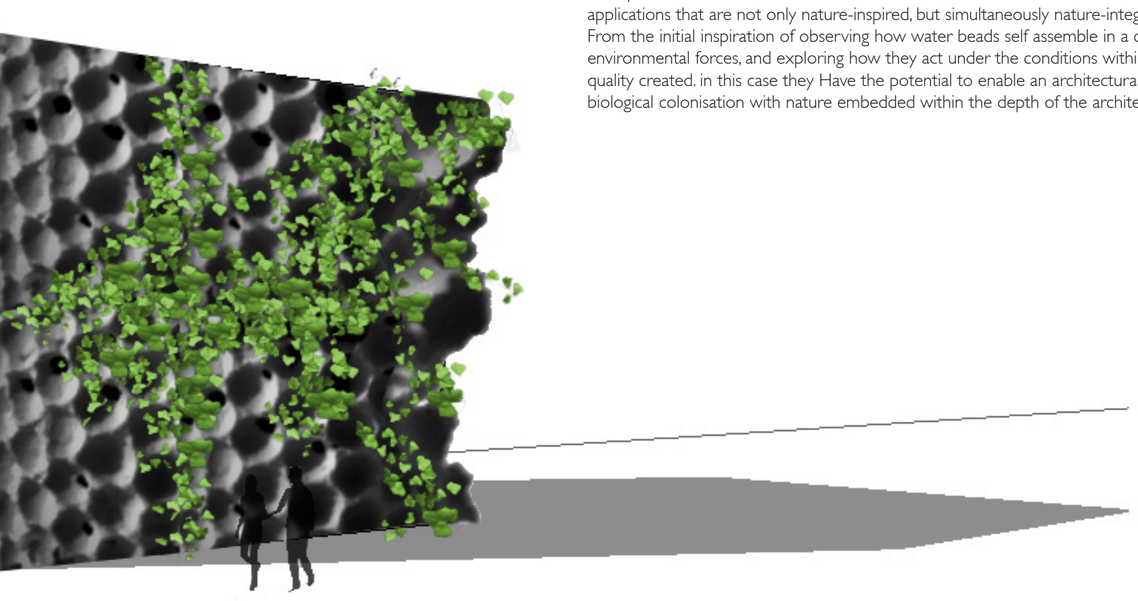
01 DH711

Cellular Formations

This Project explores the potential in
UTILIZING
The qualities of the cellular formed concrete., And how the material can be used to open up discussion for applications that are not only nature-inspired, but simultaneously nature-integrated.
From the initial inspiration of observing how water beads self assemble in a contained space due to natural environmental forces, and exploring how they act under the conditions within concrete and the surface quality created. in this case they Have the potential to enable an architectural element that can promote biological colonisation with nature embedded within the depth of the architectural Fabric.



Cellular formed concrete cut open exposing the voids

Biocolonisation.

Surface growth of plants upon a building material is known as biological colonisation. Buildings- or more specifically building materials are prone to vegetative covers as they age over time.
Observation into the way micro-organisms grow on buildings reveal that colonisation is more likely to happen on some materials than others is dependant on physical and chemical characteristics of the material substrate.

RESEARCH HAS SHOWN THAT THE PARTICULAR CHARACTERISTICS OF POROSITY CREATE AN IDEAL ATTACHMENT SYSTEM FOR SPORES AND AIR DUSTS TO SETTLE.

