored independent studies for graduate and undergraduate students at MIT and the Harvard GSD.
- Provided mentorship to undergraduate students in the Environmental Sustainability minor program at MIT.
- Trained graduate and undergraduate students to use the wet laboratory and digital fabrication facilities at the MIT Media Lab.

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Selected Press

[Aguahoja I by Mediated Matter Group is a robotically fabricated structure made of organic matter](#)

Dezeen, 2019

[Aguahoja - Programmable Water-Based Biocomposites](#)

Creative Applications, 2019

Neri Oxman: Bio Architecture

Abstract: The Art of Design - Netflix,
2019

[Neri Oxman and MIT Develop Programmable Biocomposites for Digital Fabrication](#)

Arch Daily, 2018

Technical Skills

Digital Fabrication

- Custom 3D printing systems
- Industrial robotics operation
- Materials processing and development
- CNC machining

Computational Design

- CAD systems in Houdini, Rhino, Grasshopper
- Simulation, optimization, and structural analysis
- Procedural workflows in Houdini and Python
- Machine learning systems
- Python, C#, G Code, and Vex

Energy Systems

- Environmental simulation
- E(m)ergy evaluation and LCA
- Construction ecology
- Ecological impact assessment

Wet Lab

- Material characterization
- Cell culturing
- Microscopy and histology
- Fungi, bacteria, honey bee, and silkworm cultivation

Teaching Experience, contd.

Architect's Association Visiting School

Boston, MA

Computational Design Instructor

February 2021 to September 2021

- Developed curriculum for and taught a class on the use of generative algorithms to create 3D printed furniture for nineteen students.
- Managed fabrication workflows to allow students to access off-site 3D printers in order to fabricate prototype models.
- Identified and collaborated with guest lecturers.

Leadership and Service Experience

MIT

Cambridge, MA

Sustainability Community Coordinator

2022 - present

- Mentored students in the Environmental Sustainability minor program at MIT through the Martin Family Fellowship for Sustainability.
- Coordinated communal research talks on environmental resilience and sustainability at the MIT Media Lab.
- Provided career counseling and mentorship to students seeking careers or research tracks aligned with environmental sustainability goals.

MIT Media Lab

Cambridge, MA

Environmental Health and Safety Officer

2019 - present

- Managed a BL2 biosafety research space for communal use at the MIT Media Lab including safety inspections, hazardous waste management, and training new graduate and undergraduate researchers.
- Conducted trainings and managed equipment for communal 3D printing applications including Stratasys polyjet printers, Formlabs resin-bath printers, and various extrusion-based systems.

Professional Experience

Fields, LLC

Cambridge, MA

Co-Founder, Computational Designer

September 2017 to May 2018

- Conducted contract-based parametric modeling, design, and prototyping work for companies designing products with high-performance geometries.
- Managed client relationships and established contracts for design projects.

BeeCo

Cambridge, MA

Co-Founder

September 2016 to July 2017

- Founded a company to design an intelligent apiary system that used a sensor suite to monitor and improve the survival of honeybees at the Harvard iLab.

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Referees

Neri Oxman, Ph.D. (she / her)

Founder of Oxman Architects
Dissertation Advisor
neri@oxman.com
design experience, leadership

Markus J Buehler, Ph.D. (he / him)

Director of Civil and Environmental
Engineering at MIT
Dissertation Advisor
mbuehler@mit.edu
technical experience, engineering

Tod Machover (he / him)

Academic Head, Media Arts and
Sciences, MIT Media Lab
External Advisor
tod@mit.edu
leadership, independent research

Professional Experience, contd.

Contraline

Charlottesville, Virginia

Creative Director

May 2015 to May 2016

- Founding member at a company developing a novel contraceptive for men.

Exhibitions

San Francisco Museum of Modern Art

Aguahoja, Aguahoja II, Aguahoja III, Synthetic Apiary II

Nature X Humanity, 2022

Oxman, N., Lee, N., Zilberman, N., Lee A., Kramer, F., Costa, J., Bader, C., Van Zak, J., Kennedy, J., Weber, R., Bader, C., Costa, J., Sharma, S., Weaver, J., Duro-Royo, J., Sharma, S., Weaver, J., Ling, A.

Museum of Modern Art

Aguahoja Artifacts

Material Ecology, 2020

Oxman, N., Duro-Royo, J., Mogas-Soldevilla, L., Lizardo, D., VanZak, J., Tai, Y.J., Ling, A., Bader, C., Lee, N., Darweesh, B., Sharma, S., Weaver, J.

Cooper Hewitt Smithsonian Design Museum

Aguahoja II

Design Triennial, 2019

Oxman, N., Lee, N., Van Zak, J., Kennedy, J., Weber, R., Bader, C., Costa, J., Sharma, S., Weaver, J., Duro-Royo, J.

