# PHOTO SYN - THETIC LAND - SCAPE

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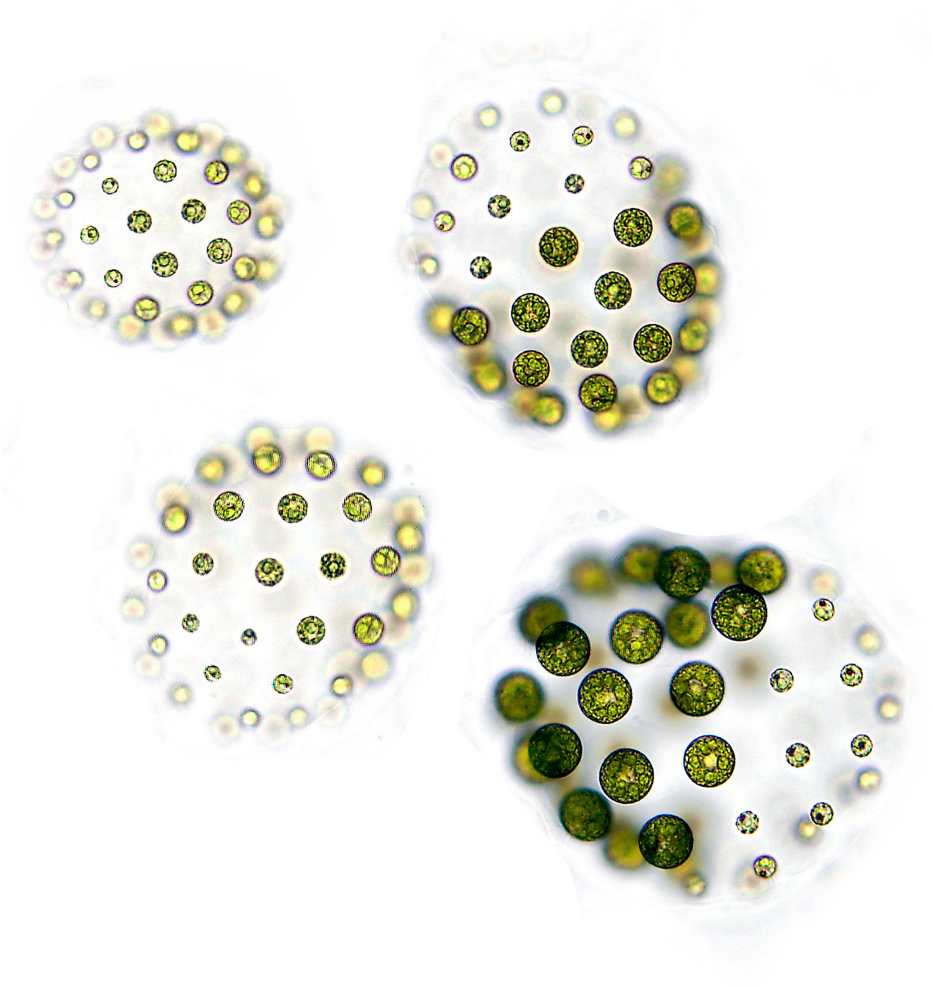
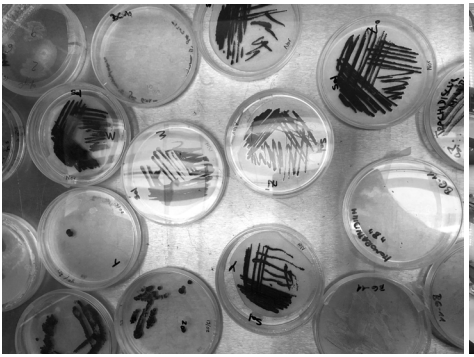
**Technologicalization of nature is often negatively associated with the loss of *natural* at the expense of *technological*. Is it possible to create synergy between them?**

