

Ørb!t6

Group Activity Light

Zhengkun (Hanson) Li
Spring2024 - ID2024 - Abigale

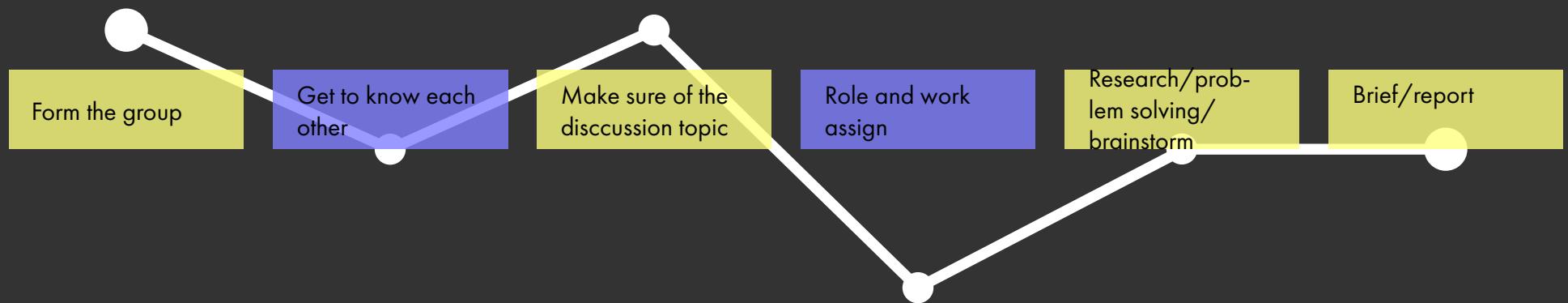
Design Statement

To design a multi-directional lighting solution capable of adjusting illumination in response to the number and character of individuals, enhancing ease and engagement in group activities, such as board games or brainstorming sessions.

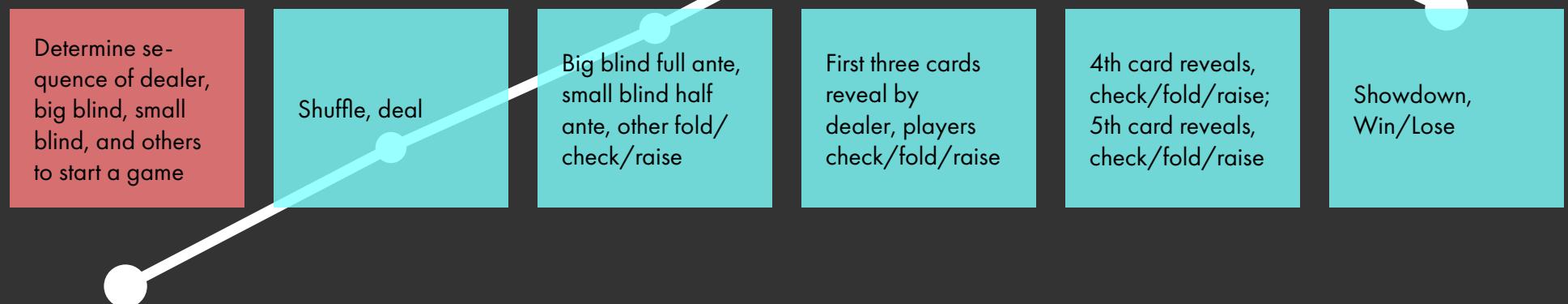
Journey Map

- Y - axis represents the level of confusion among personnel
- X - axis represents workflow of an activity

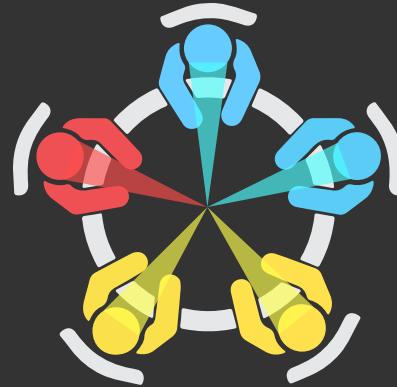
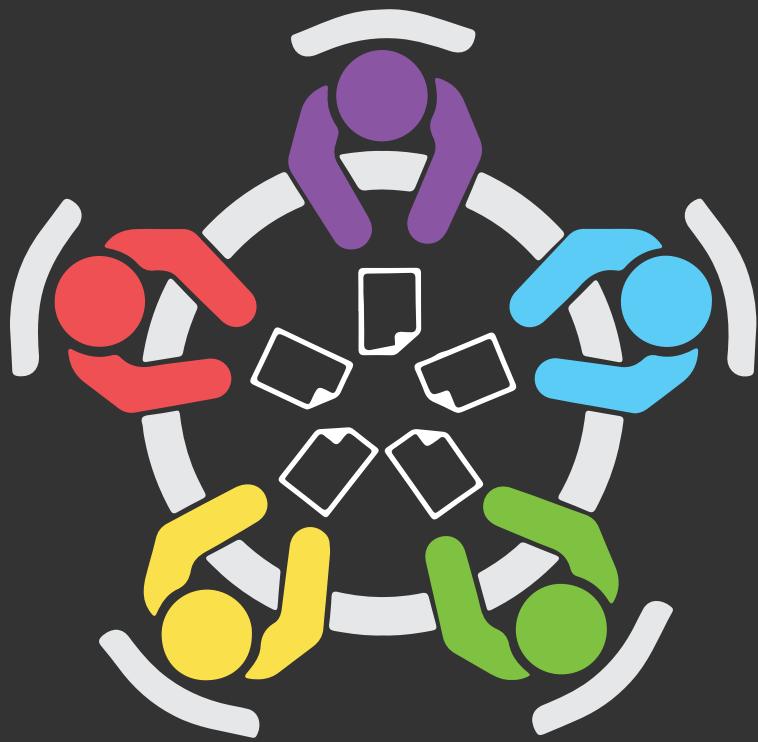
Group Brainstrom



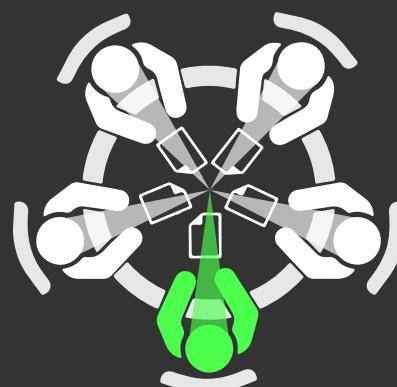
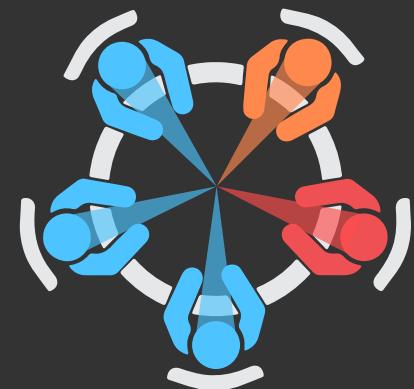
Texas Hold'em



Usage Scenarios



Texas hold 'em using color to identify "big blind" and "small blind"

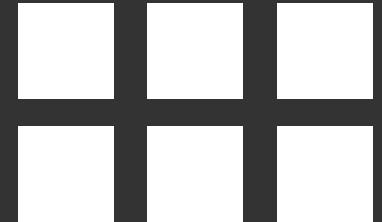


Third-party contractors project bidding with an head investor

Usage Scenarios

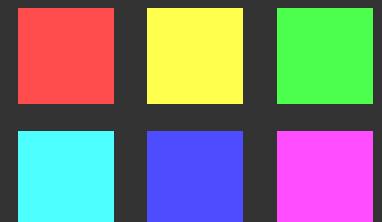
Illuminate

Illuminate areas for individuals around the table during board games, group researches, project brainstorms, etc.



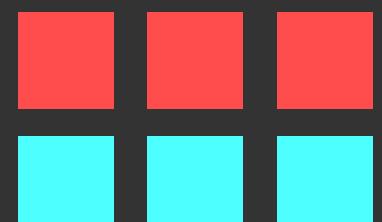
Identify

Identify each person in a unfamiliar group using color to relate with names; assign role of each person using different colors as symbols.



Catagorize

Catagorize secondary groups within a large group using same color light as a mark.



