SYNERGY

MULTI- MORPH SYSTEM

Devin Rooney x Stephanie Perosa

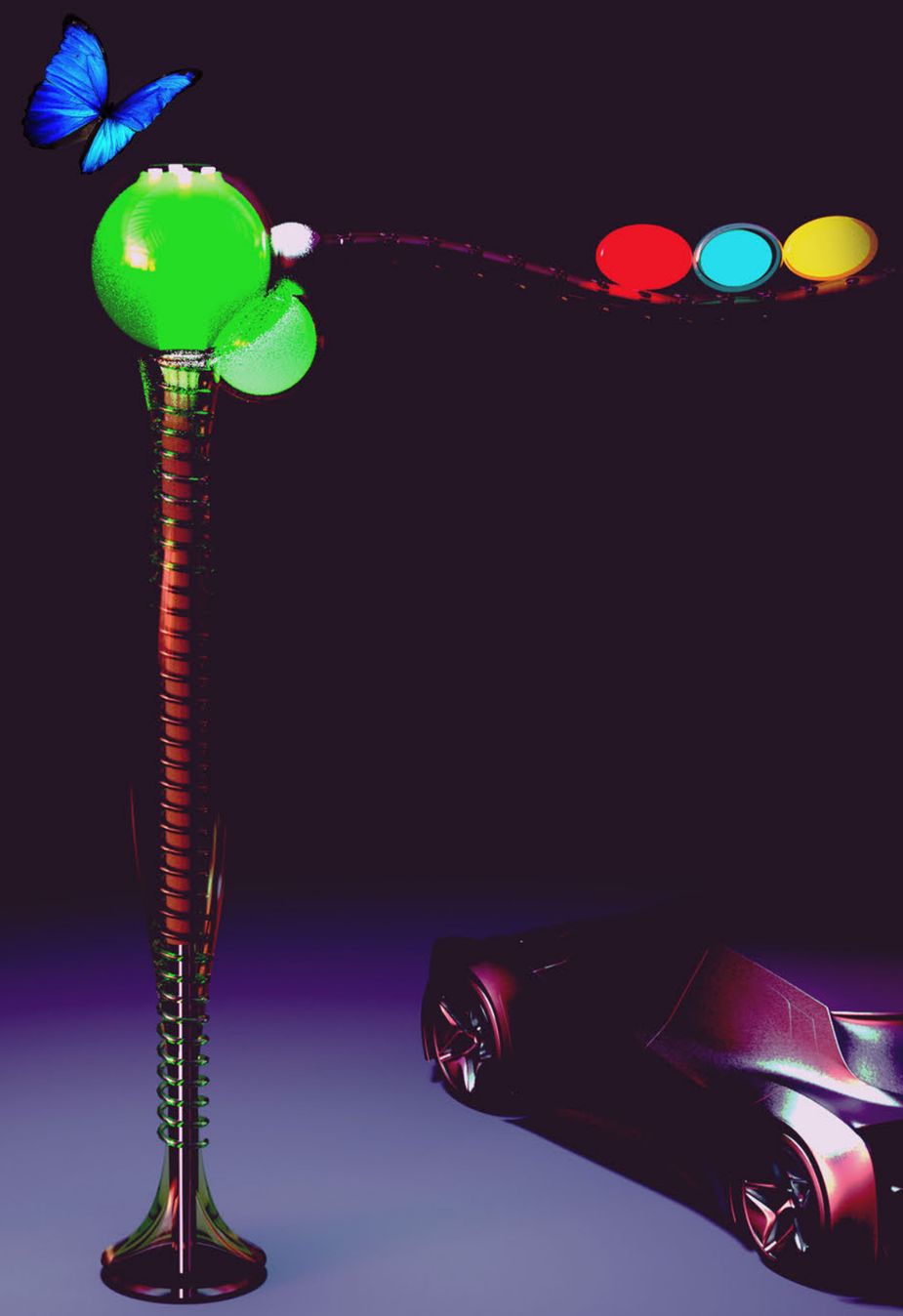
Biomimicry

Urban Arcitecture

Systems Design

Renewable Energy

Synergy is a light refractive system inspired by the wings of the Blue Morpho butterfly. By re-designing the traffic light and switching from artifical to bioluminesent light with alage, Synergy reduces traditional energy usage and light pollution. Synergy's traffic lights sequester carbon above ground and convert it to oxygen. By using the rails of the subway to generate electricity, and fiber optic cables to channel natural light into subway stations from above ground, Synergy creates a self sustaining loop, and a more sustainable urban transportation experience.



Algae cells

What is Biomimicry 3.8

Biomimicry operates on the understanding that nature's organisms, cycles, and systems have evolved the very way they were supposed to. There is no "waste" in nature. Energy use, food production, and climate control are just a few examples of many where nature has already "solved" a problem,and where we could draw inspiration to solve the many problems of our own.

NATURE AS A MENTOR

NATURE AS A MODEL

NATURE AS A MEASURE

How can nature serve as a blueprint to **seek, design** and **implement** sustainable solutions that are **conductive to life**?

Biology to design

Emulate

Takingethos foundation and our (re)connection, relationship and experiences with nature and applying it into design.