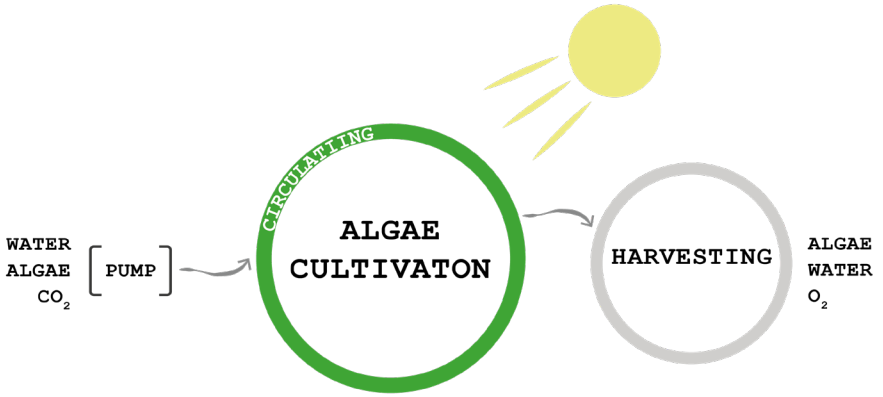
Installation Photosynthetic landscape aims to explore the functional, spatial, and aesthetical qualities of microalgae as a living, productive element existing within the coactive urban space.



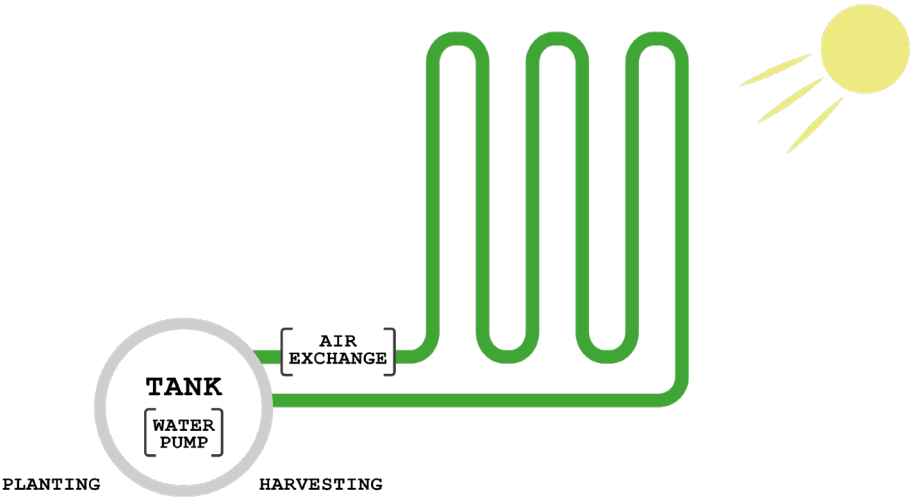


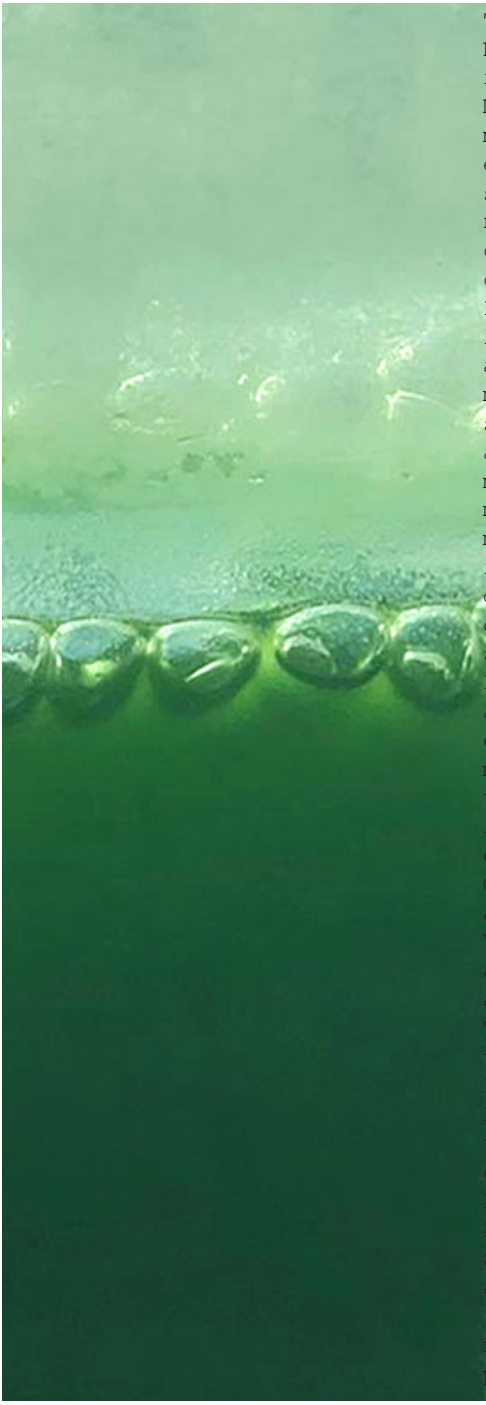
The term "microalgae" is usually used in biotechnology in its broadest sense to mean both prokaryotic cyanobacteria and eukaryotic algae – unicellular and filamentous strains that are on the order of micrometers. They differ from macro algae (usually called seaweed) growing mostly marine, whose thalli reach a length of several meters. The smallest known microalgae have an average size of less than 1 micrometer. Microalgae represent the oldest microorganisms, that - more than 2.5 billion years ago - began to form the oxygen atmosphere of the Earth. They have evolved into a diverse group of aquatic and soil species of undisputable ecological importance, the distribution of which is enormous: they occur in all major ecosystems from cold, polar regions to extremely acidic, alkaline or saline habitats, from hot springs to deserts.
Microalgae perform photosynthesis and metabolic processes similar to higher plants, but have a significantly higher growth rate due to higher photosynthesis efficiency, very short reproductive cycles, simple cell structure with low demands for metabolic functions. Natural microalgae – phytoplankton, – is at the base of the food chain. They grow in freshwater reservoirs, running waters and especially in the seas , where they are responsible for about a half of global primary photosynthetic production.

