



**Semester Project -02**

# Origami Inspired Lighting Solutions

**Prof. Sandesh R.**  
Project Guide

Submitted by

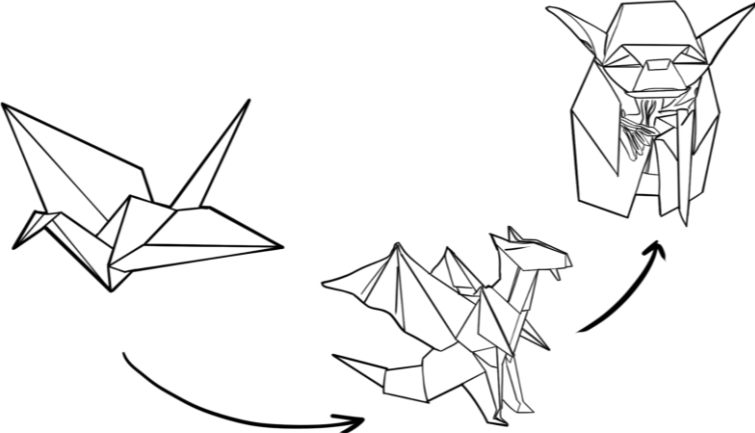
**Aryan Gajwe\_206130001**



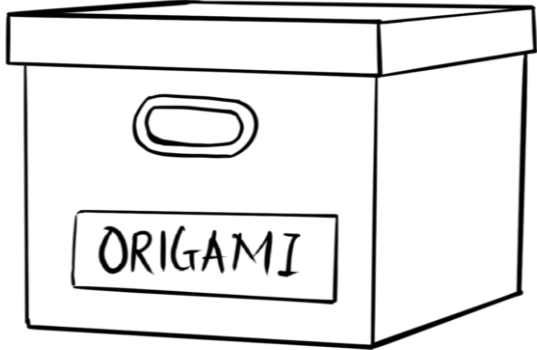
**Why Origami?**

# Me & Origami ●

I started with a crane, folded a basic dragon, and then progressed toward more complex origami



Ever since my childhood I have always been fascinated by the art of origami.

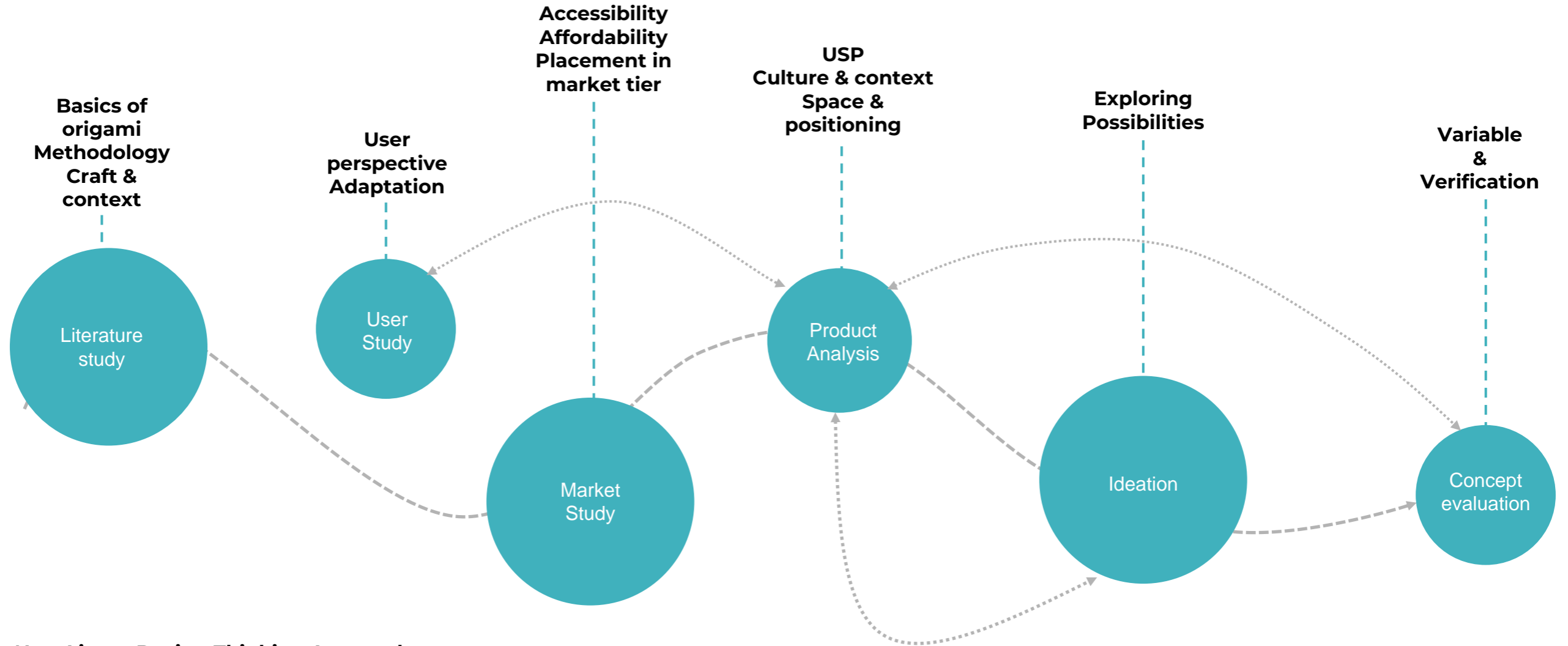


But everything that I did ended up in a box full of paper and origami models.



