Architecture and Decay:

Designing for Regeneration, Adaptation, and Ecological Coexistence

Ilaria Mazzoleni, ilaria.mazzoleni@student.uni-ak.ac.at

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Department of Building Construction, Institute of Architecture, University of Applied Arts Vienna

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Supervisor: Prof. Petra Gruber, petra.gruber@uni-ak.ac.at

Concept and Objectives

This research explores how architecture design might further evolve by aligning with the cyclical logic of natural systems—particularly through the study of **decay**, **atmospheric stressors**, and the **regenerative processes of ecosystems**. Which would expand the interest of design into the maintenance and operation of a building life cycle intensively. Instead of viewing environmental degradation and material breakdown as threats to architectural integrity, this project seeks to understand how such forces can inform a new architectural paradigm—one that prioritizes **regeneration, transformation**, and **adaptive coexistence** over resistance and permanence. Conventional architecture has long been preoccupied with permanence, durability, and enclosure—ideals rooted in an anthropocentric and extractive relationship with nature. In contrast, natural systems exhibit cycles of **growth, decay, decomposition**, and **renewal** that are essential to ecological resilience.

This research asks what might emerge if buildings were designed not merely to withstand time and entropy, but to **actively engage with them**—if decay itself could become a design tool, enabling architectural assemblies to **participate in the metabolic flows** of their environments over the long timeline of a building use and operation. Drawing from over two decades of biomimetic and ecological design inquiry—including the framework developed in *Architecture Follows Nature – Biomimetic Principles for Innovative Design* (CRC Press, 2013)—this project builds upon previous investigations into responsive, adaptive building envelopes. These were conceived as analogs to biological membranes such as skin, capable of sensing, regulating, and adapting to external conditions. This research will expand on those ideas by integrating the **temporal dimension**—specifically, how buildings evolve, disintegrate, and potentially return to the ecosystems from which their materials originated.

A significant conceptual foundation for this work lies in **edaphology**, the study of the relationship between soil, rock, and living organisms. Soils, often overlooked in architectural thinking, are in fact complex, active systems shaped by both geological and biological forces. They are not inert matter to be excavated and discarded, but dynamic agents in cycles of life and decay. In regions with highly diverse bedrock and mineral compositions, plant species develop **unique physiologies and**

morphologies in direct response to the terrain, adapting through time to the material, chemical, and atmospheric conditions of their environments. At the same time, these plants, through their roots and metabolic processes, contribute to the weathering of rock, the generation of soil, and the enrichment of ecosystems. These reciprocal interactions offer a compelling model for architecture: systems and assemblies that are **locally rooted**, **responsive to context**, and **designed with impermanence in mind**. Just as flora adapts to and shapes the ground it grows in, buildings, or some of their parts, could be designed to interact with and contribute to the environmental conditions they inhabit—both during their use and after their disassembly or decomposition.

The core objective of this research is to develop a theoretical and practical framework for **"coexistent architecture"**—an architecture that not only exists in the environment but **participates in it**, that transforms with it, and that ultimately **contributes to the health of ecological systems** rather than degrading and polluting them.

Research Questions

Together, these lines of inquiry converge in an architectural primary question: one that aligns with the cyclical, evolving logic of nature, embraces transformation over time, and repositions architecture as an active participant in the ecology of climate resilience.

- In what ways can principles of edaphology—especially the interaction between mineral substrate and plant life—inspire new material strategies and structural morphologies in architecture?
- In what ways can biomaterials (e.g. soil), decay, and geological responsiveness be integrated into architectural design to create context-specific, ecologically regenerative, and temporally adaptive built environments?
- How can we shift architectural education and practice to move beyond permanence, resistance, and extraction?
- What are the cultural, economic, aesthetic, and ethical implications of embracing decay as a design principle?
- How can a collaborative non hierarchical process, which includes the performing and visual arts, can contribute to these spatial and material studies?

These questions aim to provoke a deeper interrogation of architecture's relationship to time, materiality, and the natural systems it occupies—urging a reconsideration of foundational assumptions around durability, waste, and value. Moreover it implies the necessity of working in a multi-inter-cross-disciplinary way, from research to experimentation, moving between academic and professional settings.

Research Activities and Possible Results

To explore these questions, the research will be carried out through a combination of **fieldwork**, **design and biomaterial prototyping**, and **interdisciplinary dialogue**. Activities will be anchored in residencies, laboratory environments, and collaborations with scientists, ecologists, visual and performing artists, and architects.

a. Site-Specific Investigations
In continuation with work at the **Nature, Art & Habitat (NAH*R*) *Residency***, fieldwork will focus on

observing and documenting **natural processes of decay, soil formation, and ecological succession**. Sites with varying geological and climatic conditions will be studied to understand how material processes unfold over time and how organisms adapt to their terrain. This will include photographic and material documentation, soil sampling, and interviews with local experts.

b. Biomaterial Experiments and Prototyping
The research will include hands-on experimentation with **biodegradable and mineral-based materials** (e.g., rammed earth, mycelium composites, lime, and locally-sourced aggregates) to explore their behavior over time in different environmental conditions. Prototypes of small-scale building components or envelope assemblies will be constructed and observed for their responsiveness, weathering, and potential for integration into soil-making processes.

c. Collaborative Dialogues
Building on the interdisciplinary format of *Transect of Coexistence* (ListLab, 2024), the project will facilitate roundtable discussions and workshops with specialists in **edaphology, pedology, material science, architecture, art, and ecology**. These dialogues will serve to contextualize architectural questions within broader ecological frameworks and generate transdisciplinary methodologies concerned with spatial and environmental quests.

d. Theoretical Development
Parallel to empirical work, the work will articulate a theoretical framework for "coexistent architecture," drawing on ecological philosophy, systems theory, and bio inspired design. This framework will critique prevailing architectural narratives of control, permanence, and enclosure, offering an alternative vision rooted in **impermanence, interaction, and return**.

e. Educational Outcomes
Outcomes will include an illustrated research publication, public talks, and workshops aimed at students and professionals. Visual documentation of material transformations and decay processes will be a central component of the work strategy.

Conclusion

This early-stage research offers a speculative yet grounded investigation into how architecture can shift from resisting nature to **collaborating with it**—from designing against time, to designing with time. By engaging deeply with natural processes of decay, soil formation, and environmental responsiveness, the project seeks to catalyze a more **ecologically literate architecture**—one that contributes to resilience, fosters regenerative design, and aligns human building practices with the **cyclical intelligence of living systems**.