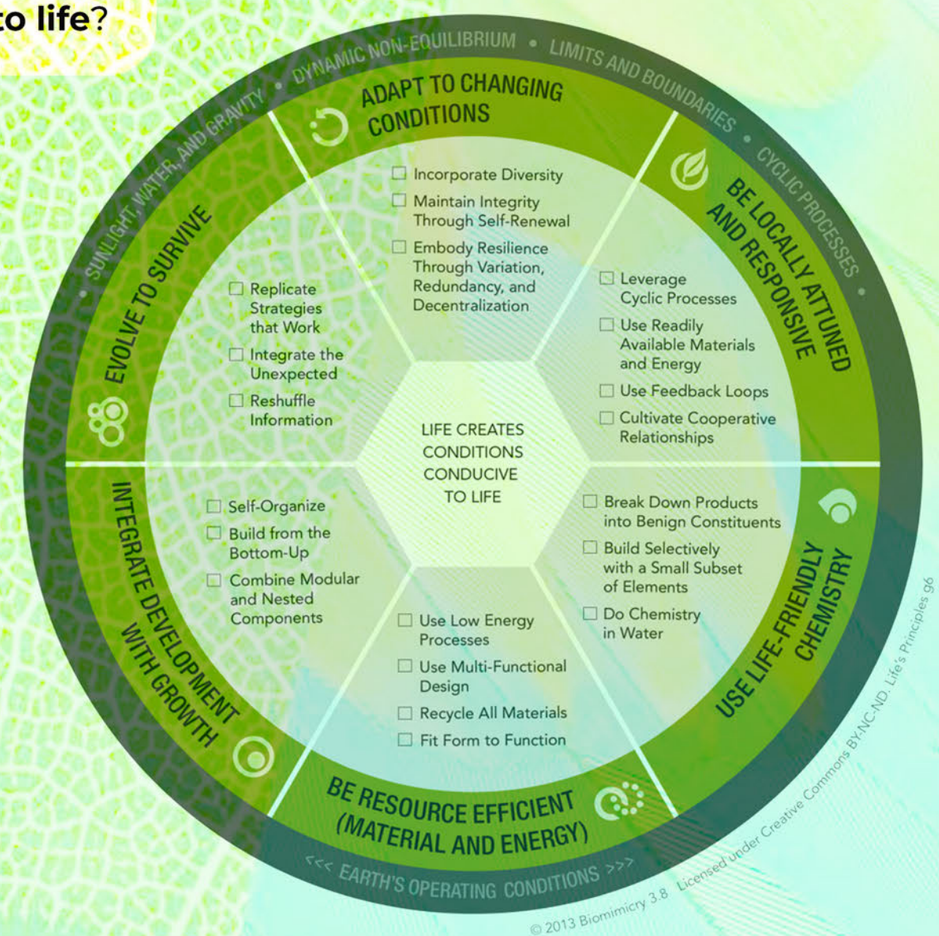
Ethos

Foundation of respect, gratitude and responsibility that our designs and conditons can be built upon and into nature.

(Re)connect

(Re)connecting with nature is to understand our relationship to and with it. Through tuning into quiet human cleverness we can build skills in observing and learning from natures intelligence.

Life's principals



Biomimicry Design Process

Discovering

Upon identifing mechinisms, we develop a design principal by removing the science, or abstracting.

Scoping

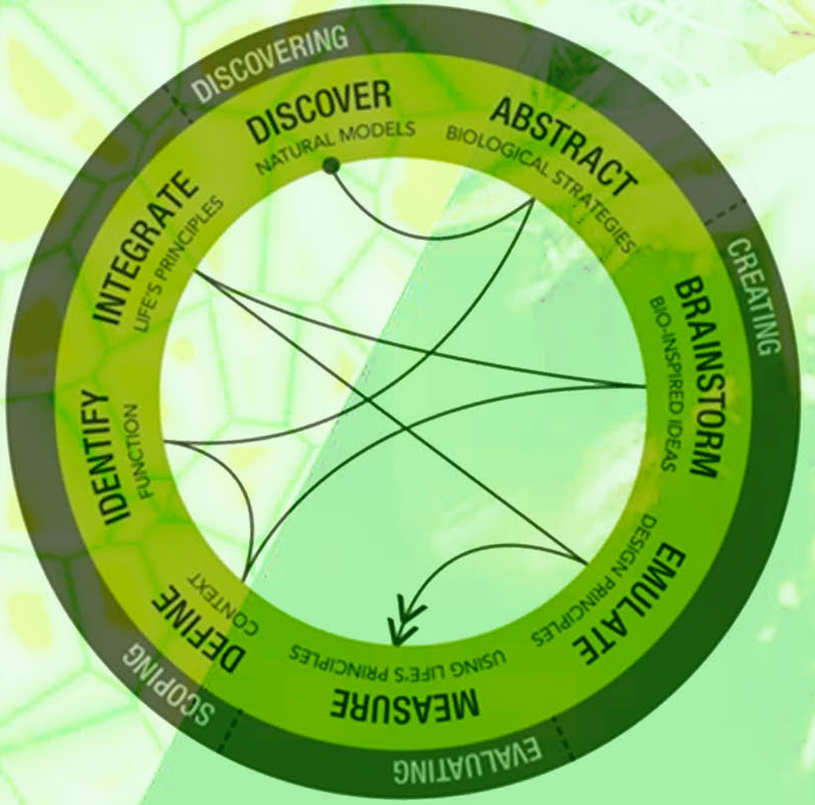
Further identify and clarify naturally occuring function. Discover possible applications.

Creating

Brainstorm solutions, emmulate design principals. Kinetic process of discovering, and scoping.

Evaluating

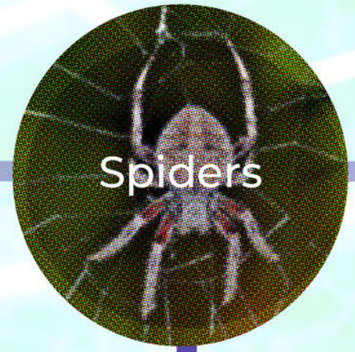
Question if design is conductive to life and the earth's operating conditions. Does design hold up against life's principals checklist.



Discovering

Shell geometry and materials resist cracking

Underground network distributes resources



Spiders fly using electric current

Create adhesive that is strong and flexible

Final Organism

Mechinism- Blue morpho (Morpho menelaus) butterfly wings have a layered microstructure that cause light waves that hit the surface to diffract and interfere causing certain color wavelengths to cancel out while others, such as blue, are intensified and reflected.

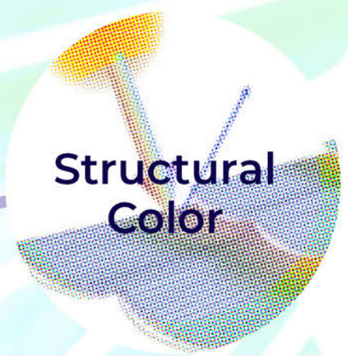
Strategy- Scales of Morpho butterfly wings refract light to create dynamic reflectivity.

Function- Refect light and repel water

Design Principal-Ridged structures arranged in overlapping rows refract light and manipulate color.

Matrix for Evaluation

Organism	Butterfly	Tortoise	Spider	Oyster
Strategy	Microscopic rigid structures arranged in overlapping rows refract light and manipulate color.	Tight nestled domed geometry withstands pressure and impact.	Electrostatic repulsion through the air.	Organic/inorganic matrix forms both a strong and flexible adhesive.
Design Applications	UV protection in buildings can defract light away (less air conditioning)	Protective and construction applications. Underwater research	Renewable energy source for movement, Environmental balance, Repulsion technology.	Adhesive for wet conditions; medical applications, construction, and bioadhesion prevention.



Each ridge has 6 to 8 horizontal structures. More layers close together equates to brighter color.