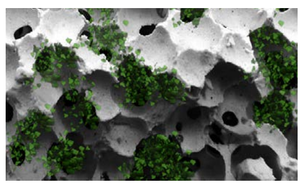


Image showing the porous and tactile nature of cellular formed concrete

Green walls

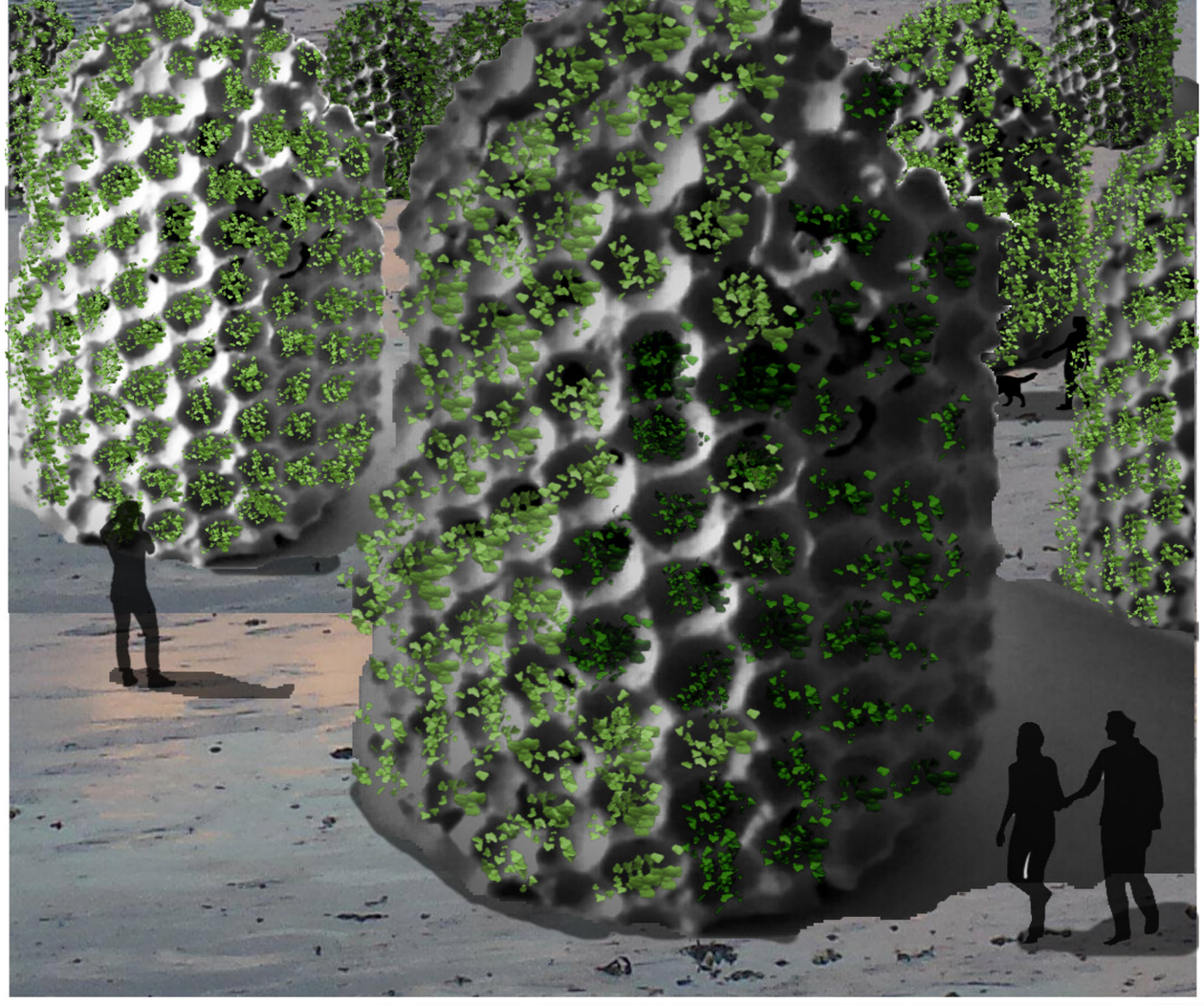
In the present realm the representation of green walls might be seen as that of a garden bolted onto a vertical surface.
This has been shown to be difficult and expensive to maintain.
A more biologically intelligent idea might be that of creating a building material or facade That acts as a host to propagate living micro-organisms.

