Muddy Making

Making digital earth-based shelters through a togetherness action

The GSAPP Natural Materials Lab

Founded and directed by Assistant Professor **Lola Ben-Alon**, the Natural Materials Lab at Columbia GSAPP investigates raw, *earth- and fiber-based building materials*, their life cycle, supply chains, *fabrication techniques*, policy, and *upscaled possibilities* by converging material science, geology and geography, architecture, engineering, art, and design.

Workshop Instructors:

Lola Ben-Alon

Olga Beatrice Carcassi

Rethinking raw earth for contemporary construction through immersive exploration.

3D Printed Earth Hackathon

A project-based seminar that provides both theoretical and hands-on building experience

Down to Earth

A raw (non-stabilized) rammed earth installation at Lamont Doherty Earth Observatory

Farm to Building

Advancing the science and geometry of 3D printed earth-fiber composites

Digital Earth-Fiber

Developing digital weaving techniques for structural earth-fiber lattices

Digitally-Weaved Lattice Structures

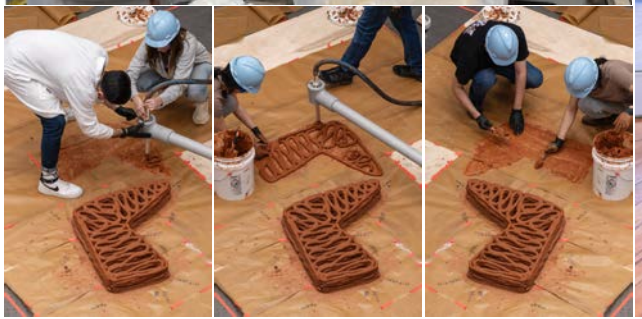
Blending ecological fabrication with cultural and bioclimatic considerations.

Fiber Ventilation Wall

Natural Materials Lab – Our Previous Workshops

3D printed earth Hackathon at Carleton Lab (Columbia Engineering)

Fostering student engagement in cross-disciplinary educational and extracurricular scientific and fabrication activities.



Carcassi, O. B., Maierdan, Y., Kawashima, S., & Ben-Alon, L.(2024, August). Recyclability of Earth-Fiber Materials for 3D Printing. Furthcoming in IASS 2024 Symposium, ETH Zurich.

Natural Materials Lab – Our Previous Workshops

Farm to building

A raw (non-stabilized) rammed earth installation at Lamont Doherty Earth Observatory (Columbia University)

Lola Ben-Alon and Tommy Schaperkotter. Highlighted at The Green Issue Lifo. (2023). Earth, Water, Air, Sans Fire: Building with Raw Earth. Interview by Danai Makri. Print, p.34. of edition titled "Vision, Urban, Materiality".

Proposal for a GSAPP Summer Workshop

Research Question:

Explore computational design possibilities of *digitally fabricated earth and fiber materials in our two-week summer workshop*.

By combining natural material knowledge with architectural artifacts, this immerse course provide a unique opportunity to scale-up fiber rich earthen materials with 3D printing technology to create communal spaces.

COLUMBIA GSAPP

NATURAL MATERIALS LAB

Proposal for a GSAPP Summer Workshop

Tentative title:

Shelter to rest. Scalability Assessment of Digitally Fabricated Earth and Fiber-based Materials

Possible collaboration:

- Organic Recycling
- WASP S.R.L.
- Lamont Doherty Earth Observatory
- Kuka

Possible speakers:

- Shiho Kawashima (Columbia Engineering)
- Samuel Armistad (Living Materials Lab, University of Boulder Colorado)
- Laia Mogas-Soldevila (DumoLab Research, University of Pennsylvania)
- Benay Gürsoy (Format Lab, Penn State University)

Proposal for a GSAPP Summer Workshop

Research Gap:
Maximize fiber content in 3D printed earth assemblies. In current examples, the fiber content do not exceed 2 wt.%


Gaia, Wasp (2018)


Clay Rotunda, Ming Jenny, Mayer *et al.* (2021)


Mud Frontiers, Rael, San Fratello *et al.* (2019)


Tecla, WASP (2021)


Digital Soil, Mitterberger, Derme (2020)


Terramia, Mudd Architects (2019)


Printed Stair, IAAC + WASP (2019)


Construmat, IAAC (2017)


Digital Adobe, IAAC (2018)

Bryson, Z. E., Srubar, W. V., Kawashima, S., & Ben-Alon, L. (2022, June). Towards 3D Printed Earth-and Bio-Based Insulation Materials: A Case Study on Light Straw Clay. In *18th International Conference on Non-conventional Materials and Technologies*.

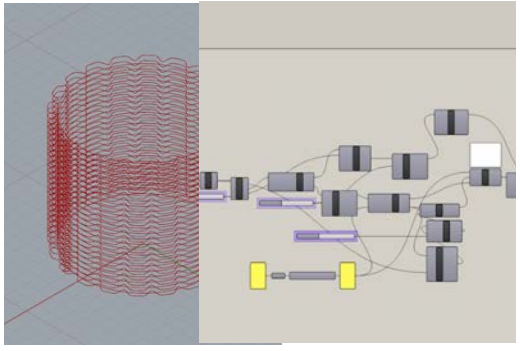
Proposal for a GSAPP Summer Workshop

Planning

Week 1

1. Computational Design Basics:

How to Create 3D Printable Models



2. Material Design:

How to Develop an Extrudable Paste

3. Cultural Exploration:

How to Design a Communal

Week 2

4. Intense Fabrication Session

5. Community Celebration