A wax layer and micro bumps shatter and disperse water droplets creating a hydrophobic wing surface

Light gets reflected through the layered ridges, cancelling out some light wavelengths while intensifying others.

Light entering from a different angles results in a minor change in the wavelengths reflected creating iridesence.

Scoping

Brainstorming: Blue Morpho Butterfly

Paints
Interior Application, Car paints, Temperature Control

Security
Security tags, Id's, Banknotes, Tickets

Energy
Consumption
Health

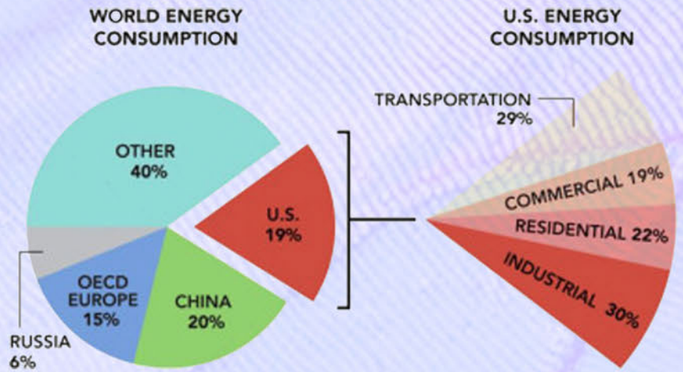
Reflective Coating
Windows, Plastics

Fibers
Fashion Textiles

Focus Artifical Lighting & Energy Consumption

11% of greenhouse gases worldwide are attributed to illuminating the United States

2% Of all electrcity in the United States is used by New York City alone



83% of the country lives under a haze of artifical light leading to negative impacts