During pandemic, I rediscovered that box of origami and my interest for it.

# How to go about it



**Non-Linear Design Thinking Approach**



## Literature Study

User Study

Market Study

Product Analysis

Ideation

Concept Development

# What's Origami?

Origami is a **Japanese art of paper folding**. Everyone thinks it originated from Japan, but it is not the entire truth. Creatives from several countries helped shape origami into the practice it is today.

Around 105 AD marks the invention of paper in China; folded paper, or **Zhe Zhi**, most likely developed soon after. **Paper yuanbao**, often known as gold nuggets, were a common sight at traditional Chinese funerals by the year 900.

These transitory ornaments were made with the goal of being burned after the event and were made by painstakingly folding **gold or yellow paper into ingot coins**.

It was not until Japan's Edo Period (1603 – 1868) that origami would also be viewed as a leisurely activity and art form.

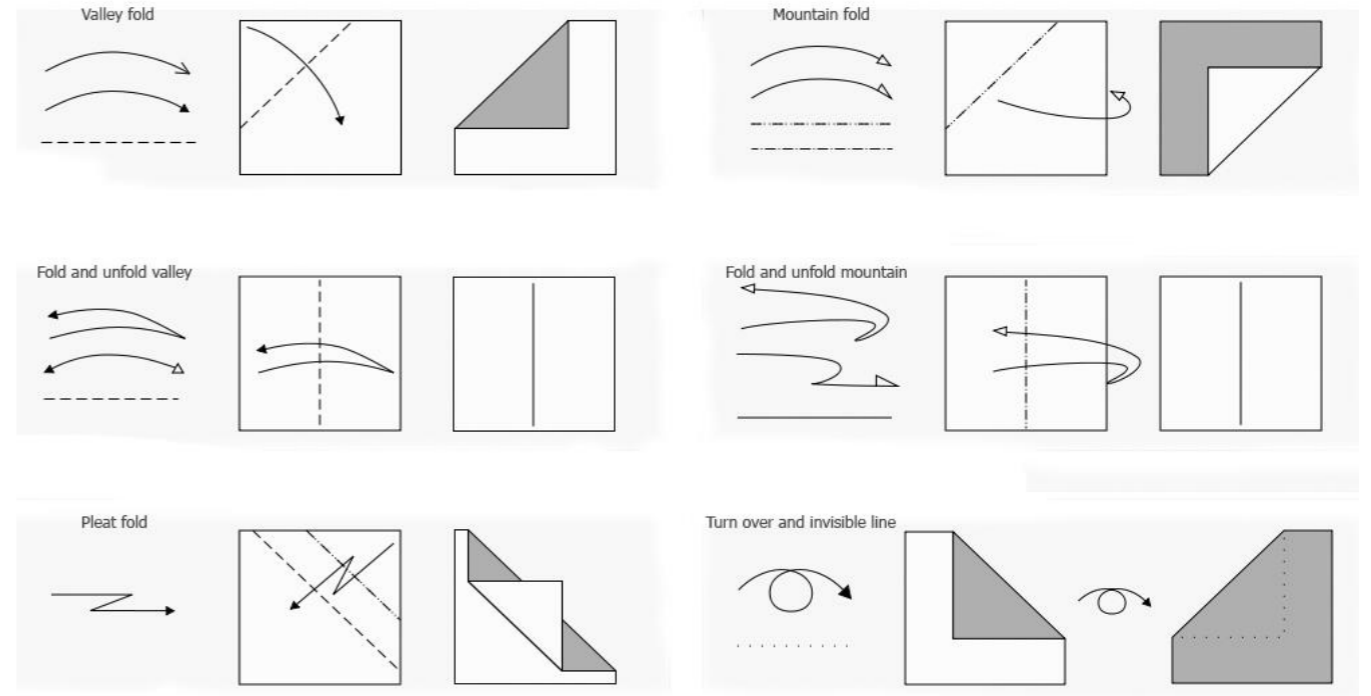
Paper was introduced to Japan in the 6th century. During this time, the practice of paper folding emerged as a ceremonial Shinto ritual.