Process of microalgae cultivation



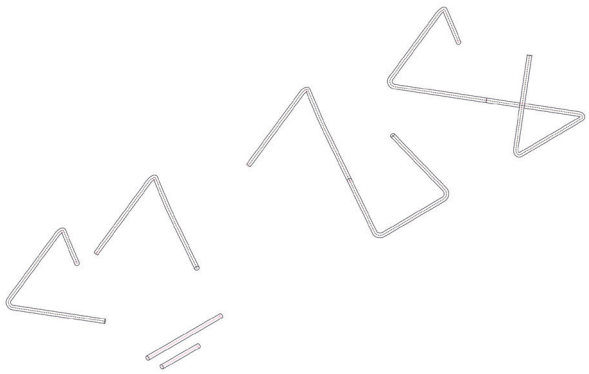

Photobioreactor - closed loop system diagram



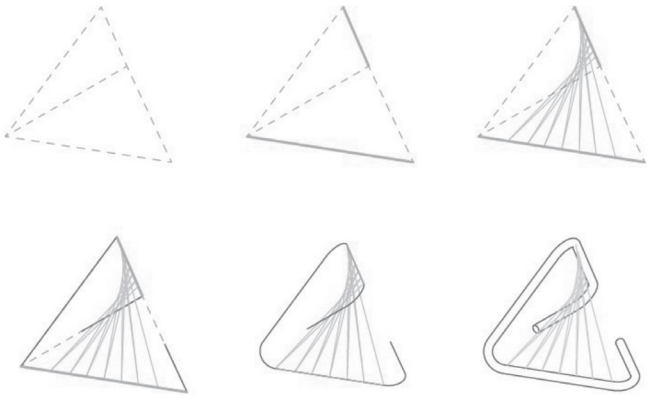


The platform Hacking the Nature is part of the research of PhD. candidate MgA. Veronika Miškovičová - multidisciplinary platform exploring potential kinds of synergetic behavior between natural and technological elements related to architecture and spatial art. Prototype Photosynthetic landscape combines the natural and technological to complement each other in to create space suitable both for micro- and macro- scales. Dynamic movement is necessary for the microalgae medium to grow, the modularity of static elements is allowing the structure to grow with the needs of the organic substance. The installation and prototype Photosynthetic landscape is a result of semestral work exploring the properties of microalgae within the architectural framework and collaborative work and research of the student's team Anna Östlund, Vojtěch Kordovský and Adam Varga led by MgA. Veronika Miškovičová, prof. ak. arch. Imrich Vaško and assistant MgA. Shota Tsikoliya, Ph.D., M.Sc. within the Studio of Architecture III at UMPRUM Prague, CZ. Prototype was realized with the help of the main partners of the project: UMPRUM Prague, Center Algatech, ITB Development, and Architekti Šebo Lichý. Installation is a part of the 8th Landscape festival, a festival connecting landscape, city, and public space in Prague.