- Planet
- People
- Profit

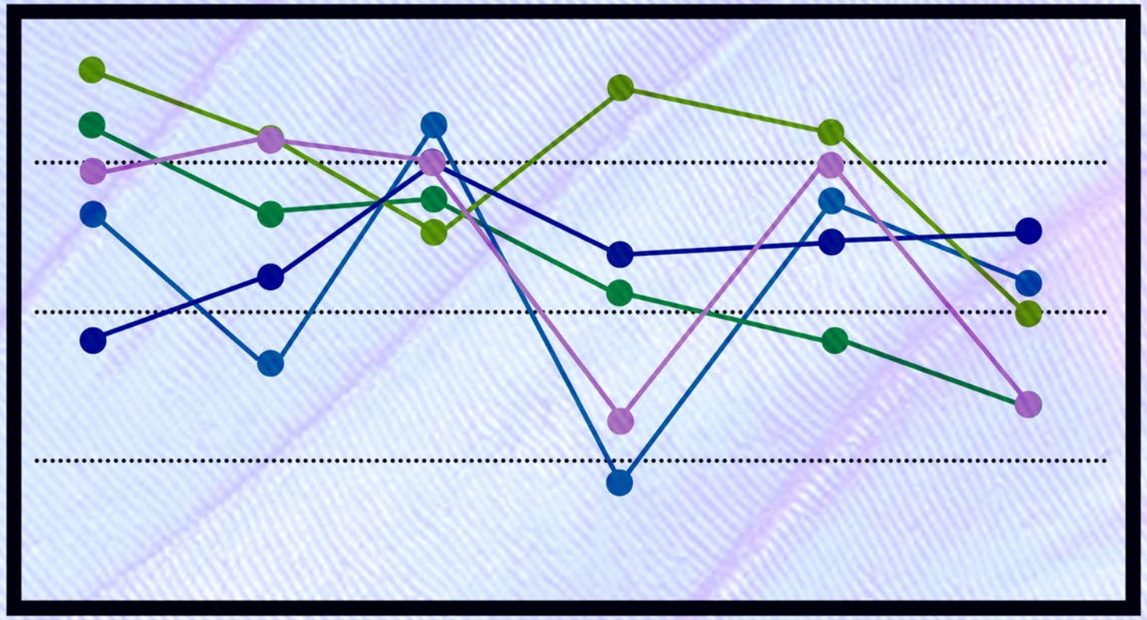
New York City Energy Issues

Overuse → Lack of renewable energy → Inefficentcy

Energy Consumption

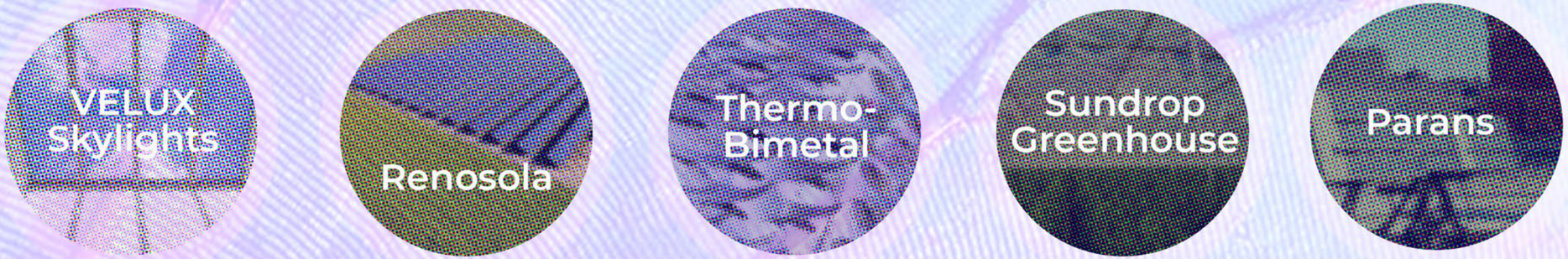
Target Areas

Strategy Analysis Canvas

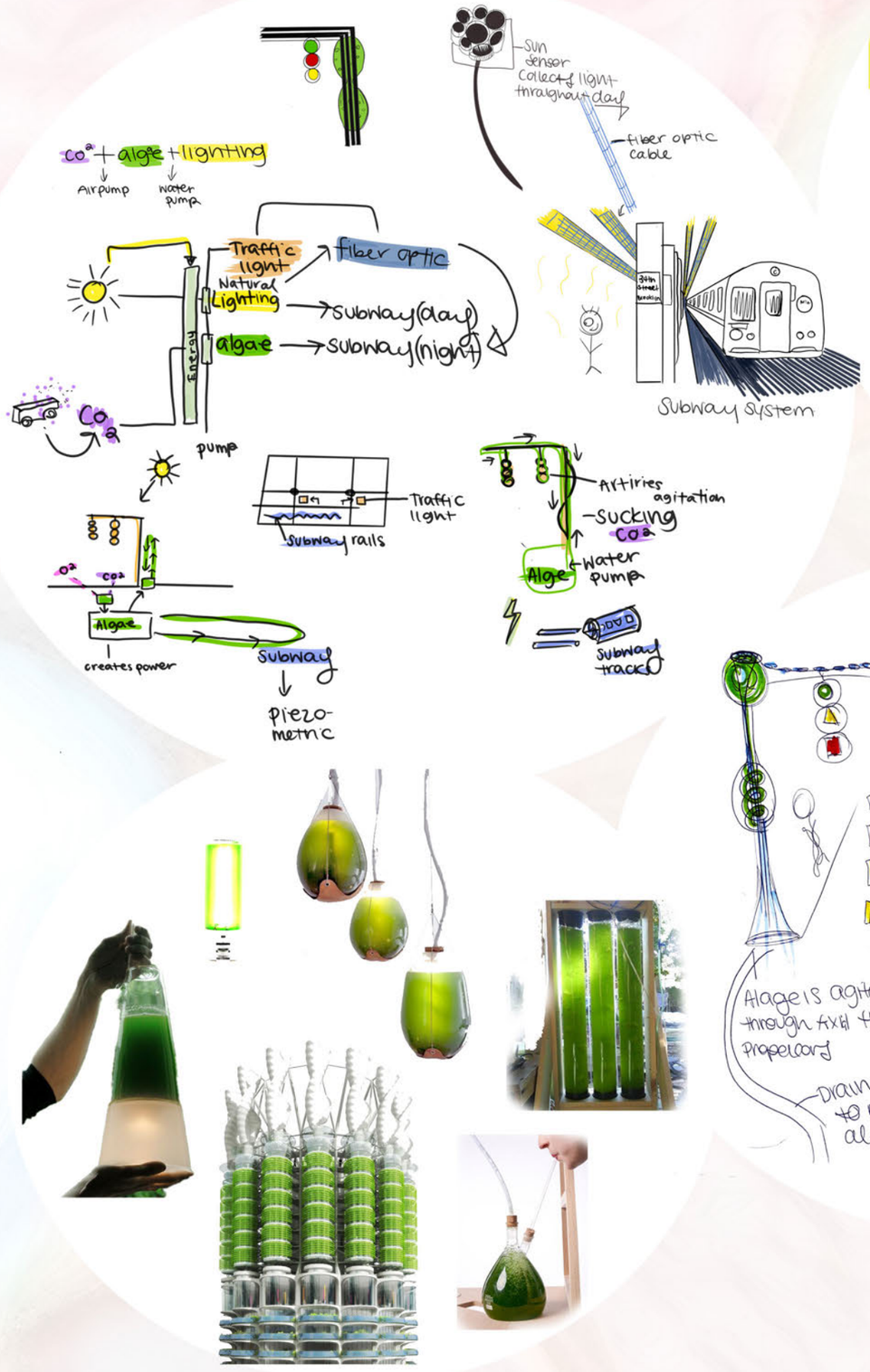


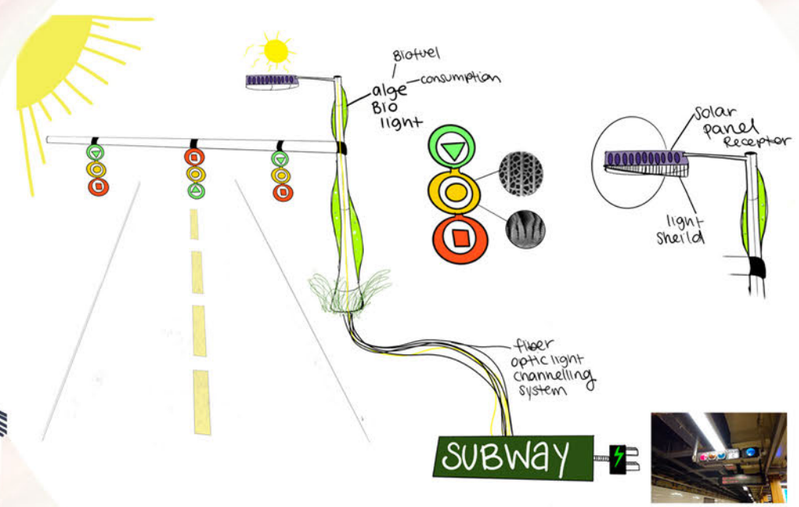
Analysis Guide

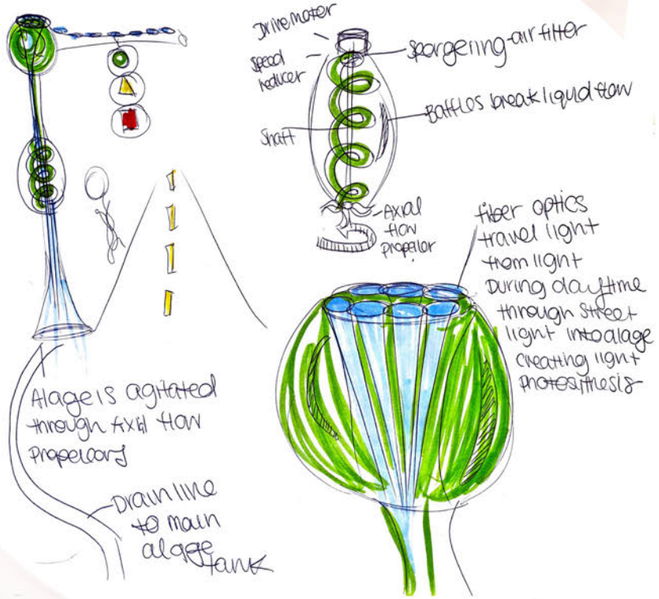
Case Studies

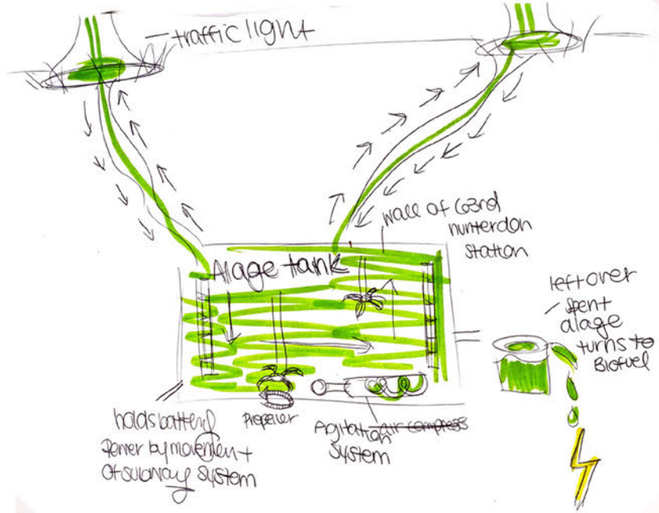


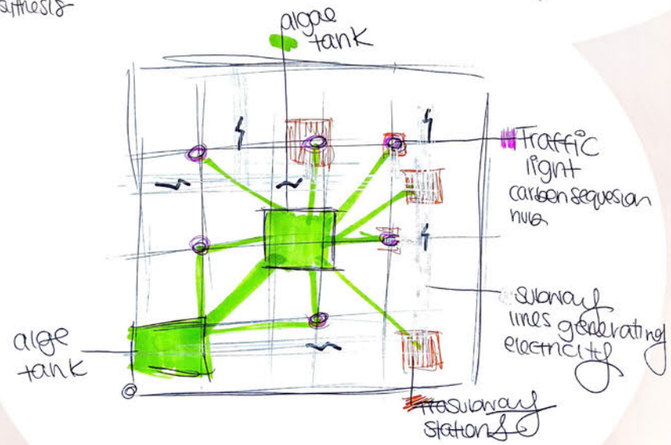