# Origami Techniques

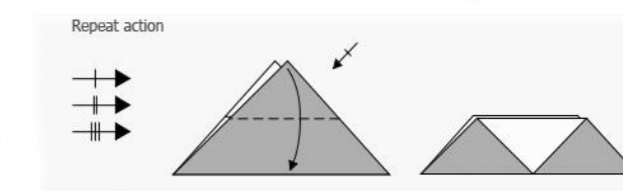
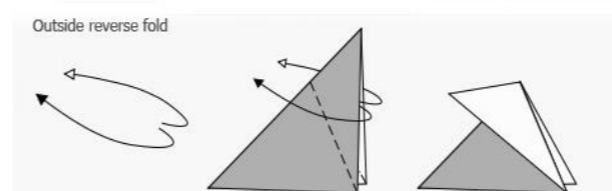
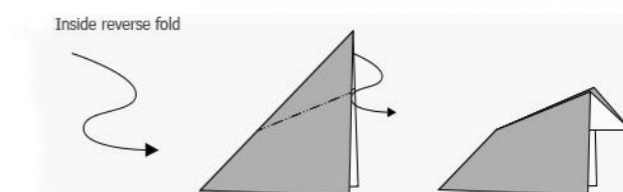
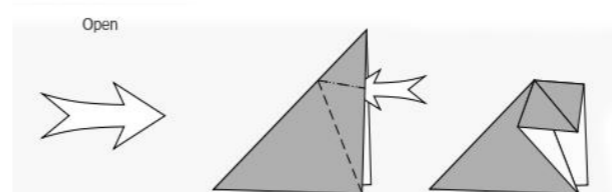
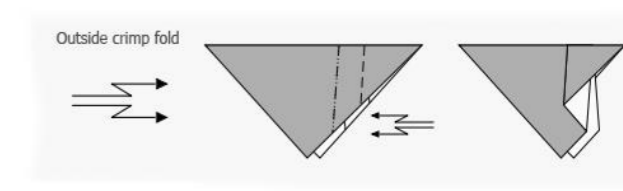
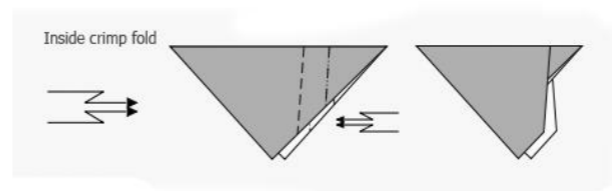
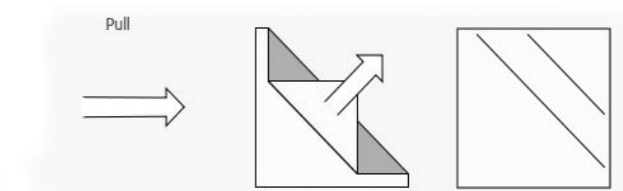
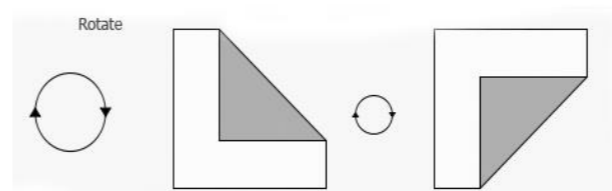
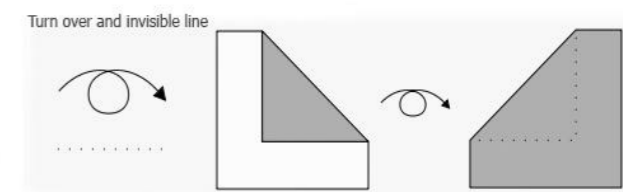
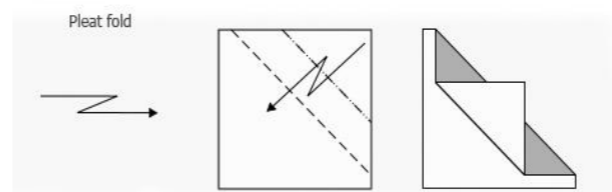
## 1. Basic Operations

- Arrows indicate how origami paper is bent or manipulated, while lines depict different types of edges. Lines and arrows are the two main forms of origami symbols.
- The paper's edge is marked by a thick line.
- The Valley fold is indicated by a dashed line. The paper is folded so that it faces the front.



## 2. Common Operations

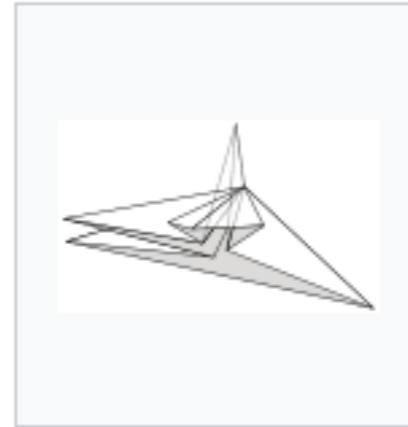
- All of the operations presented here are very typical. The two creases are frequently made at an angle for the reverse folds and pleat folds
- Usually, feet or the heads of birds are created by folding a corner back on itself.
- The sink fold is regarded as a middle to high skill move. The version displayed here is known as an "open sink," and another version known as a "closed sink" creates a triangular pocket with no flaps visible.
- The model can be folded with the sink in place after being partially unfolded in straightforward situations.