Modular components and its variations



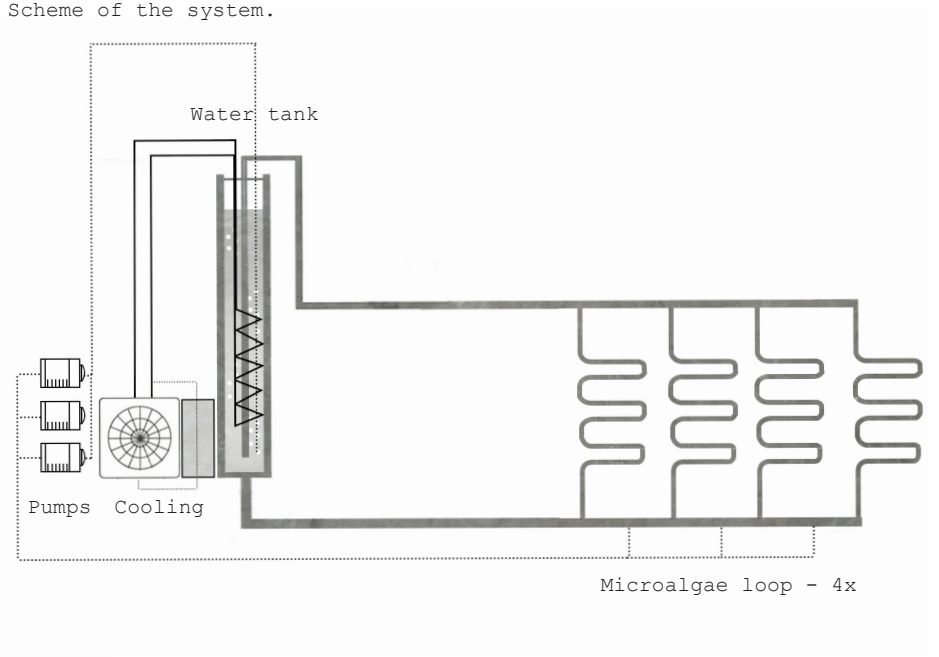
Methods of weaving the transparent tubes with microalgae



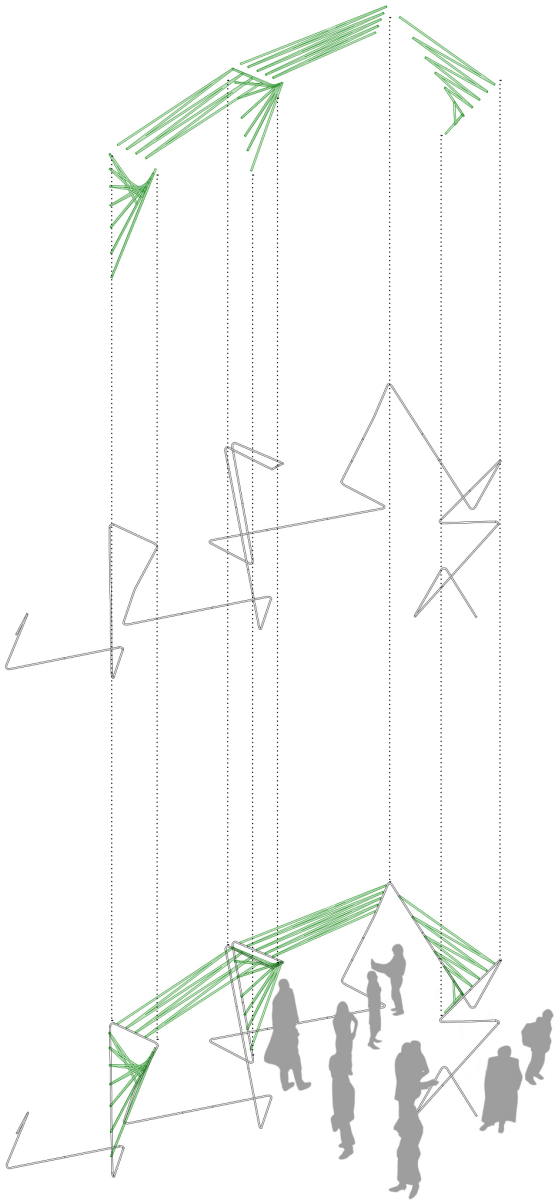
The term “photobioreactor” is now commonly used in algal biotechnology for closed or semi-closed cultivation systems with no direct contact between the microalgal culture and the atmosphere. Unlike open systems - stirred tanks, raceways or cascades - microalgae culture in photobioreactors is separated from the environment, so culture conditions and contamination can be better controlled and significantly higher harvesting densities and biomass productivity can be achieved as compared to open reservoirs. The irradiance for photosynthetic growth is provided either by the Sun, or artificial light sources.

