Morphogenetic Problem Refinement

# Initial Problem Definition

If we stopped all emissions today, the climate would continue to warm the planet for decades to come: it is vital we implement measures for carbon sequestration. Architectural regenerative design allows us to leverage the natural carbon sequestration properties of plant life, along with structural security and biodiversity gains. Until recently, we have struggled to model the seemingly random nature of biological growth, but advances in AI and morphogenetic programming have allowed us to identify the governing equations to accurately model these growth patterns. Functional Structural Plant Modelling (FSPM) models have not yet widely been applied to architectural or civil contexts: this project aims to assess the utility of regenerative measures in various construction and retrofit applications, modelling these structures and simulating their responses over time considering these environmental factors.

## Problem Areas

Identify scenarios in which biological design in architectural or civil spheres are most impactful

Establish mechanisms for ensuring desirable qualities within biomaterials (i.e. mycelium stone)

Modelling morphogenetic growth in 3 dimensions, investigating the accuracy of dynamic point cloud generation, reinforcement learning and mathematical/rule driven/L-function approaches

Coverting volumetric generated structures into STL/STEP files for testing strength properties for modelling reinforcement (FEA)

Model carbon absorption, damaged incurred to bonded structure over time etc.

Inform the design of new structures aimed at working with regenerative plant growth

Establish the relative ‘randomness’ to build uncertainty values and enforce homogeneous design properties

# Assumptions Map

## Validation Approach