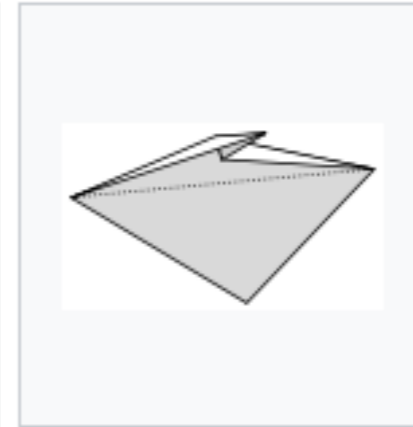
# Origami Techniques

## 3. Compound Operations

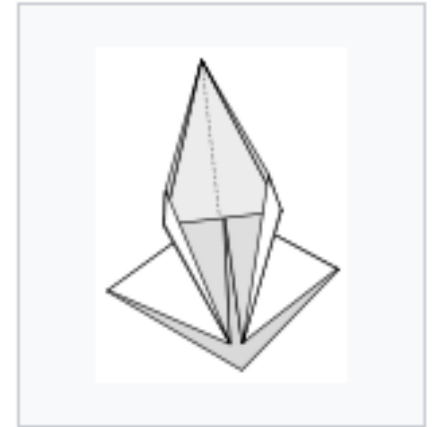
- A flap with at least two layers is required to begin a squash fold, and a reference crease running diagonally is required to begin a rabbit ear fold.
- Two flaps that are joined and have at least two layers each serve as the foundation of a petal fold. These are example of Compound operations in origami.



Squash fold applied to one flap of a waterbomb base



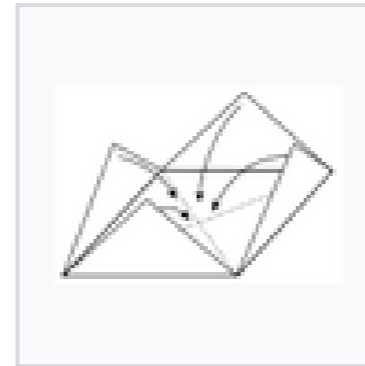
Rabbit ear fold



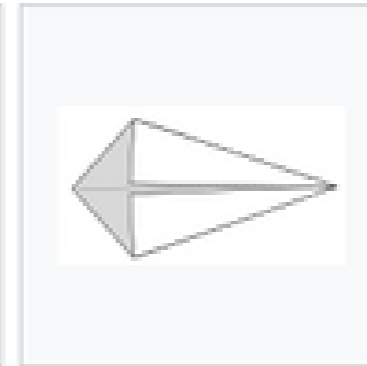
Petal fold on one half of a preliminary fold

## 4. Origami Bases

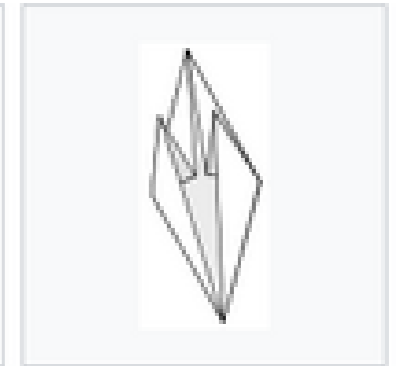
In origami, a variety of bases are used to build numerous models. Any folded paper that comes before the final folding and shaping of the model-to-be is referred to as the "base" in general.