Design Process











How can we use technology and nature to innovate, expand and evolve outdated systems?

We wanted to create a more biophillic experience for the everyday comuter and bring life and fun to the dreary subway station.

DESIGN INTENT

INNOVATION

EVOLUTION

BIO CENTERED

INTERACTIVE

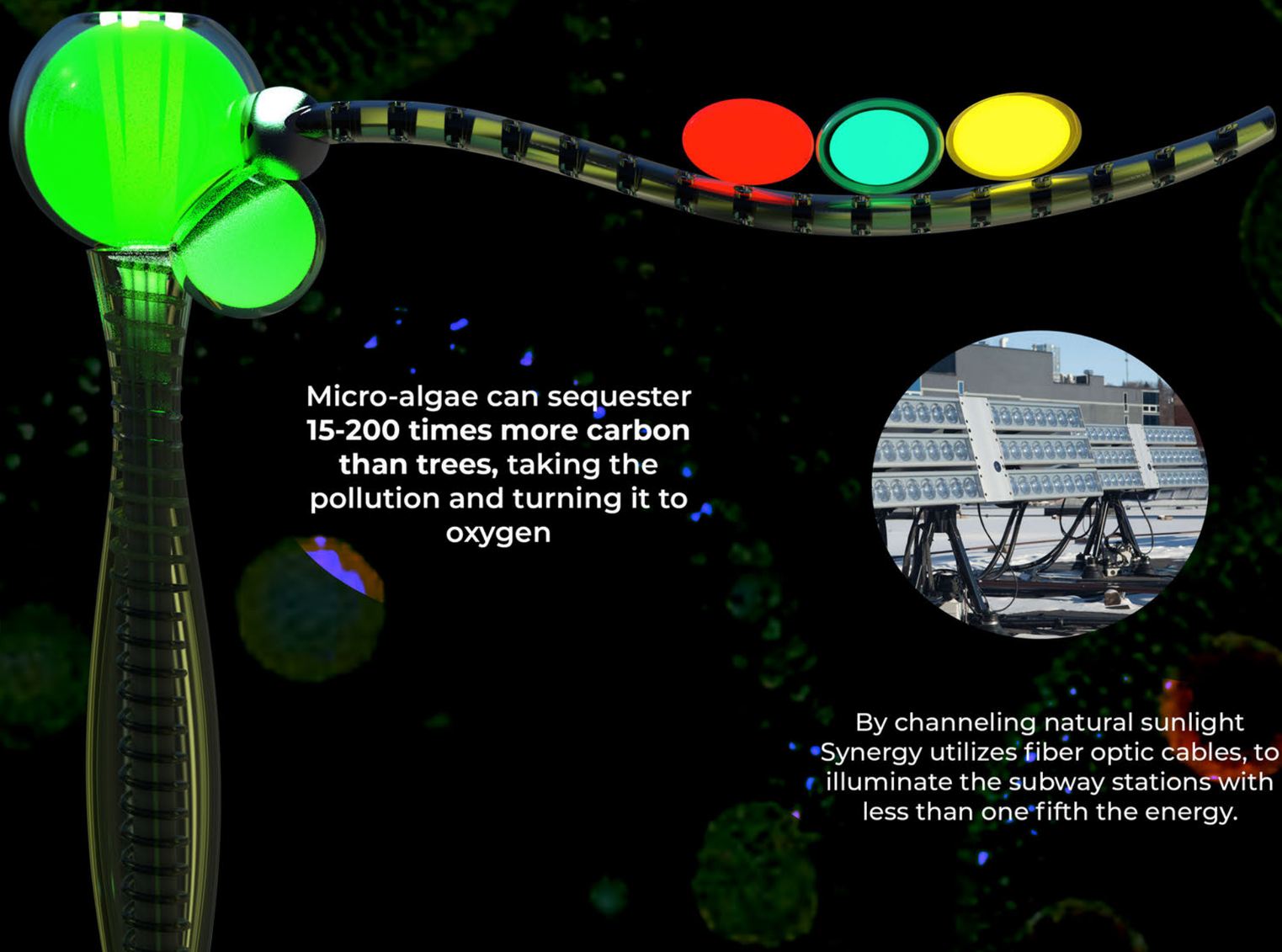
USER EXPERIENCE

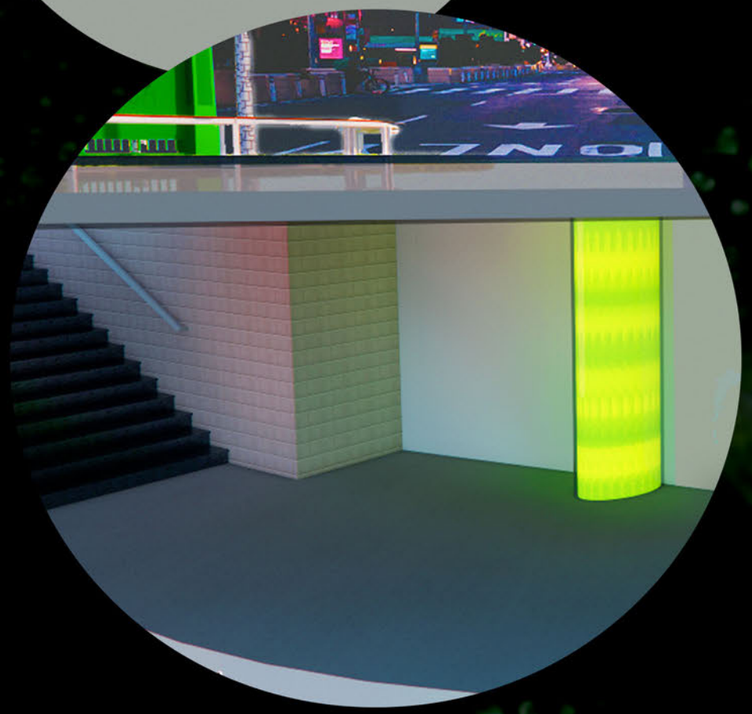
Who says traffic lights have to be boring?