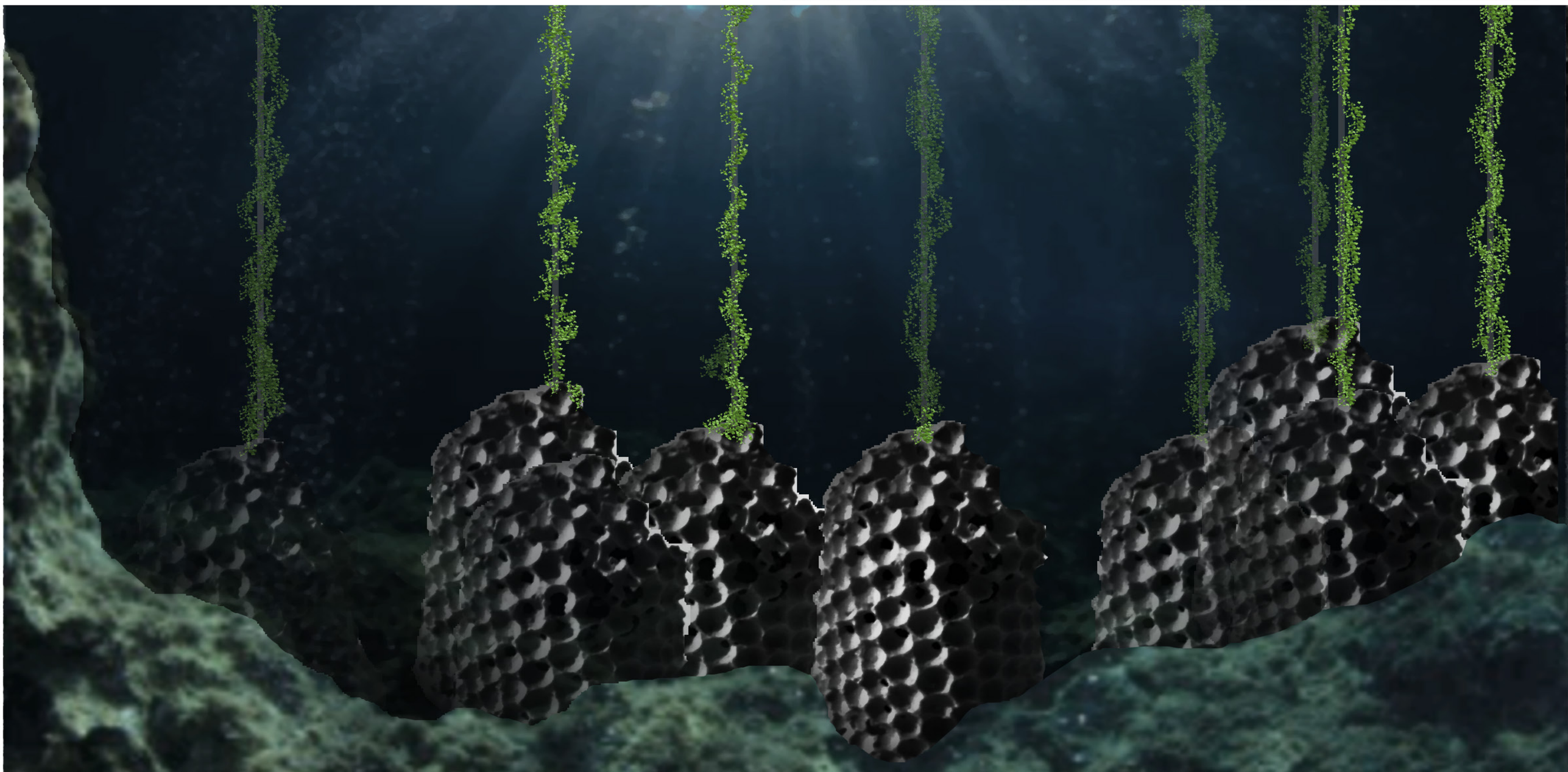
It is possible here to imagine the potential the porous nature of cellular formed concrete has, in regards to opening up the discussion of how we think about and construct Green walls. With its dual functionality of being both structural and highly porous we could begin to observe a paradigm shift from the notion of the green-wall as an architectural skin to that of an Architectural BIOTOPE. An element which would be more receptive, mediating between internal and external conditions.
Cellular formed concrete could offer a different interface for material-tectonic-environmental negotiations to take place between nature and architecture via specific biological-material performativity.

Suspended artificial reef.