Sequence

Sequence people in a board game using gradient or other color marking system. Sequence is crucial in games like Monopoly, Texas Hold'em, etc.

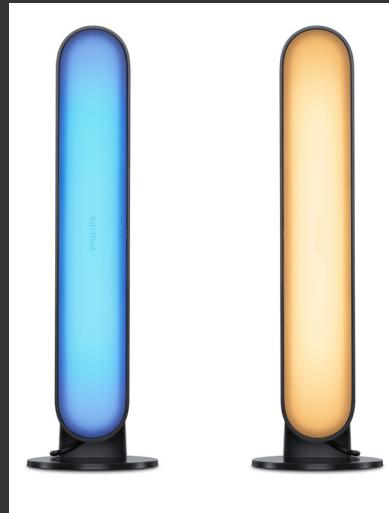


Market Research

Color Change

Most of the color changing lightings in the market are emissive and ambient light, instead of directional light that illuminates a certain area.

Also, the size of the light works well as an individual, yet they will be chunky and hard to set up as a group of lights.

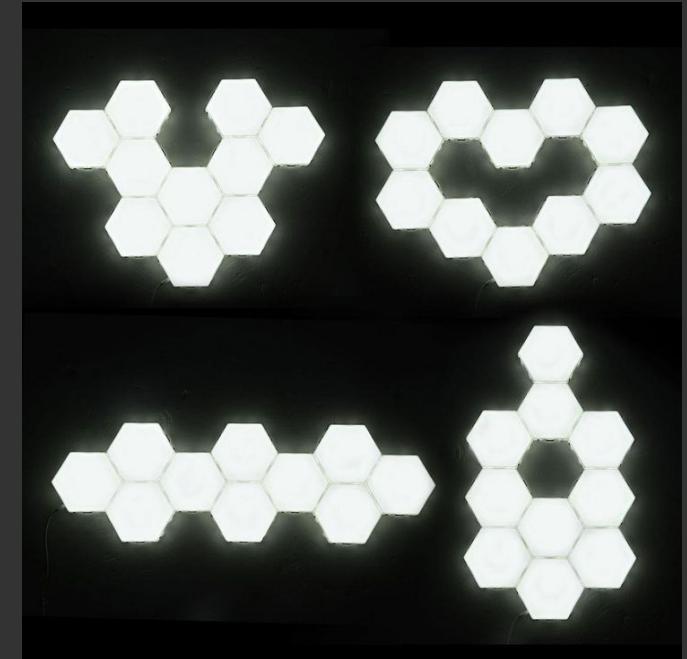


Market Research

Modularity

Modularity endows users to customize and adjust the lighting setup.

Some modular lighting panels have high degree of freedom, but will take lots of time to setup. While some modular lighting has a main body that branches out individual lighting component. This method saves learning cost and time.



Design Criteria

	Form	Light	Product Experience
Adjustable	Modular design, repetition of same parts, high degree of freedom	Able to change in color, brightness, even temperature	Each person has own colored lighted area, cater multiple people
Directional	Avoid using circular forms, use sharp-edged, straight line forms	Cover lid on top of LED should be narrow	The illuminated area separate the space, not blend together on edges
Fun to interact	Design with circular rotation, lateral movement, etc.	Light on/off when using/not using	Have multiple moving parts with degree of freedom, be interactive
Color change		Use multicolor LED to have variety of color	Be able to cater each user case, such as group discussion, game...
Easy to use	Simplistic form, the degree of freedom should be limited to not overcomplicate	Do not need to have hundreds of color options, limit to single digit number	Should be assembled/unfolded within 10 seconds, the task/game is top priority

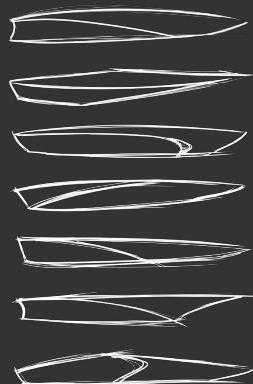
Must Have

- Movable and adjustable parts
- Modular design or repetition of same parts
- Simplistic form
- Directional light to separate space by illumination and color
- The degree of freedom should be limited for easiness
- Able to change in color, brightness
- Cover lid on top of LED prevent dazzling



Should Have

- Avoid using circular forms, use sharp-edged, straight line forms
- Design include movement, such as rotational, lateral, etc.
- Margin of each light area should be sharp and not blend together
- Be easy to use, assembled/unfolded within 10 seconds, maintaining task as priority
- Smooth sanded plastic finishes