SYNERGY

MULTI MORPH SYSTEM

Synergy uses photobioreactors to turn carbon dioxide from pollution into oxygen. The process of photosythizing algae creates light which is then used to to light the streets at night.

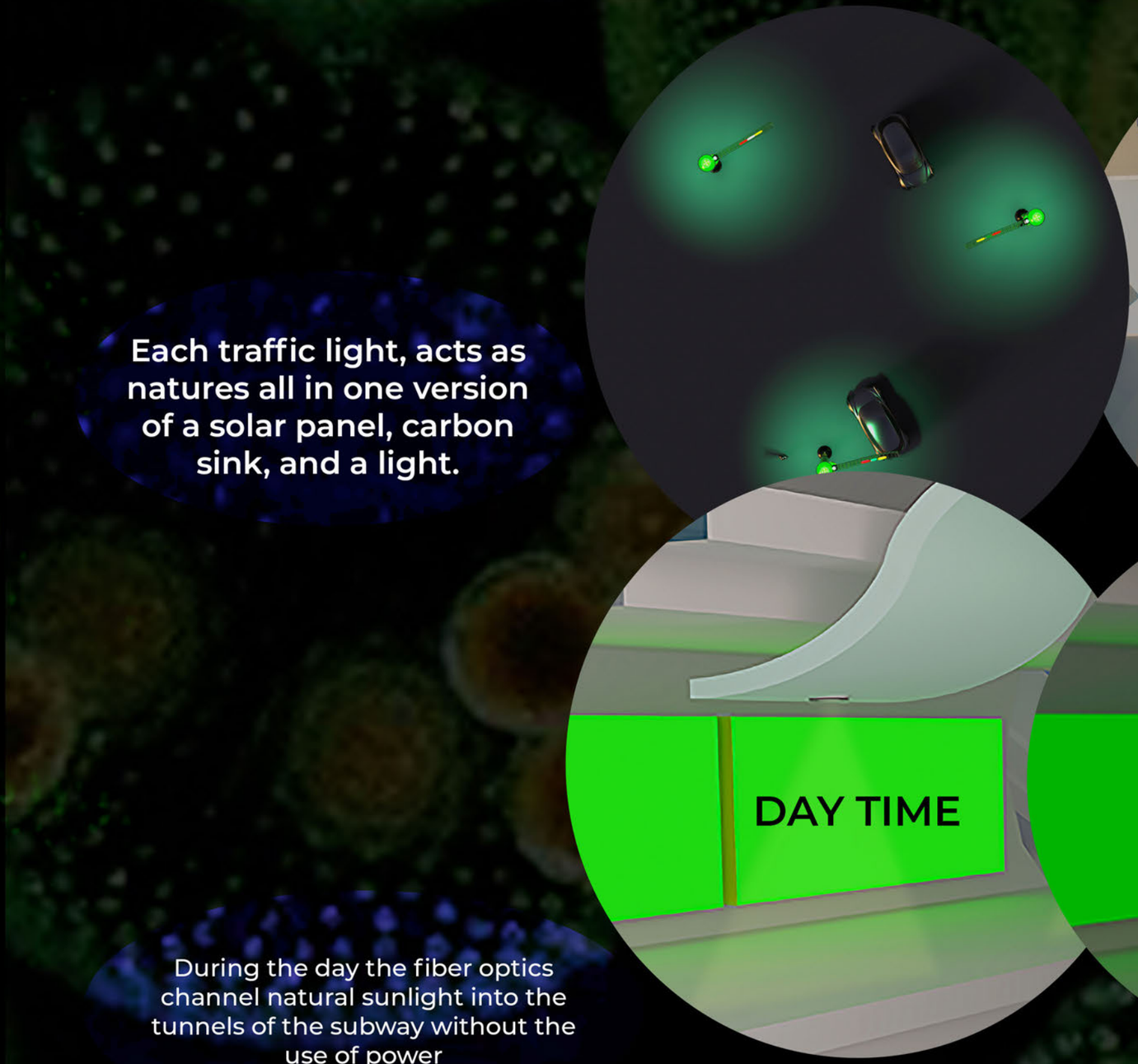




Micro-algae can sequester 15-200 times more carbon than trees, taking the pollution and turning it to oxygen

By channeling natural sunlight Synergy utilizes fiber optic cables, to illuminate the subway stations with less than one fifth the energy.

Each traffic light, acts as natures all in one version of a solar panel, carbon sink, and a light.



The algae is circulated through the stations giving users a more biophillic experience.

During the day the fiber optics channel natural sunlight into the tunnels of the subway without the use of power

During the night the subway stations are lit by the algae circulating through the traffic lights.