Suspending the forms underneath the sea from rope for sea life, such as plants and crustaceans, to cling to the porous surface and therefore be cultivated.
as we look to the sea to help our ever increasing need for food production.
The lightweight quality allows to to be easily retrieved from and planted in the sea.

This material with its lightweight and nature-inspired form.
Has the potential to help with food production in the future along with being a beautiful architectural and sculptural appearance which resonates an aesthetic appeal that people can engage with and interact with.





02 DH711

Material Investigations

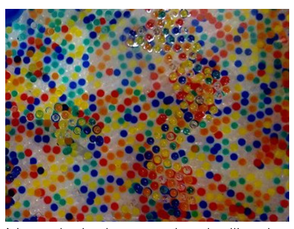
The project began by exploring how cellular bodies (water filled beads) self assemble into packed clusters based on their natural reaction to their environment (in this case finding a state of equilibrium within the concrete as it cures.) By casting the negative space between the cellular bodies, interesting forms or cellular solids are formed. This natural self organisation of form has been developed through evolutionary means over time, which intricately tie together the form, growth and behaviour of the organism.

Water Beads or SAPs (Super Absorbent Polymers)

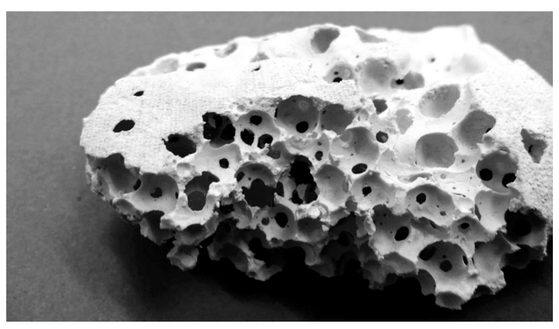
are classified as hydrogels when cross-linked, absorb aqueous solutions through hydrogen bonding with water molecules. In deionized and distilled water, a SAP may absorb 300-1200 times its weight and can become gel.
The total absorbency and swelling capacity are controlled by the type and degree of cross-linkers used to make the gel. Low-density cross-linked SAPs generally have a higher absorbent capacity and swell to a larger degree. These types of SAPs also have a softer and stickier gel formation. High cross-link density polymers exhibit lower absorbent capacity and swell, but the gel strength

Uses

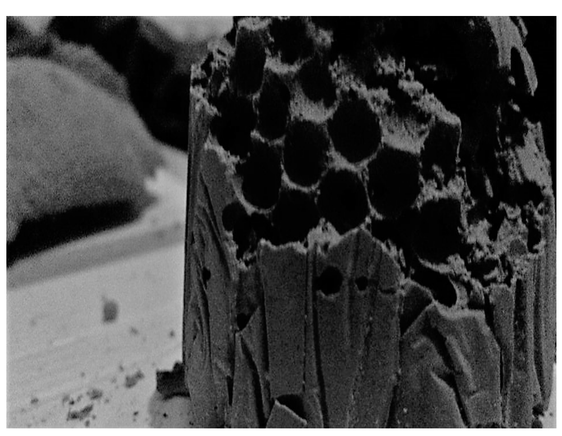
Widely used in agriculture, forestry and gardening, such as soil water retention agent, seed coating, soil-less cultivation, artificial turf, etc.

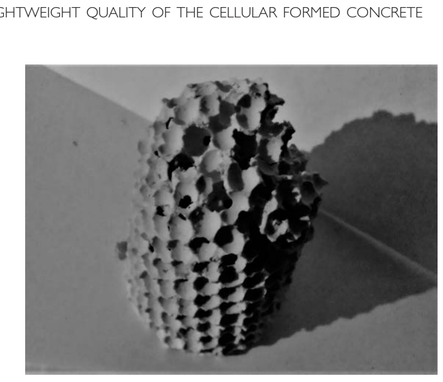


Not only do the water beads allign themselves naturally creating an optimal formation of both stregth and efficiency, the fact they they can expand and then shrink means that transportation costs are reduced.



small scale material investigations with concrete using water beads to form voids





Weight of cellular formed solid
57g

Weight of same size of material without the voids.
163.3g

Right : Larger scale material investigations using water filled balloons to replicate the self assembling properties of the water beads at a larger scale .