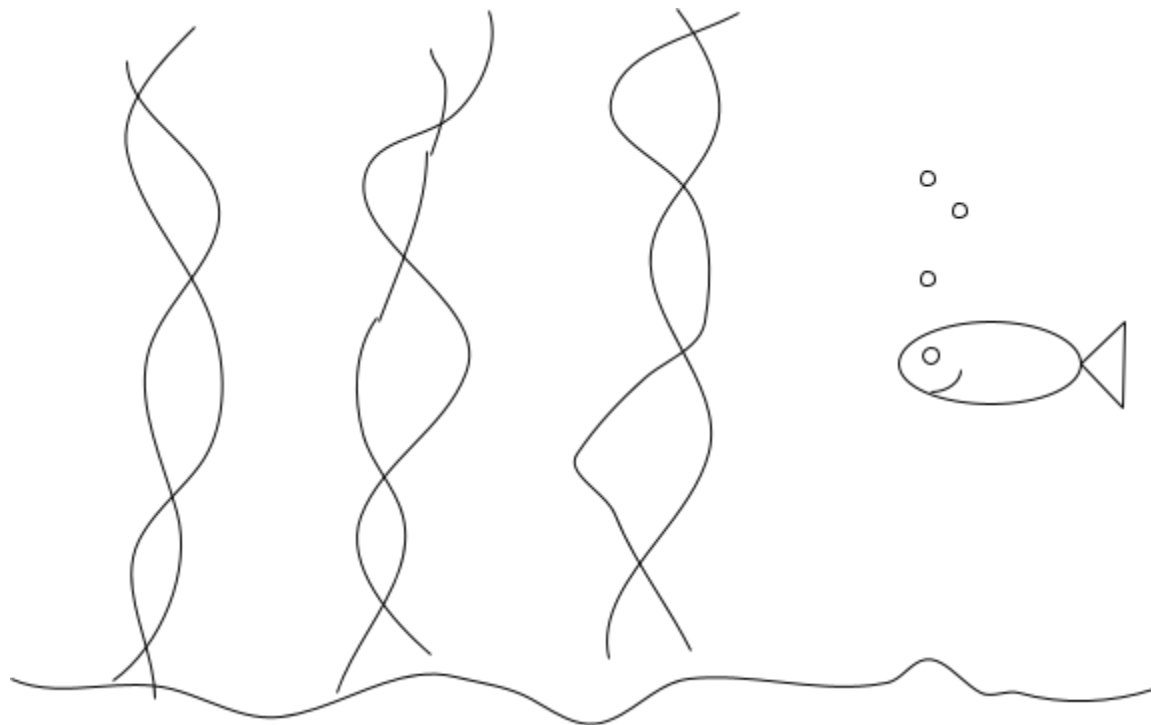


Deadlines:

Koen: sketch by monday night for cad and working illusion by wednesday for video

Derek/Lucas: Monday midnight - just work on the slides and do as much as we can before koen finishes the final sketch, Tuesday midnight - finish CAD and preferably slides before we meet on Wednesday, Wednesday - get together with hopefully everything done run thru the slides check for error and then do the video.

WEDNESDAY MEETING TIME: 4-5pm



Problem Statement: Since 1880, the combined land and ocean temperature on earth has increased at an average rate of 0.07 degrees C per decade. By the end of the century, the planet is set to heat up by another 3 degrees C. Most greenhouse gases come from burning fossil fuels for energy production. We plan to build a device that will facilitate the farming of kelp for biofuels.

<https://www.bloomberg.com/news/articles/2019-12-10/climate-on-track-to-warm-at-least-3-degrees-without-action#:~:text=The%20world%20is%20on%20track,worst%20impacts%20of%20climate%20change>.

<https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature#:~:text=According%20to%20the%20NOAA%202019,more%20than%20twice%20as%20great>

Biofuels are a good alternative to fossil fuels because a lot of the infrastructure is in place and biofuels don't have a lot of the problems that solar and wind energy have (solar panels are hazardous to recycle and wind farms emit high-decibel infrasound that is legitimately bad for the sleep of nearby people). However, growing biomass for biofuels can cause problems with the ecosystem, and sometimes, like when the government subsidized biofuels, farmers will grow corn only for biofuels instead of for food (and this is also a problem with growing biofuels en masse in general, on land that is). Land, water, fertilizer.