Blintz base



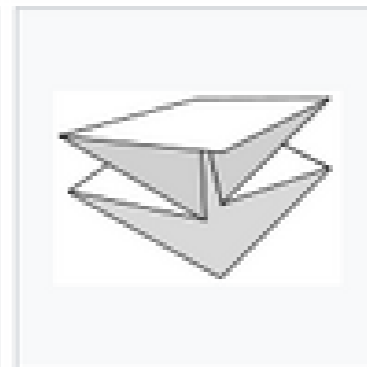
Kite base



Fish base



Water bomb base before flattening

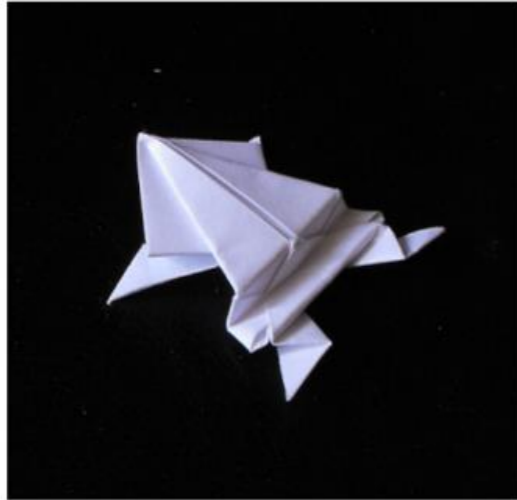


Preliminary fold or Square Base

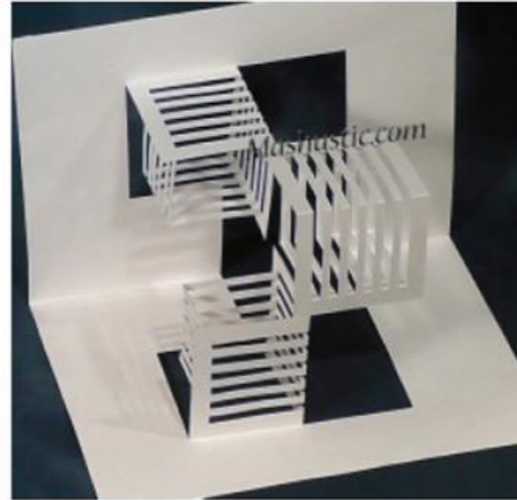


Bird base

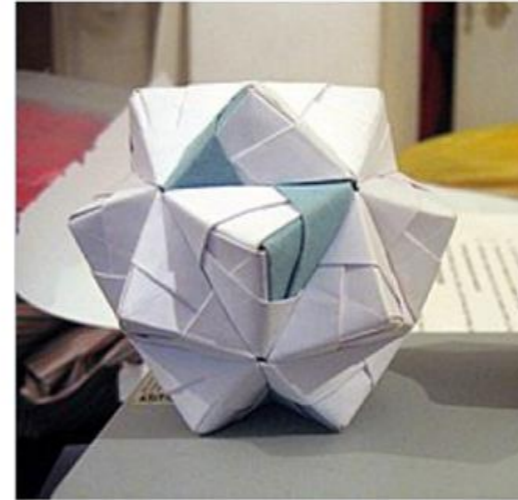
## Types of origami



Action Origami



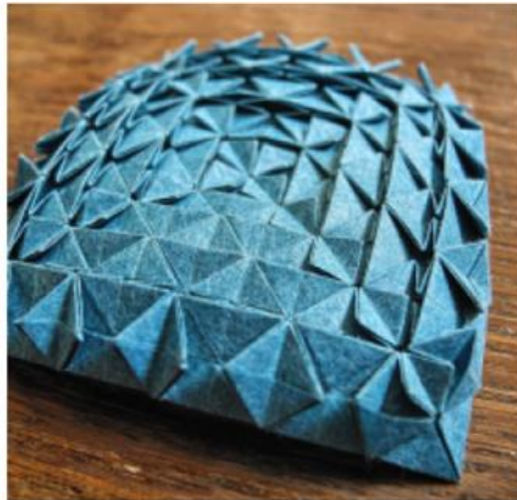
Kirigami



Modular Origami



Pureland Origami



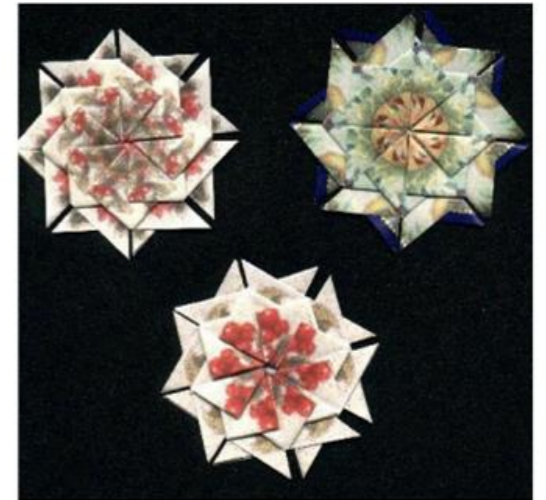
Origami Tessellations



Strip Folds



Wet Folds



Teabag Folding

# Origami & World



Although the centuries-old Japanese technique of paper folding, origami, may seem like an unexpected source of inspiration for scientists and engineers, it is the driving force behind numerous new inventions.

●  
**Art Installations**



●  
**Furniture**



## Packaging



## Fashion



●  
**Architecture**



●  
**Lights**





Literature Study

**User Study**

Market Study

Product Analysis

Ideation

Concept Development

# Perception of people toward Origami

Paper folding into art

Paper folding

Make something out of papers

Can easily Change the shape, craftable, flexible, adaptable

Paper folded into shapes without cutting

Multi facets  
Crease

Foldy papery bits

Something to do with folding paper and achieving a desired form (only through folding).