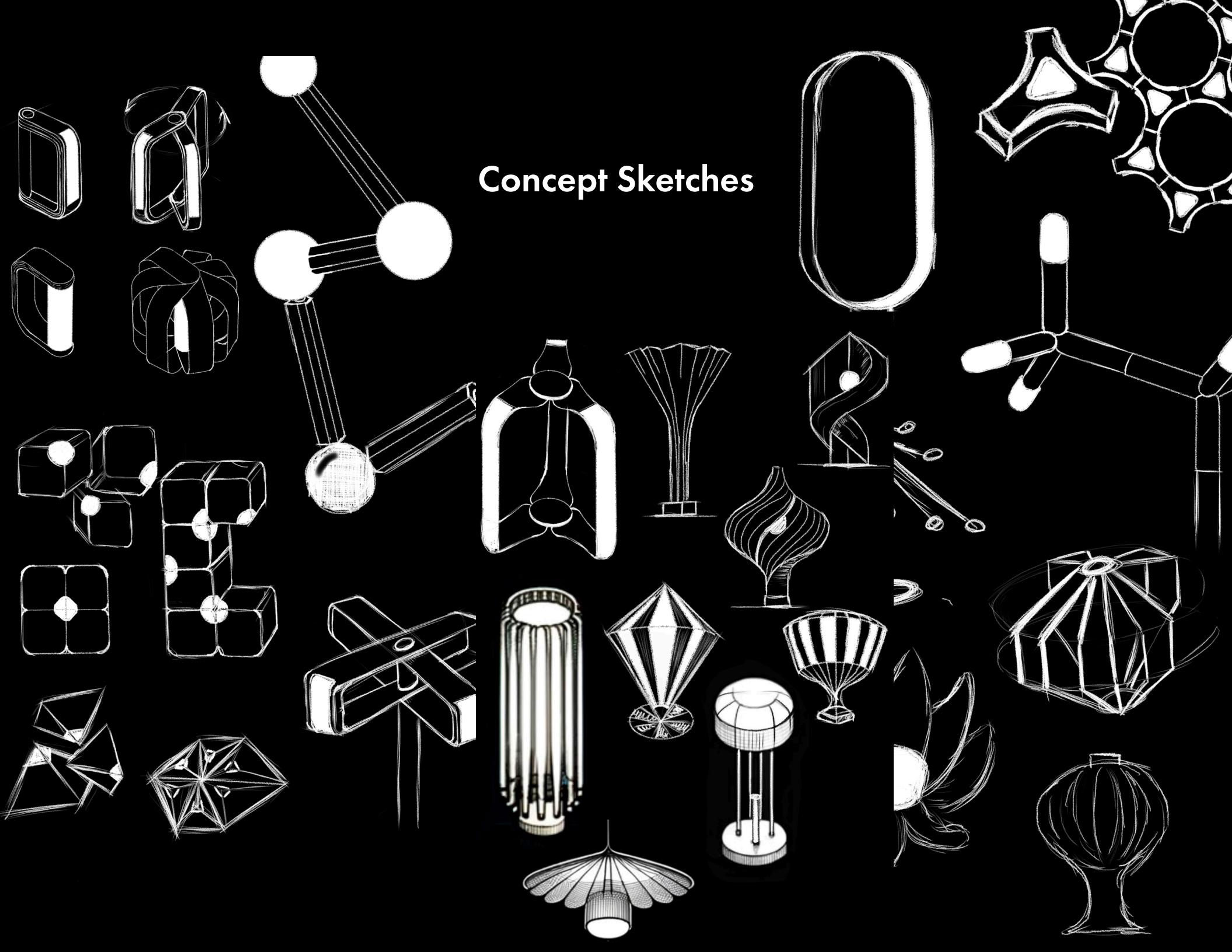


Could Have

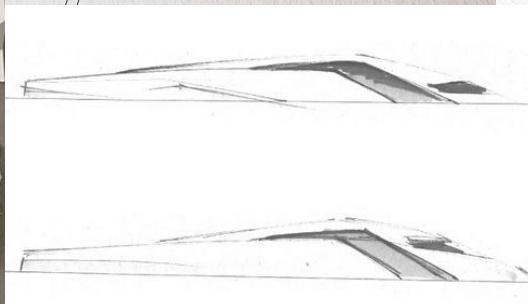
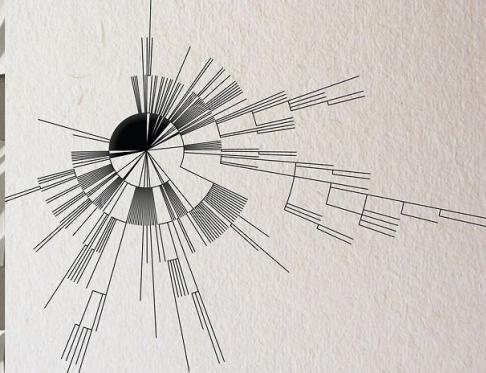
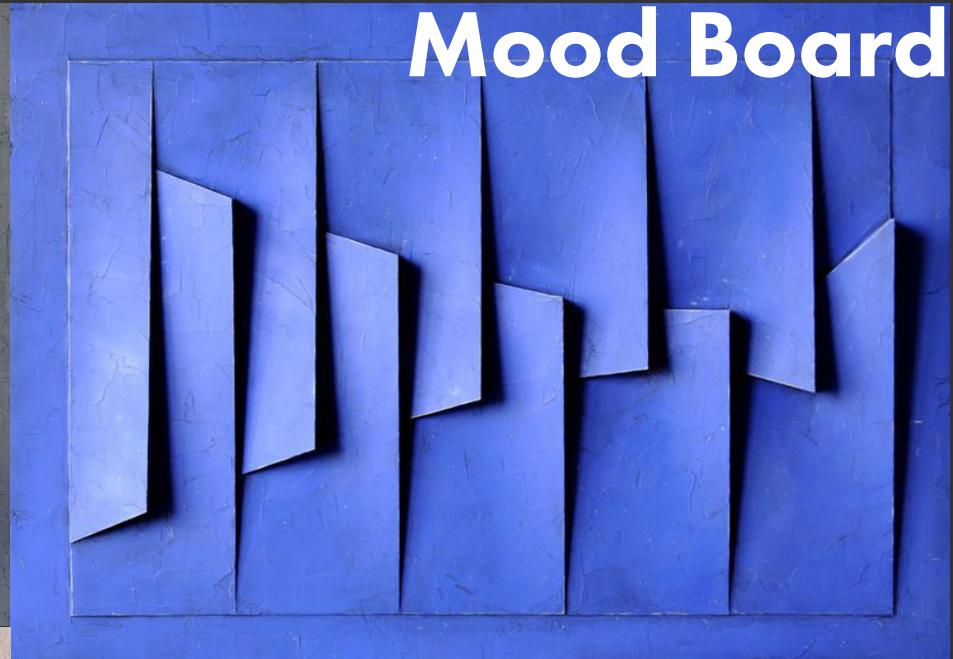
- Form creating horizontal expansional movement
- Light should blend in with the form
- Unconspicuous buttons or knobs to not break continuity of the form