Kelp is a good source for biomass for biofuels because it grows quickly. Unfortunately, it can only grow close to shore, because that's where it can get both the nutrients that are found close to the ocean floor as well as sunlight that is close to the surface. In order to mass-produce kelp, people have talked about building a "kelp elevator," which allows kelp to be grown further out to shore by lowering it to the ocean floor at night and raising it to the surface during the day.

Location: Pacific Northwest really good place to grow kelp for some reason
What things change at night?

Tides

Temperature

Amount of light

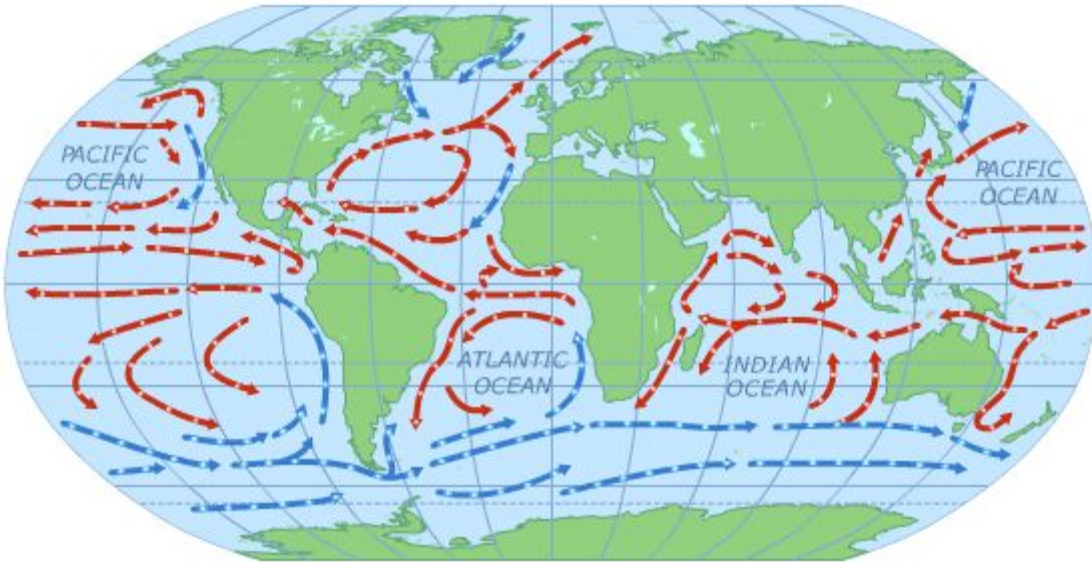
land/sea breeze

Amount of CO₂ in the air(plants don't photosynthesize)

<https://www.bbc.co.uk/bitesize/guides/zxtcwmn/revision/1>

At the ocean floor, light and temperature don't change as much.

Something that doesn't require electricity????



Ideas:

Temperature - too variable?

Earth's magnetic field

Ocean currents

Tides

Some chemical reaction???

Timer - require electronic

Solar panel - require electronic

Light sensor

Solar panel powers thing that raises/lowers it, timer/light sensor to say when

Training fish

This company is already looking into open-ocean kelp farming. They use nets suspended by drone-submarines.

<https://www.marinebiomass.com/>

WHAT IF we use some kind of chemical reaction that involves CO_2 . There is more CO_2 in the air at night because plants are not photosynthesizing, and thus there will be more CO_2 in the ocean because more will dissolve (colder liquids also dissolve more gas . . . colder surface temp -> more CO_2 in water? Need to research if there is more CO_2 in ocean at night). If so, we could use a reaction where the products are more dense (or the reactants, cuz the reaction goes both ways. The denser side needs to be the one opposite the CO_2) so that more CO_2 at night -> whole thing gets more dense -> sinks at night.