Its a art where u use thin paper or paper like material to fold it into something.

I think it's a dying art and that makes it more valuable.

Art of making objects /shapes by folding paper.

Lots of facets

Something small or flatter turned into Dynamic form

Lots and lots of details

Origami is awesome... It's divine art to modify the eccentric beauty of simplicity ❤️

objects made by folding paper.

An art with origins in Japan where you explore 3 dimensional shapes with paper. And as far as I understand you don't use glue or paper cutting tools at all to create them.

Designing with paper

Something to do with folding paper and achieving a desired form (only through folding).

Origami is a Japanese art of paper folding

An art of making geometrically attractive 3d models with no or minimal cutting and only foldings.

Fold simple looking paper, make not so simple looking stuff.

# Key Insights

Paper folding art

Representing objects into basic shapes

Geometric

Geometric Shapes

Sharp lines

Lots of Folds and cuts (One surface becoming many surfaces)

Converting flat into 3D by folding

Linear Edges

Geometry

Interdependence and connectedness

It should look folded

Not very organic more complex geometry

Origami is a method of manipulating planes

Complex geometric form

Sharp edges

Deconstructivism

An interesting pattern/design emerging by folding paper or similar material.

Art of paper folding

## Interpretation

These were some insights given by common people about how they perceive origami.

Now with the insights gained from the google form, I started clustering them to get the idea of how people see origami.

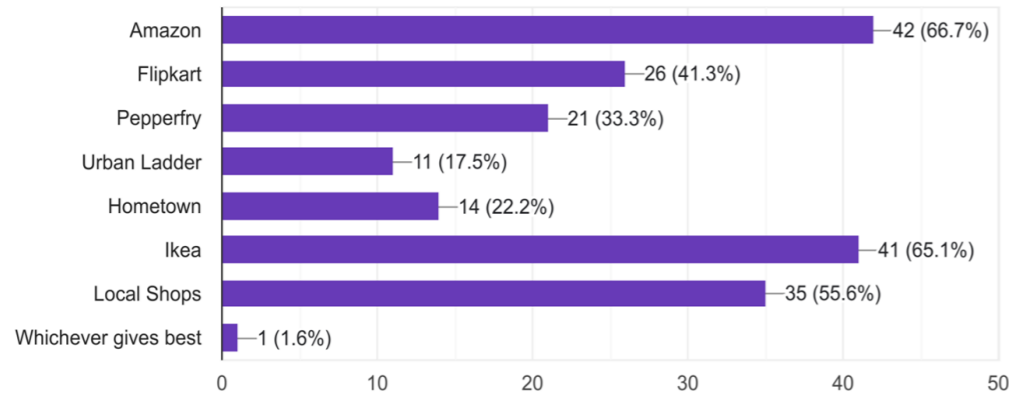


The imagery of different light included in the survey for reference

# Identifying User preferences

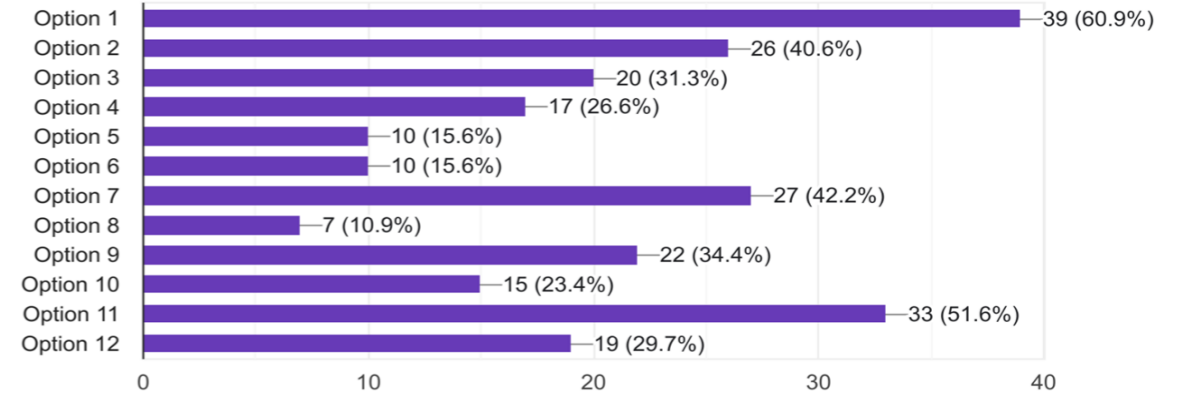
Where would you like to buy the lamps from?