Traffic light Specs

SYNERGλ
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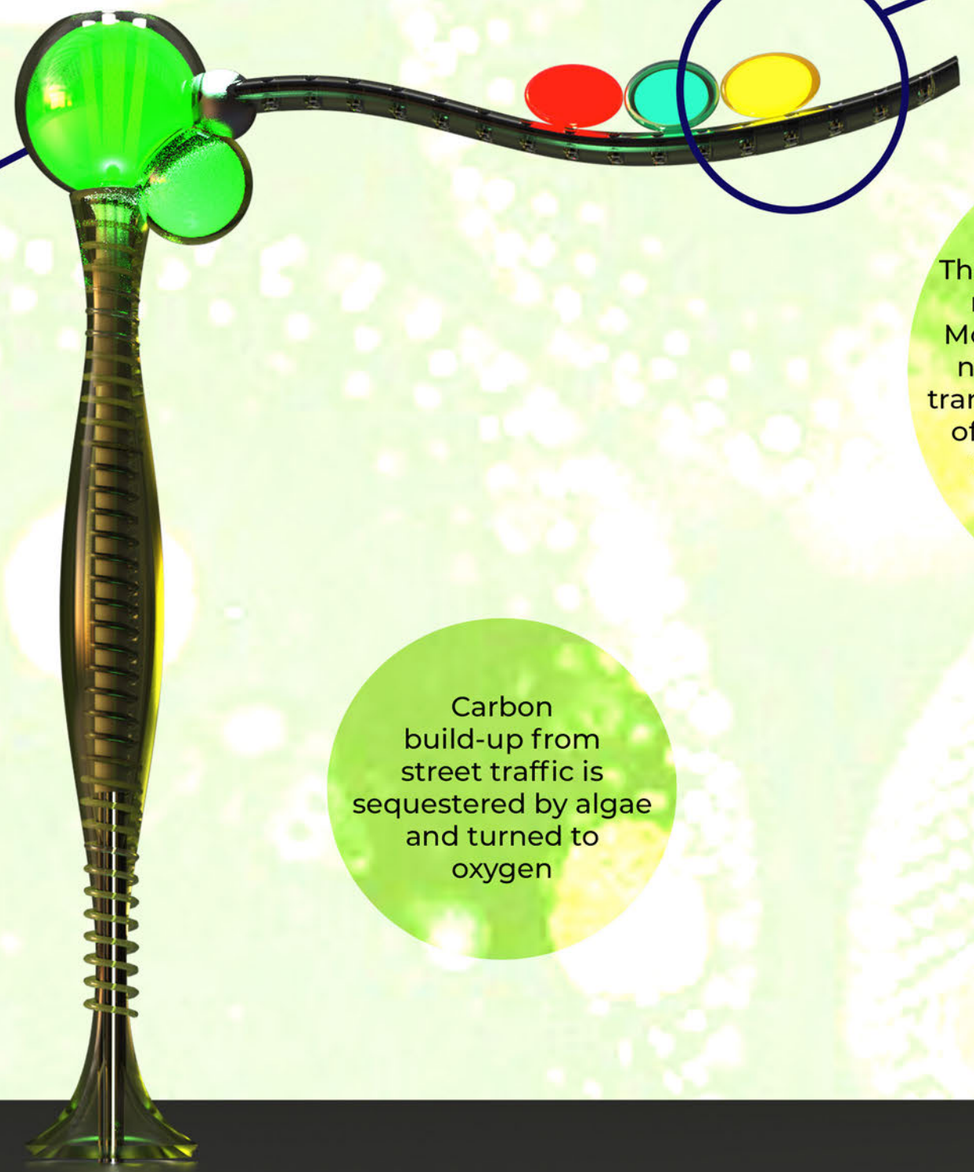
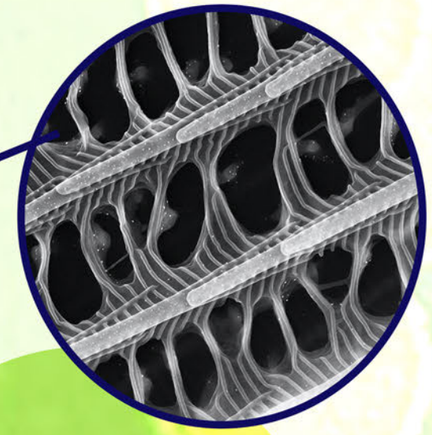
Algae is placed within traffic lights to reduce energy consumption, and artificial light pollution, as well as act as a street light for night without disrupting circadian rhythms of animals and people.





The top of our light posts are nano-structured like the Morpho Butterfly to harness natural light which is then transferred through a network of fiber optics to illuminate underground paths and algae systems.

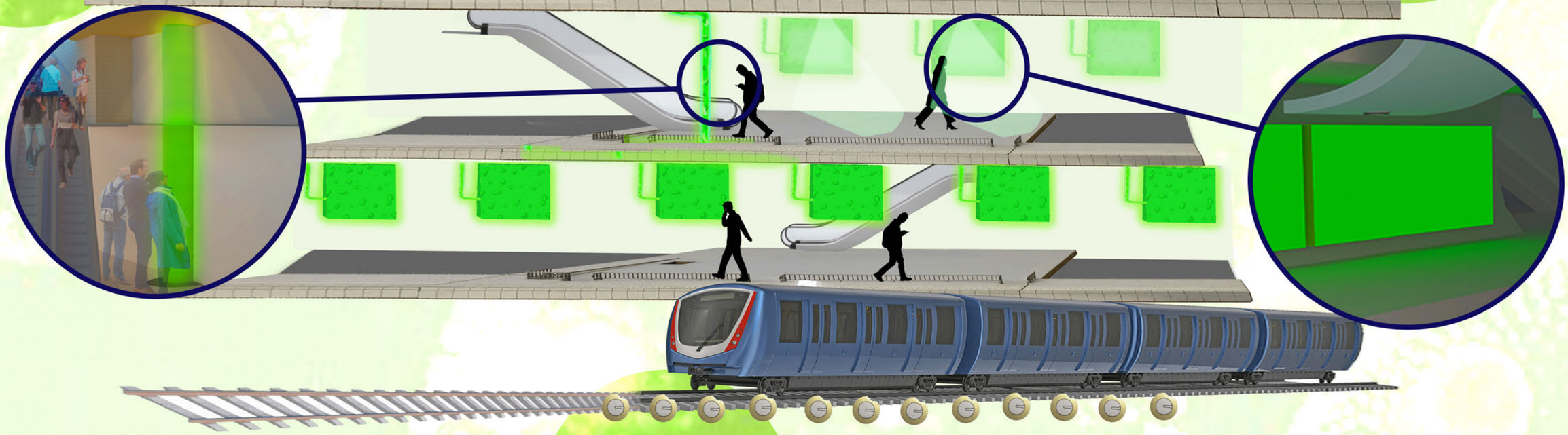
Carbon build-up from street traffic is sequestered by algae and turned to oxygen

Systems Map

Sunlight is harnessed and travels down through fiber optic cables to the underground algae tanks to feed them for photosynthetic processes.

Tubes connecting algae tanks and traffic lights, keep a constant flow for bioluminescent properties, and maximum carbon intake.

Cables bring natural light underground to keep the algae healthy in order to illuminate the underground and absorb carbon.



Water pumps, powered by piezoelectricity, maintain algae movement and optimal conditions for growth.

Sustainable Development Goals
United Nations General Assembly

The Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including poverty, inequality, climate change, environmental degradation, peace and justice

Minimizing light and air pollution and their negative health effects by amplifying natural light and artificial light alternatives.

Challenging the use of fossil fuels and emission of greenhouse gases

Harnessing and redirecting existing light and utilizing biomechanisms to generate self sustaining, accessible lighting.