Something + CO₂ <-> something more dense than reactants

[these are the bubbles in kelp that keep it afloat/upright](#)

Something based off acidity of water?

[pH indicators](#)

[pH of ocean is about 8.1](#)

[collagen filaments](#)

[pH-responsive polymers](#)

How to keep the reaction separate from the water?

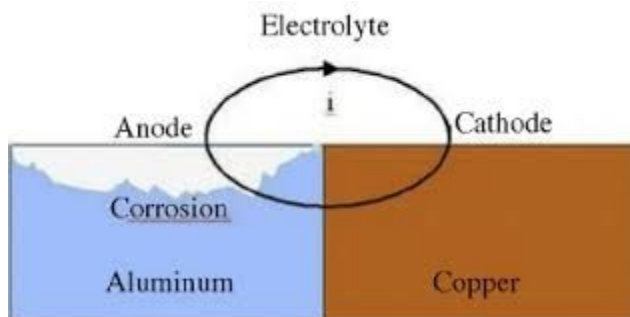
<https://www.forbes.com/sites/grrlscientist/2016/03/31/what-is-ocean-acidification-and-why-is-it-worse-at-night/?sh=54ce4cf33c79>

[using co2 for feedstock](#)

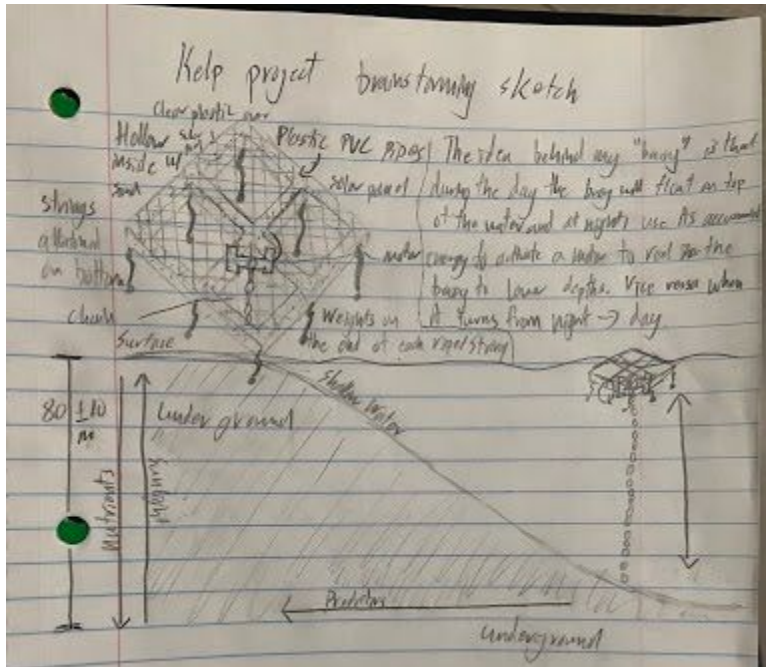
[chemistry of co2](#)

[converting co2 to co](#)

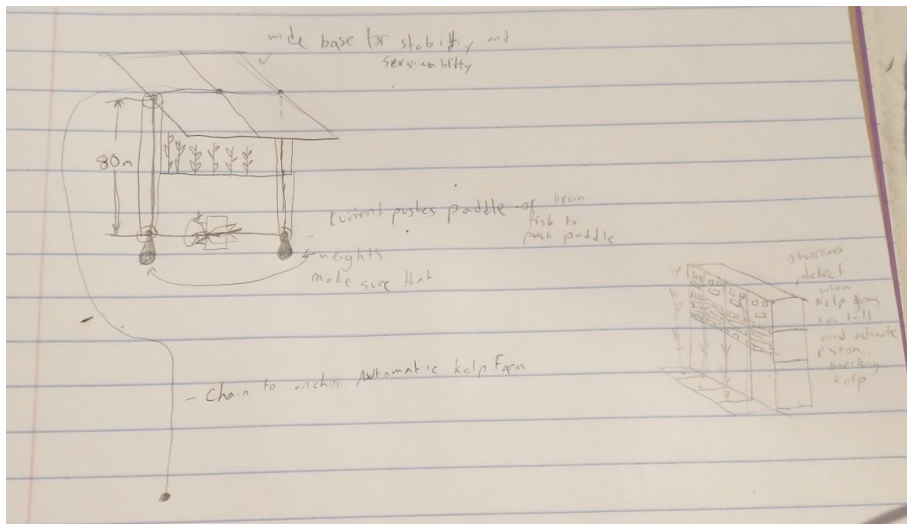
Galvanic Corrosion:



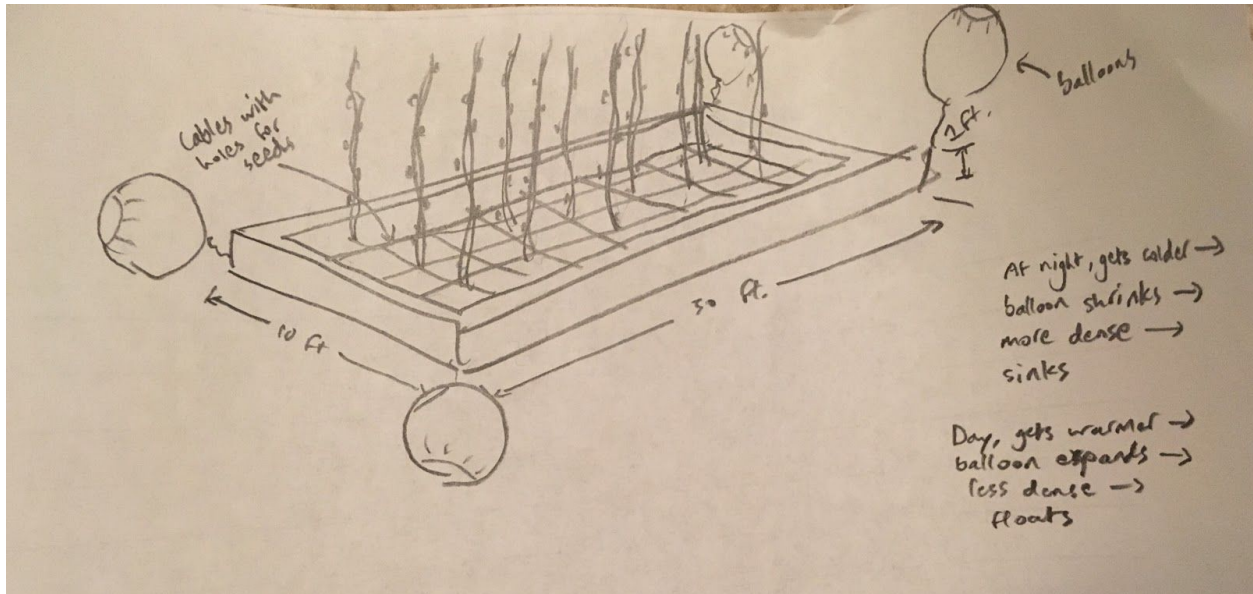
Sketch #1 (Derek)



Sketch #2 (Lucas)



Sketch #3 (Koen)



Criterion (1-5 scale 1 bad 5 good)

- How environmentally friendly is it
- How much does it cost
- How efficiently does it grow the kelp
- Is it automatic
- Originality
- Durability
- Simplicity

Sketch #/person	Environmentally friendly?	Cost	Efficiency in growing kelp	Automatic?	Originality	Durability	Simplicity	Total x/35
1 (Derek)	4	4	5	5	3	5	3	29/35
2 (Lucas)	4	3	5	3	5	5	1	26/35
3 (Koen)	3	5	5	4	5	3	5	30/35

Koen's design ended up getting the most points at 30/35. While his sketch did score the highest, it didn't score the highest in every category. Koen's sketch was very well rounded but we decided to incorporate designs from Lucas and Derek's sketches too in order to get the most points possible. Lucas and Derek's design idea will be used for the sketch to be more

environmentally friendly, Derek's design will be used for automation, and Lucas' idea will be incorporated for durability.