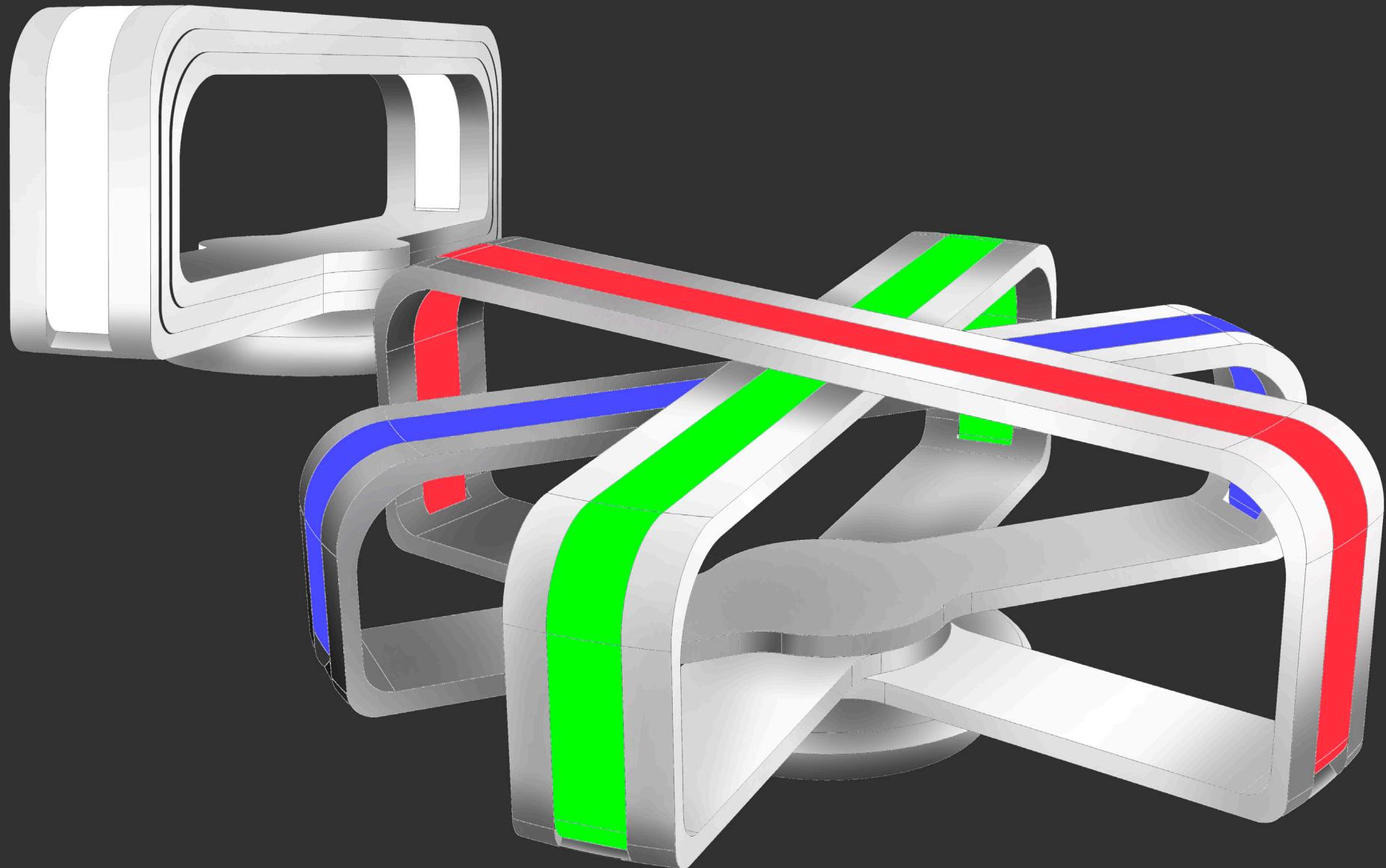
Concept Sketches



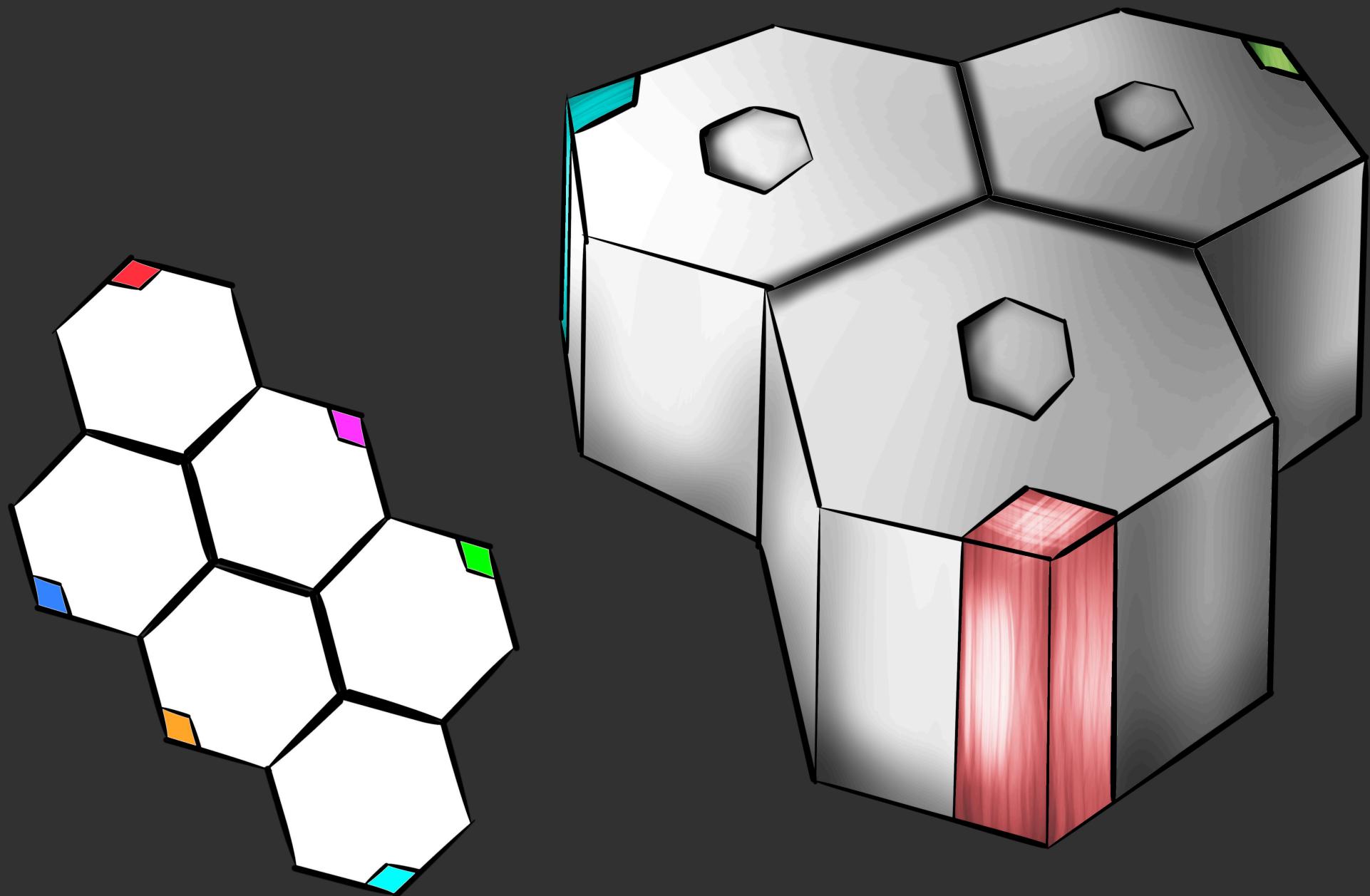
Mood Board



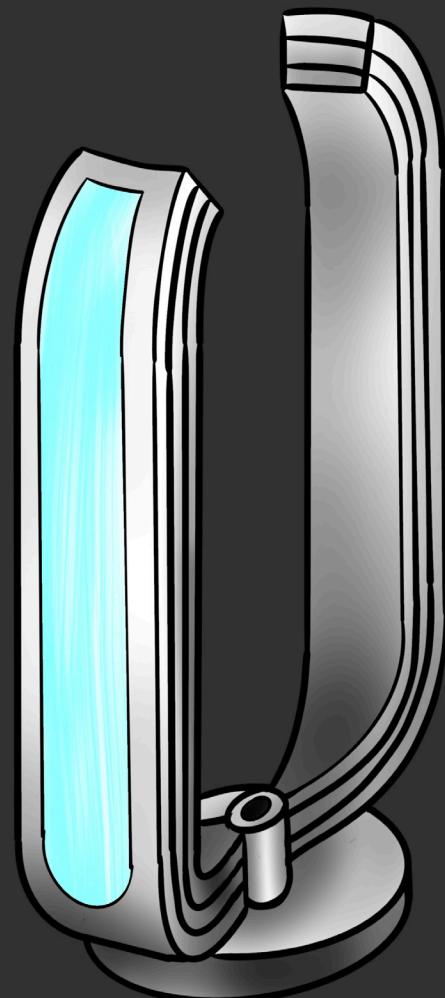
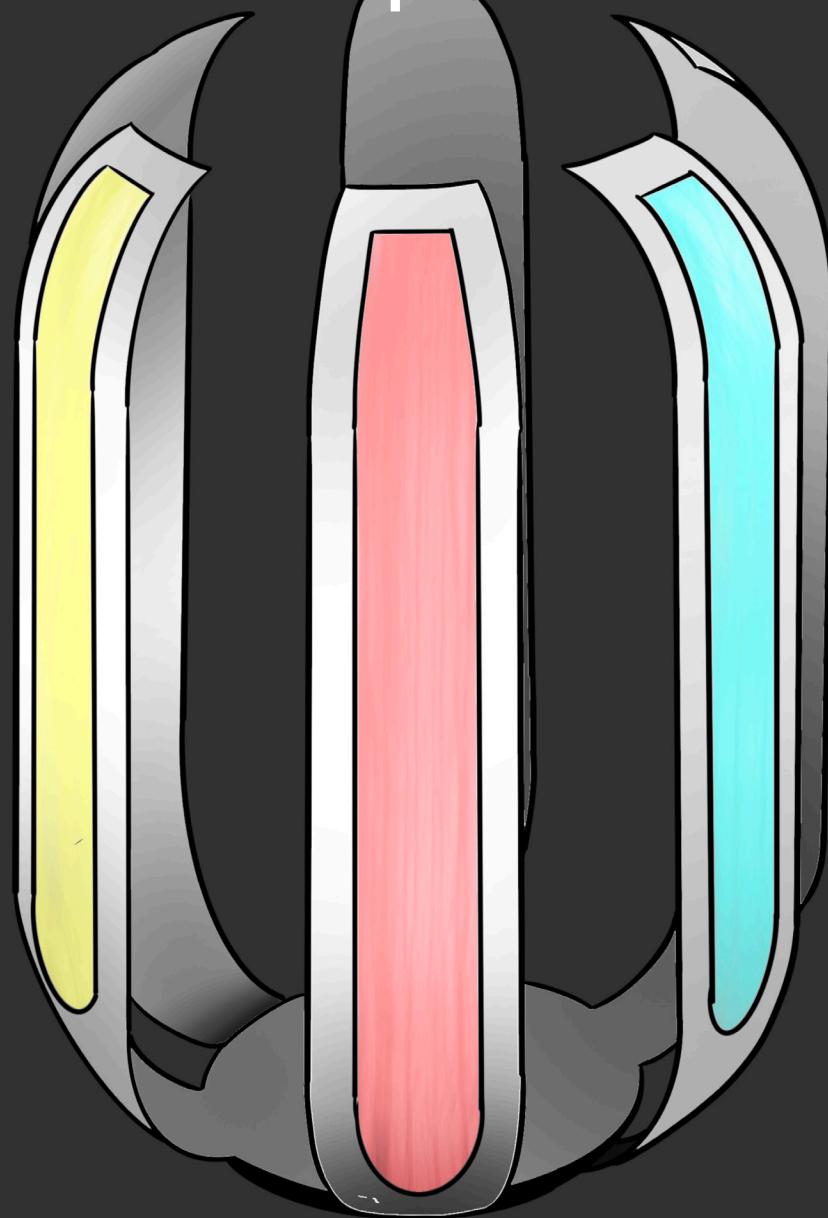
Selected Concepts