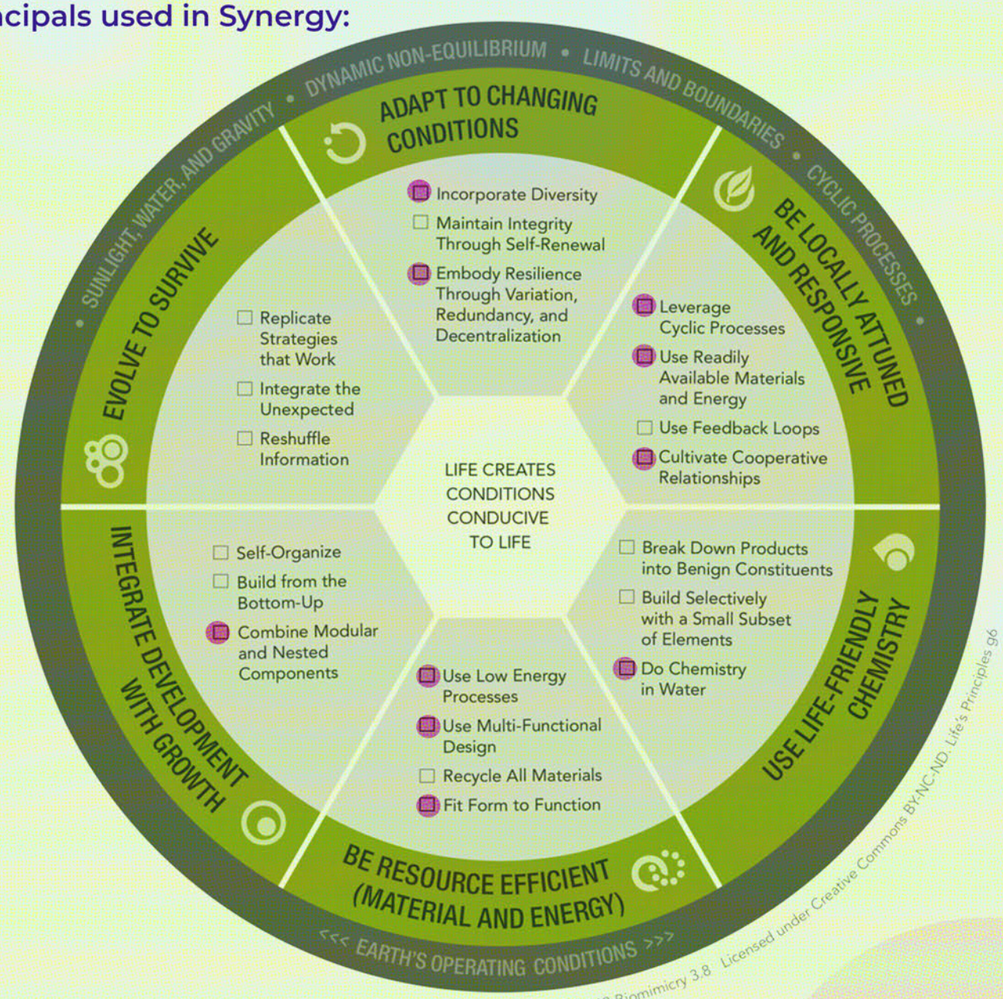
Addressing urban infrastructure by merging new and existing refractive and light collecting, storing, and emitting technologies.

Limiting artificial light pollution and skyglow to reduce animal death and disorientation.

Working towards overall healthier better functioning systems of everyday life.

Life's Principals

Principals used in Synergy:



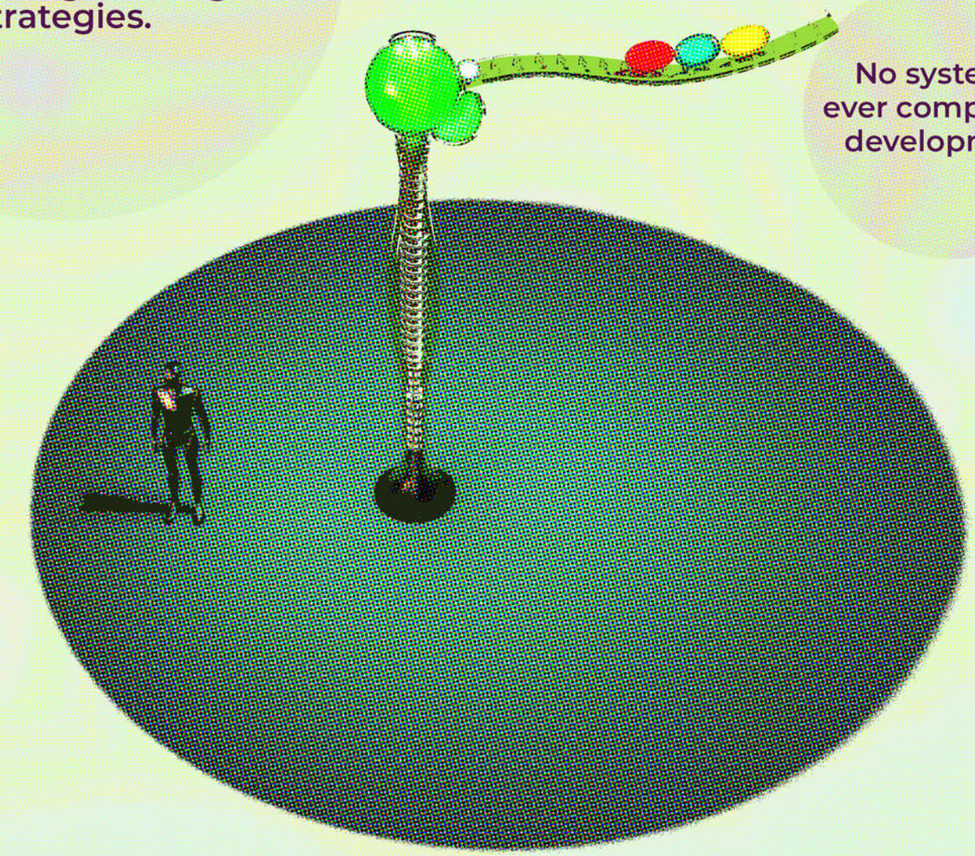
Reflections

Biology to Design yields broader results than vice versa

Within every system is a system.

Many problems can be solved through combining existing strategies.

No system is ever complete in development.



Natural and Man-made systems can help one another create dynamic solutions.

Ecological Functions can be diversified to fit a wide variety of applications.