Cube Design Museum

Aguahoja II Experiments

Nature, 2019

Oxman, N., Lee, N., Van Zak, J., Kennedy, J., Weber, R., Bader, C., Costa, J., Sharma, S., Weaver, J., Duro-Royo, J.

Centre Pompidou

Aguahoja Artifacts

Le Fabrique du Vivant, 2018, 2019

Oxman, N., Duro-Royo, J., Mogas-Soldevilla, L., Lizardo, D., VanZak, J., Tai, Y.J., Ling, A., Bader, C., Lee, N., Darweesh, B., Sharma, S., Weaver, J.

San Francisco Museum of Modern Art

Aguahoja I

Permanent Aquisition, 2018

Oxman, N., Duro-Royo, J., Mogas-Soldevilla, L., Lizardo, D., VanZak, J., Tai, Y.J., Ling, A., Bader, C., Lee, N., Darweesh, B., Sharma, S., Weaver, J.

MIT Media Lab

Aguahoja

Public Exhibition, 2018

Oxman, N., Duro-Royo, J., Mogas-Soldevilla, L., Lizardo, D., VanZak, J., Tai, Y.J., Ling, A., Bader, C., Lee, N., Darweesh, B., Sharma, S., Weaver, J.

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Mentees

Hannah Gazdus
2019 - 2022*

Branden Spitzer
2022*

Aliai D'Acuil
2022*

Moises Quinteros Morales
2022

Joe Faraguna
2017 - 2019

Danielle Gray-Stewart
2018 - 2019

Amelia Wong
2018

Ava Iranamesh
2018

Natasha Hirt
2018

Publications and Conference Presentations

An automated biomaterialomics platform for sustainable programmable materials discovery. Lee, N. A., Shen, S. C., & Buehler, M. J. (2022). *Matter*, 5(11), 3597-3613.

Computational Design and Manufacturing of Sustainable Materials through First-Principles and Materialomics. Shen, S. C., Khare, E., Lee, N. A., Saad, M. K., Kaplan, D. L., & Buehler, M. J. (2023). *Chemical Reviews*.

3D Printable Biocomposites with Tunable Biodegradation Rates. Lee, N. A., Shen, S. C., Gazdus, H., & Buehler, M. J. (2022). *Materials Research Society Fall Conference*

A 3D Printable Biocomposites with Scaffold for Mycelium Structural Materials. Shen, S. C., Lee, N. A., Spitzer, B., D'Acuil, A., Gazdus, H., & Buehler, M. J. (2022). *Materials Research Society Fall Conference*

Computational methods for the characterization of *Apis mellifera* comb architecture. Bader, C., Costa, J., Lee, N. et al. *Commun Biol* 5, 468 (2022). <https://doi.org/10.1038/s42003-022-03328-6>

Sequential multimaterial additive manufacturing of functionally graded biopolymer composites. Lee, N. A., Weber, R. E., Kennedy, J. H., Van Zak, J. J., Smith, M., Duro-Royo, J., & Oxman, N. (2020). *3D Printing and Additive Manufacturing*, 7(5), 205-215.

Multi-Material Printing of Multi Lengthscale Bio-composite Membranes Lee, N., Weber, R., Kennedy, J., Van Zak, J., Duro-Royo, J. and Oxman, N. (2019), *Proceedings, of the IASS Annual Symposium*.

A 3D-Printable Biocomposite for Mycelium Structural Materials. Lee, N., Shen, S., Spitzer, B., Gazdus, H., D'Acuil, A., and Buehler, M. J., (2022) *Materials for Humanity Conference*

Designing a Tree: Fabrication Informed Digital Design and Fabrication of Hierarchical Structures Duro-Royo, J., Van Zak, J., Ling, A., Tai, Y-J., Hogan, N., Darweesh, B., and Oxman, N. (2018), *Proceedings of the IASS Annual Symposium*. 2018

Designing (for) Decay: Parametric Material Distribution for Hierarchical Dissociation of Water-based Biopolymer Composites Tai, Y-J., Bader, C., Ling, A., Disset, J., Darweesh, B., Duro-Royo, J., Van Zak, J., *Hogan, N., and Oxman, N., (2018), *Proceedings, of the IASS Annual Symposium*.

"We're all mad here"- Power and Identity in the Modern Era of Mental Illness. *Intersect: The Stanford Journal of Science, Technology, and Society*, *Hogan, N. (2016), 10(1).

Cooperative behavior emerges among *Drosophila* larvae Dombrowski, M., Poussard, L., Moalem, K., Kmecova, L., Lee, N., Schott, E., & Condrón, B. (2017). *Current Biology*, 27(18), 2821-2826.

*Published under former name, Nicolas Hogan