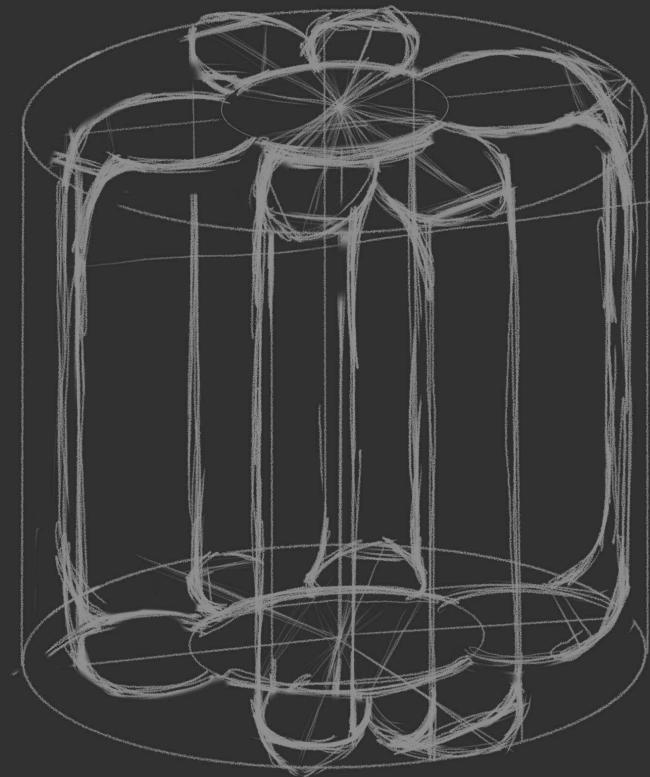
Selected Concepts



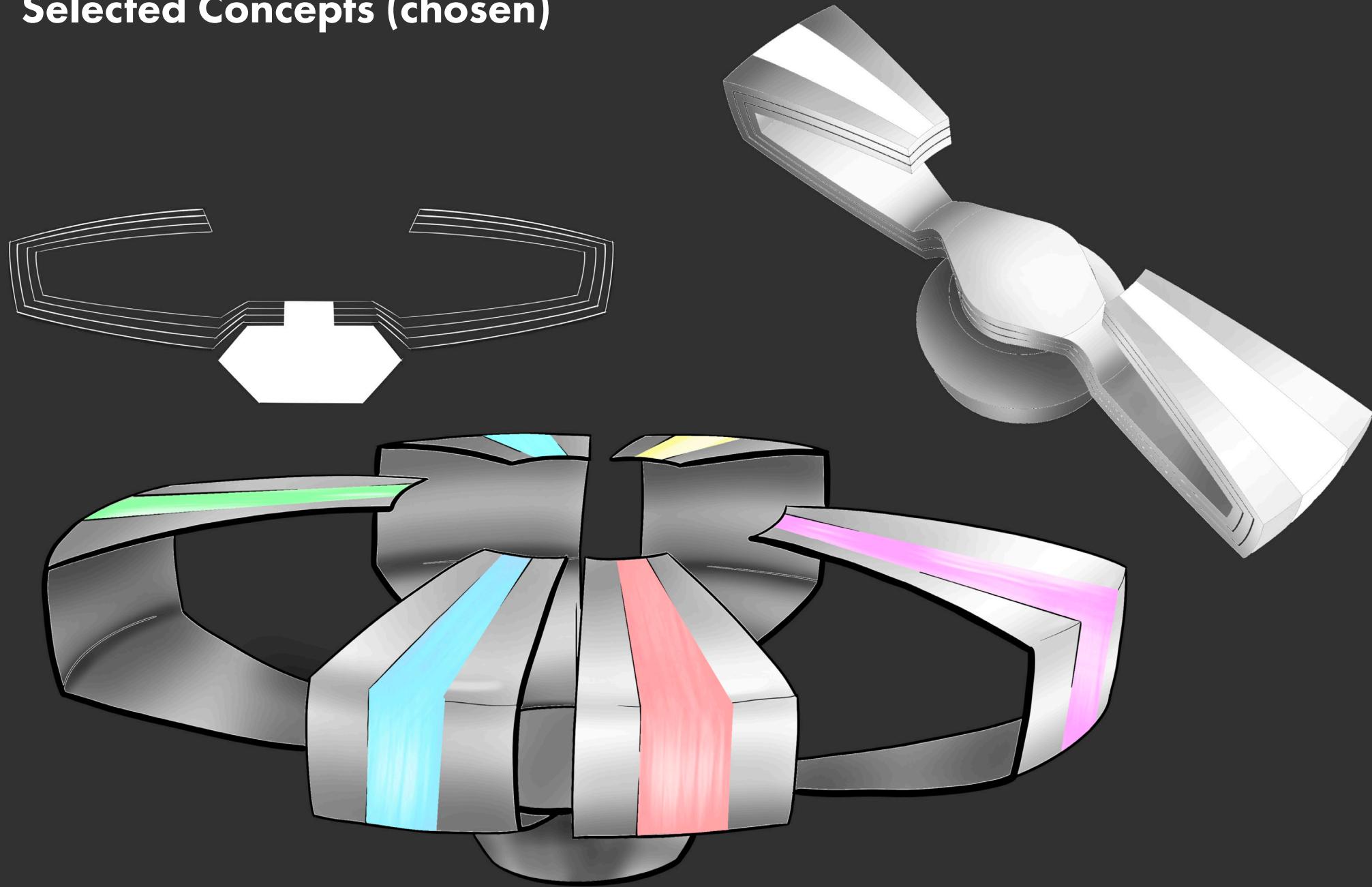
Selected Concepts



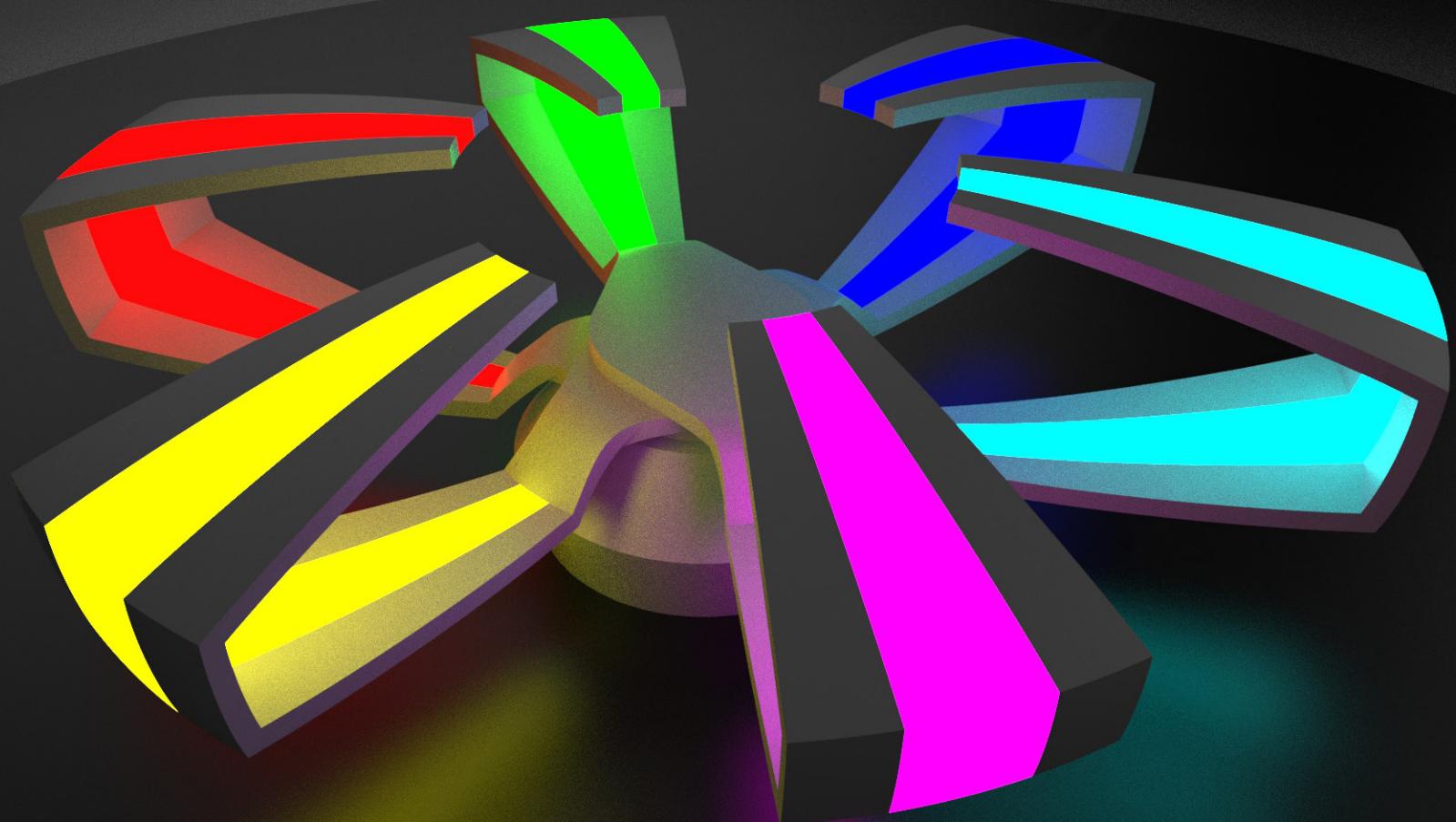
Selected Concepts



Selected Concepts (chosen)



