

**EPFL
IBOIS**

Studio Weinand FS-2025
Bio-Sourced Self-Bearing
Watertight Building Envelopes
St. Loup Chapel

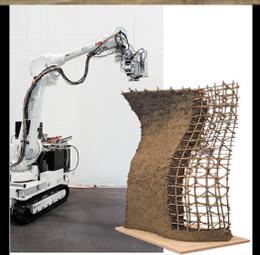
Bio-Sourced Materials
From Prototype to Building



WOOD



GRASS



EARTH

Studio Concept & Learning Goals

Material-Driven Design and Prototyping

Studio Weinand embraces **material experimentation** as the foundation of architectural design. In this context, a **prototype is not a final product—but a design method**. It is a mindset that reconnects architectural thinking to **real-world material behaviour** and hands-on making.

This semester, we focus on three bio-sourced materials: **Timber, Grass, and Earth**. Each material is explored through a combination of **digital fabrication** and **vernacular building knowledge**.

Prototyping in this studio bridges the gap between **abstract design** and **physical construction**. It transforms the architect's role from designer of ideas to **designer-fabricator**, equipped to work across tools, scales, and processes.

Prototypes serve not only as testbeds for spatial, structural, and environmental ideas—but also as efficient **communication devices** between humans, machines, and materials.

Learning Objectives

Design a coherent architectural project in relation to the program, site, and context.

Design through prototyping, with attention to material mechanics and fabrication constraints.

Develop construction details that reflect material behaviour and connection logics.

Evaluate material choices, digital fabrication methods, and their ecological impact.

Test and refine hypotheses through physical or virtual prototyping.

What is prototype?

An architectural prototype is a full-scale or scaled physical model used to test, refine, and explore design ideas before final construction. It bridges the gap between concept and reality, offering insight into spatial qualities, material behaviour, construction techniques, and user interaction. Unlike digital models, prototypes allow tangible engagement, enabling architects and builders to evaluate a design's feasibility and performance under real-world conditions.



> *Agile Dwelling Units*



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The Role of Prototypes in Architecture

Prototypes have long served as tools for experimentation—from Gaudí's plaster models to contemporary 1:1 constructions like the Khudi Bari in Bangladesh. They help address environmental challenges, construction risks, and community needs by reducing uncertainty while encouraging innovation. Especially in low-resource contexts, prototyping merges creativity with necessity, producing adaptive structures that are grounded in both material logic and lived experience.



> *Maquette de la Sagrada Família, Antonio Gaudí*



> *Khudi Bari / Marina Tabassum Architects.*
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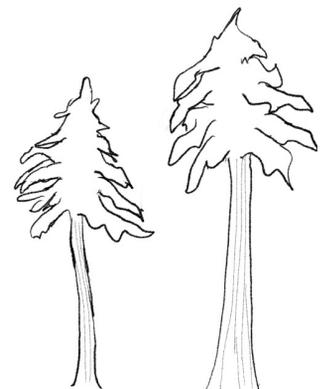
“Once a construction culture is established in norms, insurance policies, tendering documents, energy regulations, building permit laws, material safety factors, educational programmes, and so on, it becomes very challenging to envision systemic change, but not impossible. New ideas and processes are needed to create spaces where the stuff of dreams becomes possible, for everyone involved. We fortuitously found a way: architecture as prototyping”

> *Ken De Cooman & Laurens Bekemans*

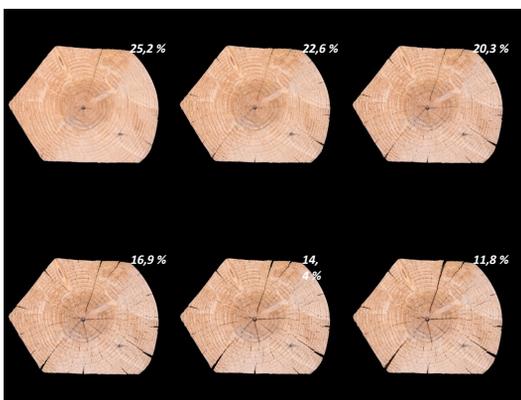


**Interlocking self bearing
watertight envelopes from
timber**

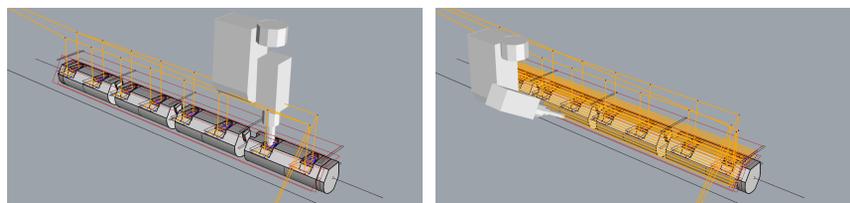
This project proposes replacing traditional stereotomy techniques—such as stone arches and masonry—with stacked round timber elements to create watertight, self-bearing walls. By using CNC technology, we explore the fabrication of precise wood-to-wood joints that eliminate the need for additional fixings. The goal is to develop a construction method where structural logic, joinery, and material constraints are tightly integrated through digital design and fabrication.