63 responses



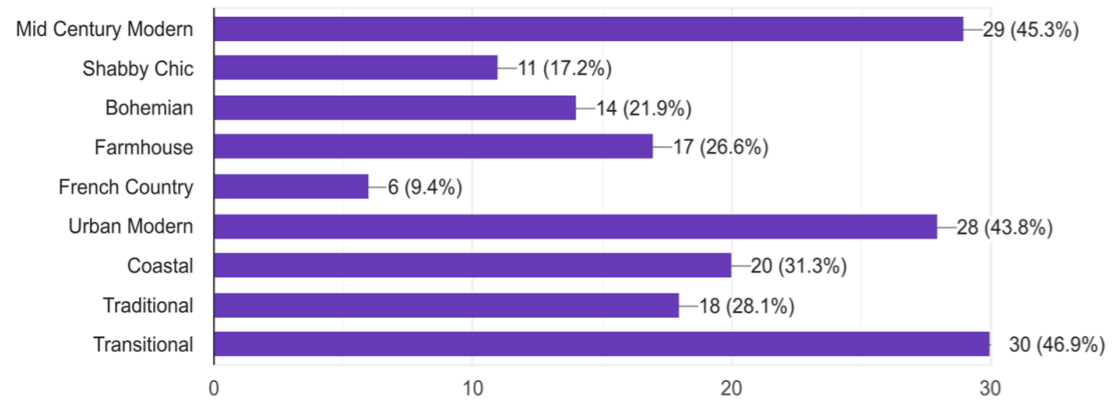
Origami For you (Please select the images that you think is origami or Origami like)

64 responses



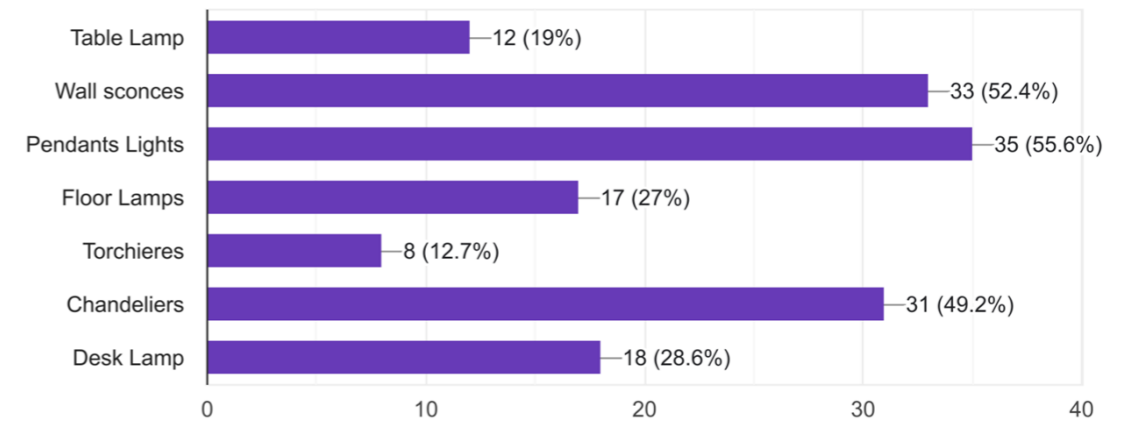
From the below images please select the home décor theme that you really like.

64 responses



Lighting Preferences (Please select your fav types of lighting that you think might look good in your home)