Digital Rendering



Sketch Model



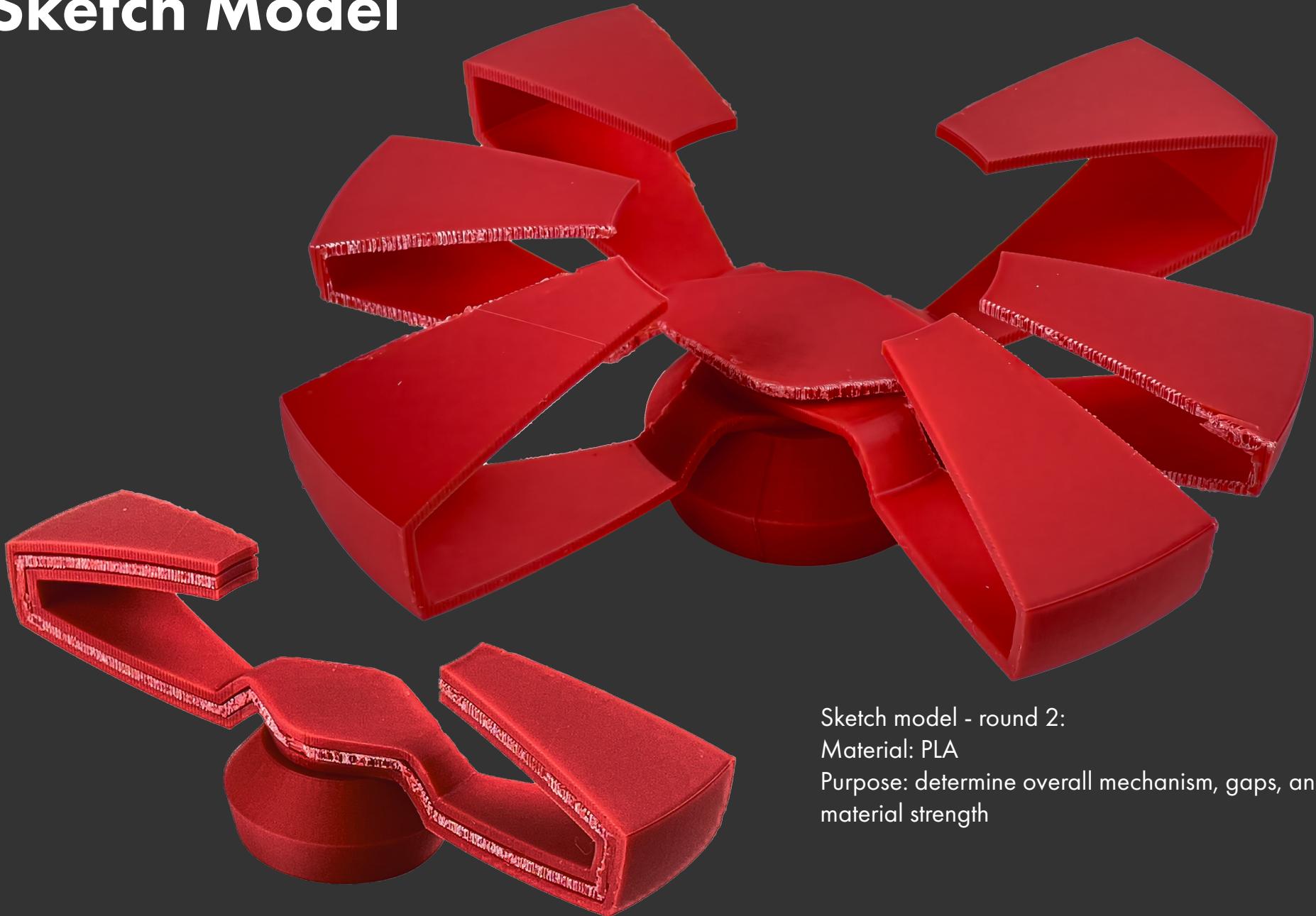
Sketch model - round 1:

Material: cardboard

Purpose: Determine scale and rotation mechanism

Scale: within 10*10*10in box

Sketch Model

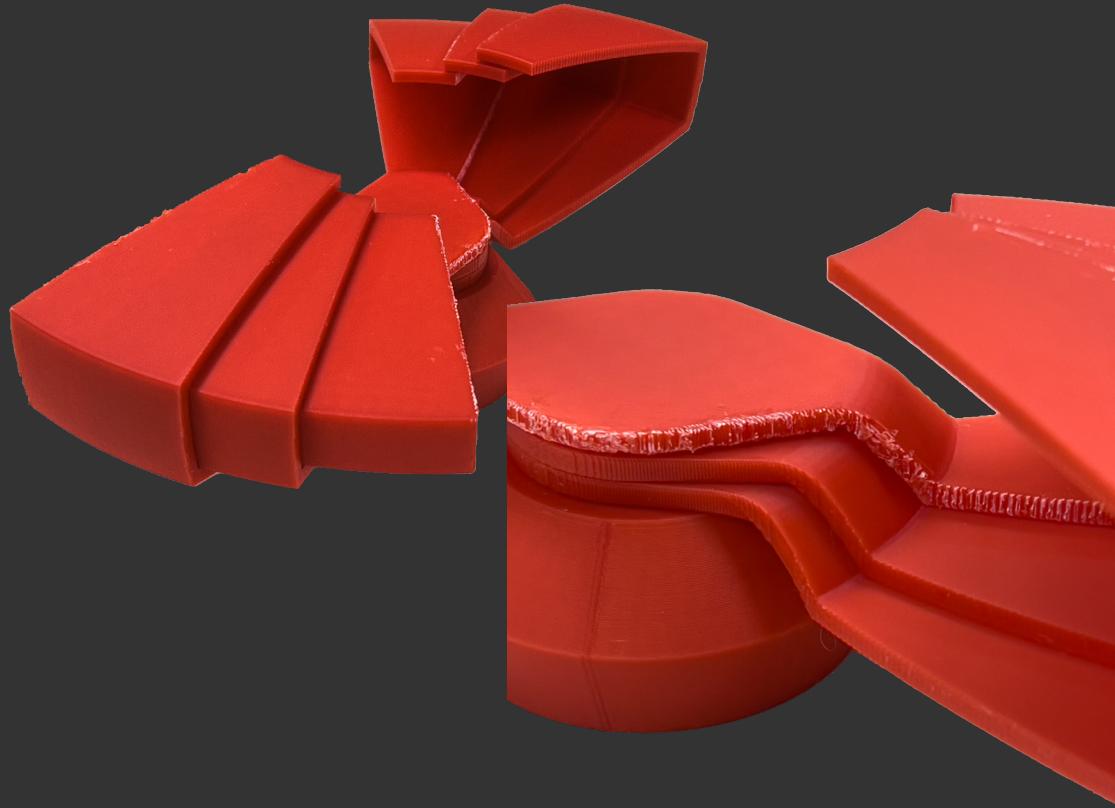


Sketch model - round 2:

Material: PLA

Purpose: determine overall mechanism, gaps, and material strength

Material Test - PLA & PETG

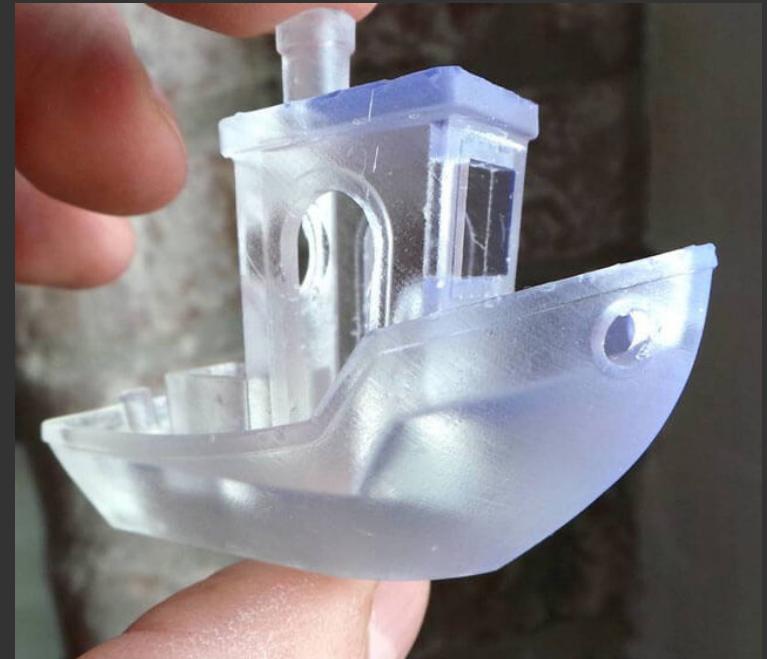


A smooth rotational feeling is crucial in this design.

Sloppy rotation: gap $\geq 0.5\text{mm}$

Damped rotation: $0.5\text{mm} > \text{gap} \geq 0.15\text{mm}$

Minimum gap space: 0.1 mm

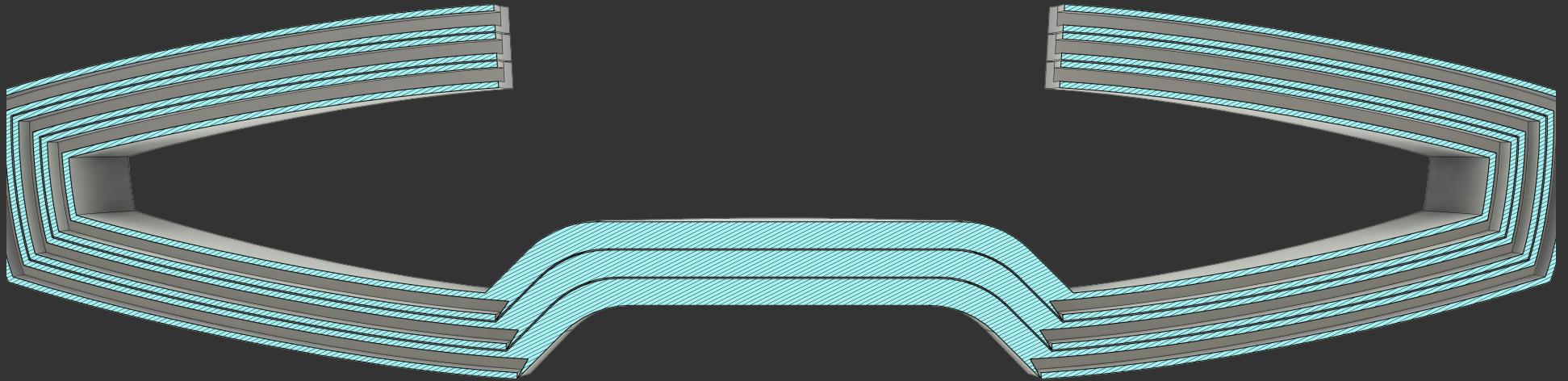


For the lid of LED lights, transparent PETG is the overall best option.

PMMA material is too fragile for a thin sheet and badly holding onto moisture.

Transparent resin is too cloudy which will diffuse the light, making it non-directional.

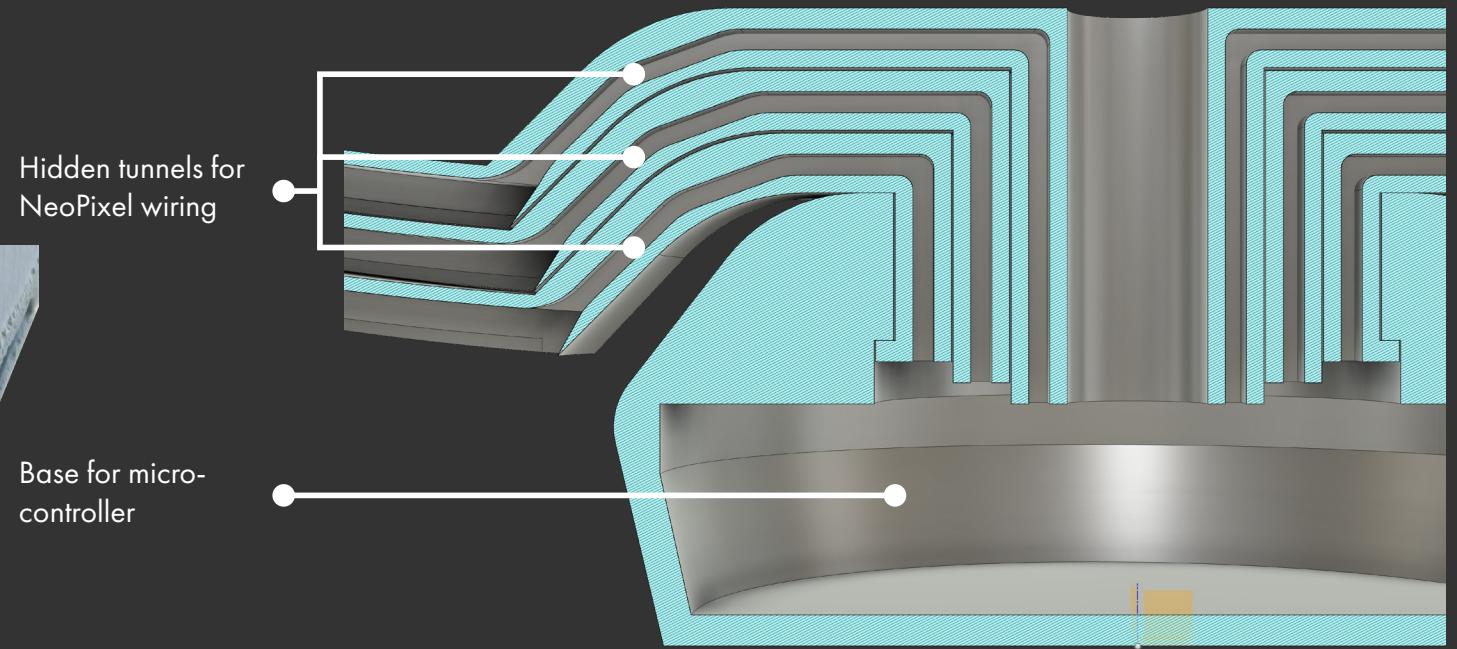
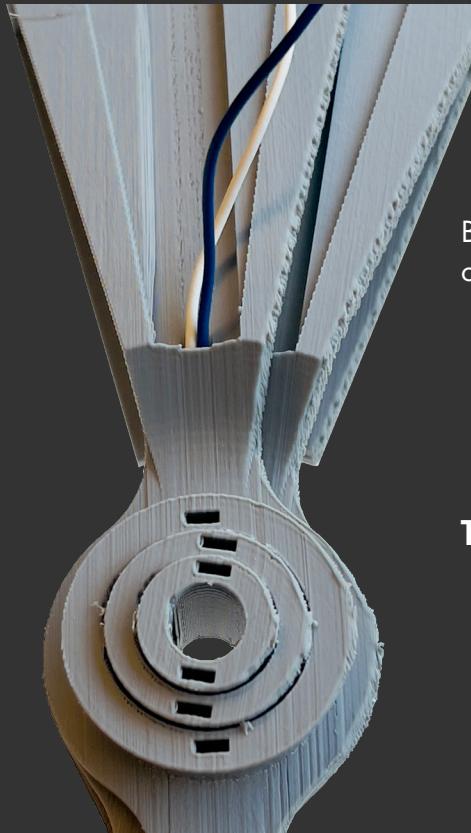
Model (version 1 - fail)



Key point:

- A diameter of 200mm is bit small for putting wires, NeoPixels, and micro controller inside
- Scaled the model to a diameter of 250mm and made changes to fix parts

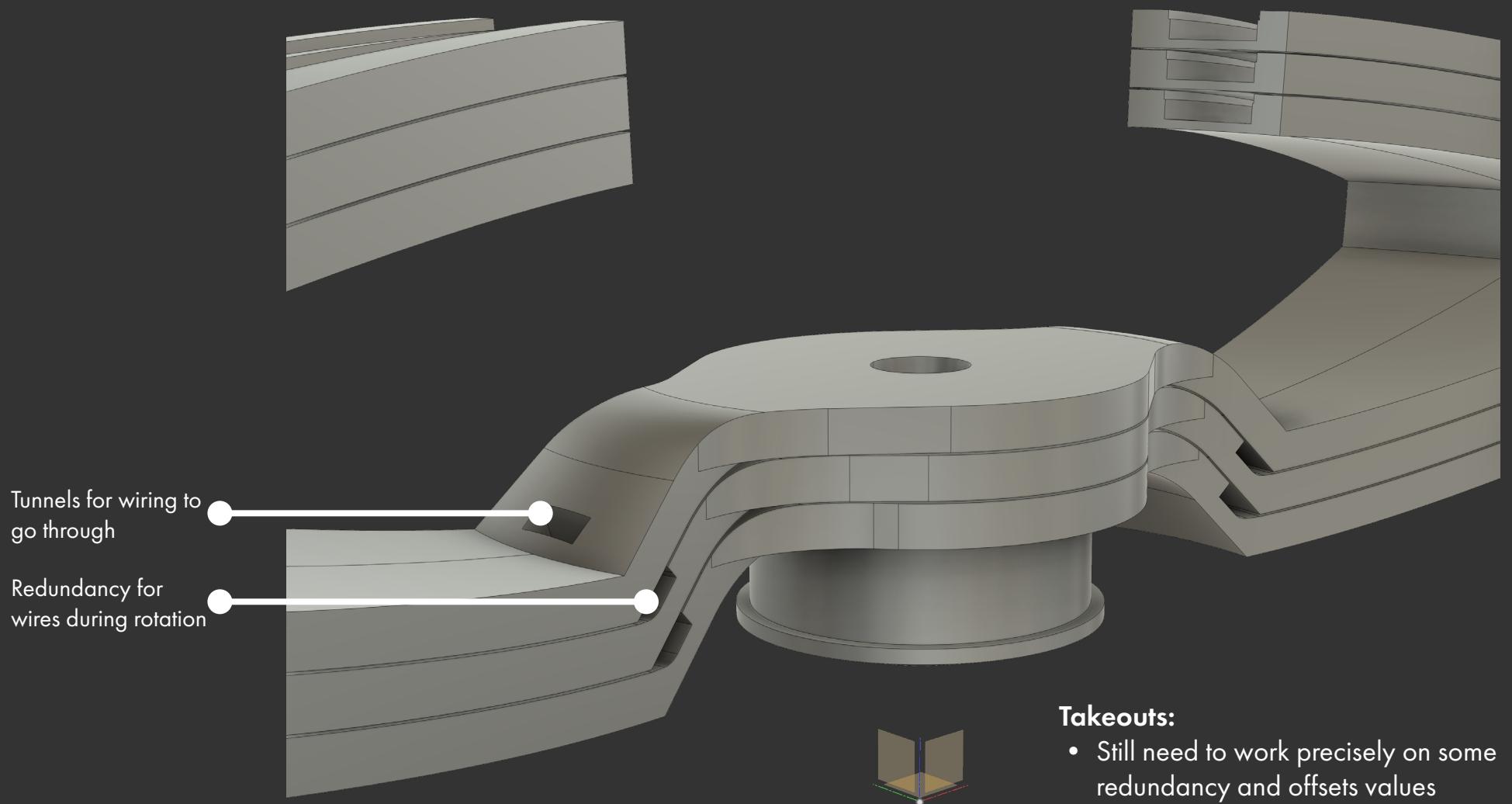
Model (version 2 - fail)



Takeouts:

- Tunnel is too narrow and long for wires to go through
- Friction too strong

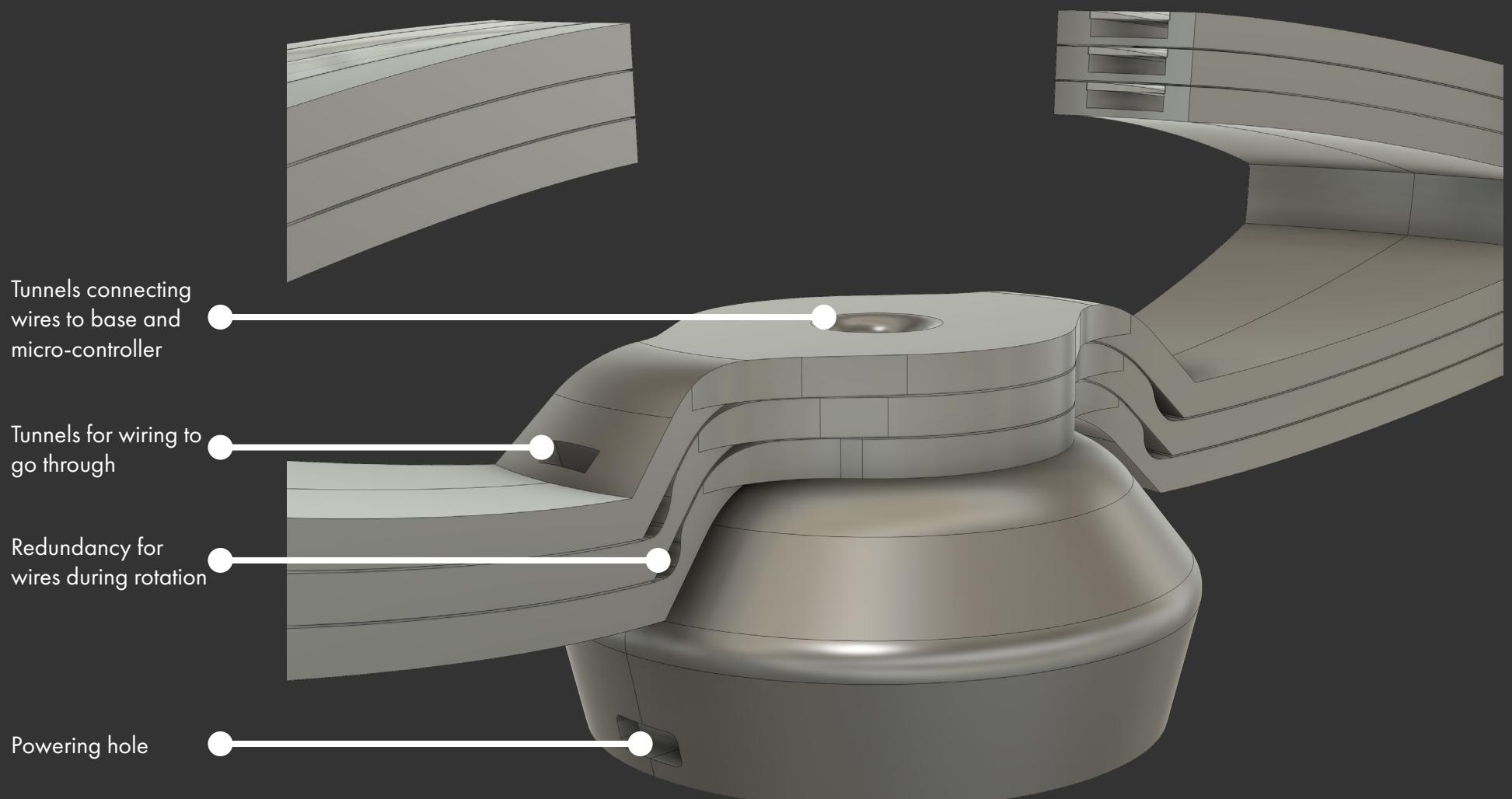
Model (version 3 - works somehow)



Takeouts:

- Still need to work precisely on some redundancy and offsets values

Model (version 4 - works)



Final Model



Finishes:

- Black undertone, grey spraypaint, gloss spray

In Context



Details