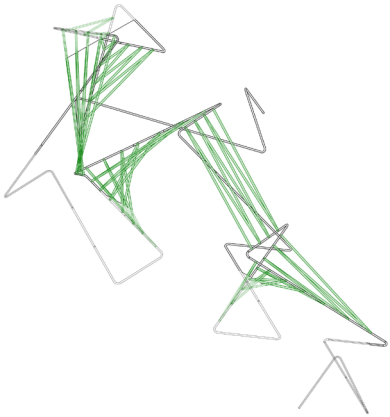
The illuminated part of the photobioreactor – photostage – can consist, for example, of tubes, columns, or panels, positioned horizontally or vertically, arranged as serpentine loops, or a series of panels, in which a culture of microalgae circulates. Photobioreactors are made of transparent plastic or glass. Due to easy maintenance and operation, photobioreactors for commercial production are usually designed as modules.

Scheme of the system.

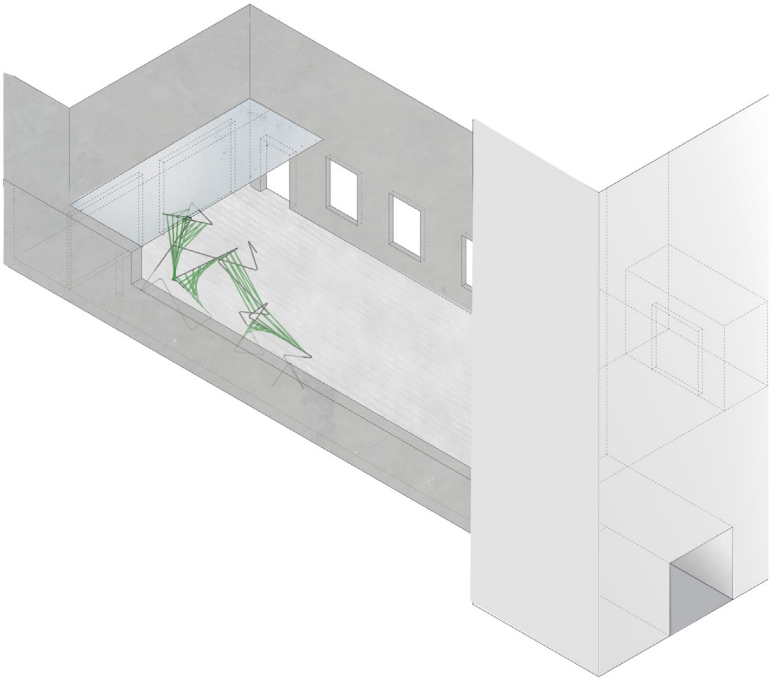


Physical prototyping of structural and technological properties at ALGATECH - the Centre of Algal Biotechnology in Třeboň, CZ. Workshop was led by MgA. Veronika Miškovičová (UMPRUM Prague, Studio A3) and hosted by prof. RNDr. Jiří Masojídek and his team of microbiologists from ALGATECH Třeboň. The workshop came out as succesful collaboration in between two disciplines - architecture and microbiology.





The ambition of the Photosynthetic Landscape project is to present the use of microalgae as photosynthetic organisms in the context of the loss of greenery in the urban environment, its impact on the reduced quality of public space. The courtyard of the Nevan Contempo Gallery in close proximity to the traditional flora of the Paradise Garden Park and Rieger Gardens in Prague - Žižkov is in contrast to the technological greenery of the prototype Photosynthetic Landscape - a modular, organic system that pushes the boundaries of thinking about nature and technology in the context of environmentally oriented spatial installation.



***HACKING THE NATURE***
***PHOTOSYNTHETIC LANDSCAPE***
UMPRUM ACADEMY OF ARTS,
ARCHITECTURE AND DESIGN IN PRAGUE
2020

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WWW.UMPRUM.CZ

***CONCEPT, PROJECT MANAGER***
Veronika Miškovičová

***ARCHITECTURE STUDIO III***
Head of the studio: Imro Vaško
Assistant: Shota Tsikoliya

***IMPLEMENTATION TEAM - FOR STUDENTS AIII***
Anna Östlund
Vojtěch Kordovský
Adam Varga

***TEXTS***
Veronika Miškovičová
Centre Algatech

***PHOTOS***
AIII UMPRUM
Petr Znachor, HBÚ AV ČR



UMPRUM ALGATECH ITB ARCHITEKTI ŠEBO LICHÝ LANDSCAPE FESTIVAL ŽIŽKOV 2020 MBÚ SABANA