Throughout the design process, we conduct a series of physical tests to assess timber behaviour, including shrinkage, thermal insulation, and watertightness. The study also investigates the orientation and installation logic of stacked elements, and examines a variety of joint types—such as lateral interlocking and top/bottom interfaces—tailored to round timber. These investigations help shape a design system rooted in material efficiency and structural clarity.



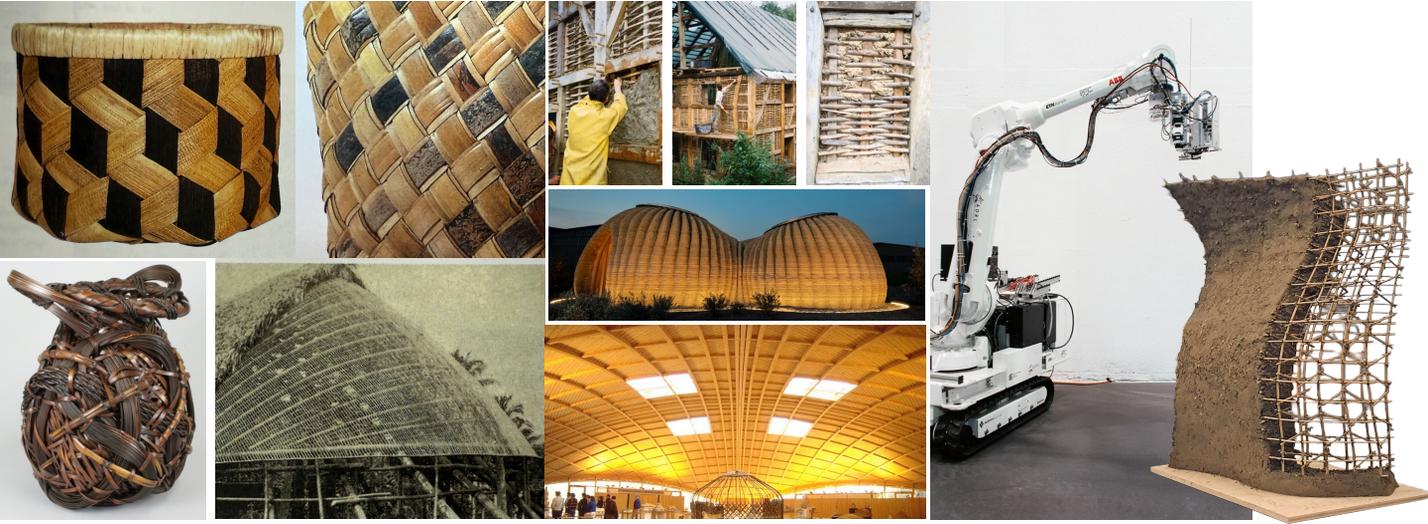
> *Shrinkage Test on Round Wood*



> *Raccoon simulation for the cutting of the lateral joints*



> *Lateral joints for 4 pieces*



Actively bending From Basket arts to Architecture

Active bending in traditional crafts and vernacular architecture uses material stiffness to create stable, self-supporting curves. Here, timber grids will be bent into various shapes and infilled with projected earth.

Projected Earth

Earth is among the most sustainable and affordable materials worldwide. Traditionally used with interlaced grids, it has recently gained attention through 3D-printed applications as a sustainable alternative. This project proposes spraying a special earth mixture onto actively bent interlaced grids to create a new architectural wall prototype.



Actively bended interlaced
timber grids with projected
earth

Timeline

		Visits and research: roundwood, from 3D scanning to assembly resolution
> P1		
08.09	(1)	presentation: IBOIS lab / S24 semester / P1
09.09		3D Scanning Workshop workshop 1 & 2
15.09	(2)	course: Rhino and Grasshopper
16.09		workshop 3
22.09	(3)	Visits
23.09		Ballenberg
29.09	(4)	Site Visit: Saint Loup Chapel
30.09		
		Prototype application: Bio Sourced Material - Prototyping
> P2		
06.10	(5)	studio
07.10		
13.10	(6)	intermediate critic
14.10		studio
27.10	(7)	studio
28.10		
03.11	(8)	studio
04.11		
10.11	(9)	intermediate critic
11.11		studio
		architectural application: Saint Loup Chapel
> P3		
17.11	(10)	studio
18.11		
24.11	(11)	studio
25.11		
01.12	(12)	intermediate critic
02.12		studio
08.12	(13)	prototyping
.12		
15.12	(14)	final critic exhibition



> Self-Bearing Watertight Building Envelopes



> Visits: Ballenberg, Open-Air Museum

The studio unfolds in three phases: site visits & workshops, prototyping, and architectural design. It begins with visits to the Saint Loup Chapel and Ballenberg Open-Air Museum, paired with workshops in 3D scanning and digital modelling (Rhino & Grasshopper) to build foundational skills.

Next, students develop material-driven prototypes focused on timber, grasses, or earth, testing structural and fabrication logic. Finally, these systems are translated into an architectural proposal for the Saint Loup Chapel. Here, the prototype becomes the driving force behind design thinking and construction strategy.



Thank you !

We hope to see you in the studio.

**IBOIS (GC H2 692)
tsungwei.cheng@epfl.ch**