63 responses



# Lighting Preferences

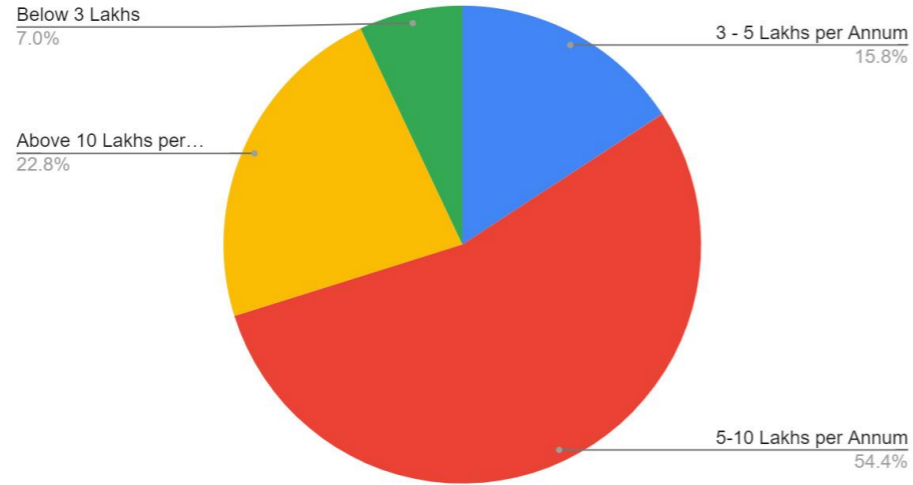


Imagery of different light included in the survey for reference imagery



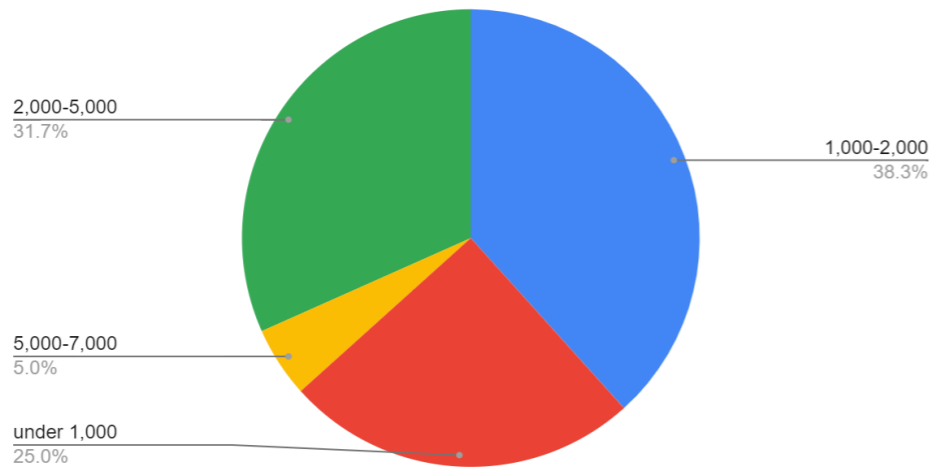
# Target Group

Count of What is your average annual income?



The survey was conducted to understand the income vs splurging ratio of individuals in metro and suburban region. It is observed that the consumer group consist of middle income group. The group tend to explore and exhibit the decor with vanity. As per the survey more than 30 % people are willing to spend around 5000 rs on lightings and home decor items.

Count of Price Range ( If you buy a decorative light for your home what price range would you consider for buying it?)



Target user: Middle income group  
Context : Residential spaces  
Cost : 3000-400



Literature Study

User Study

**Market Study**

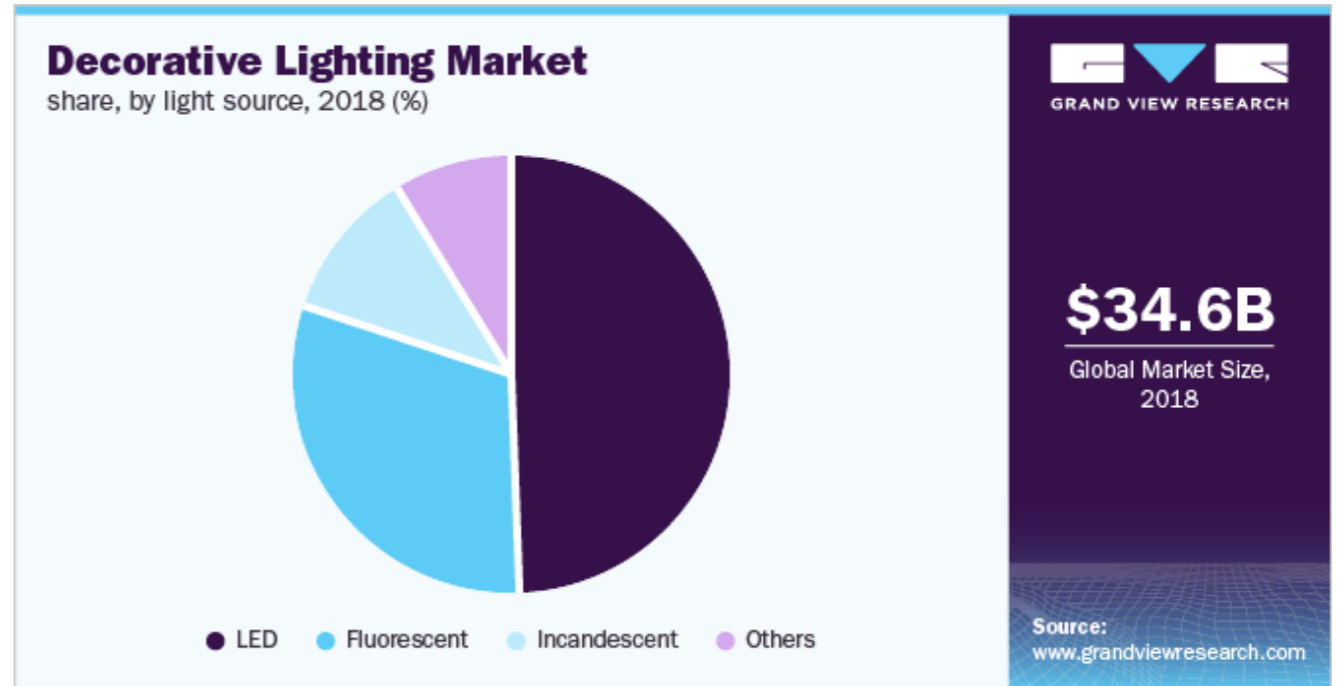
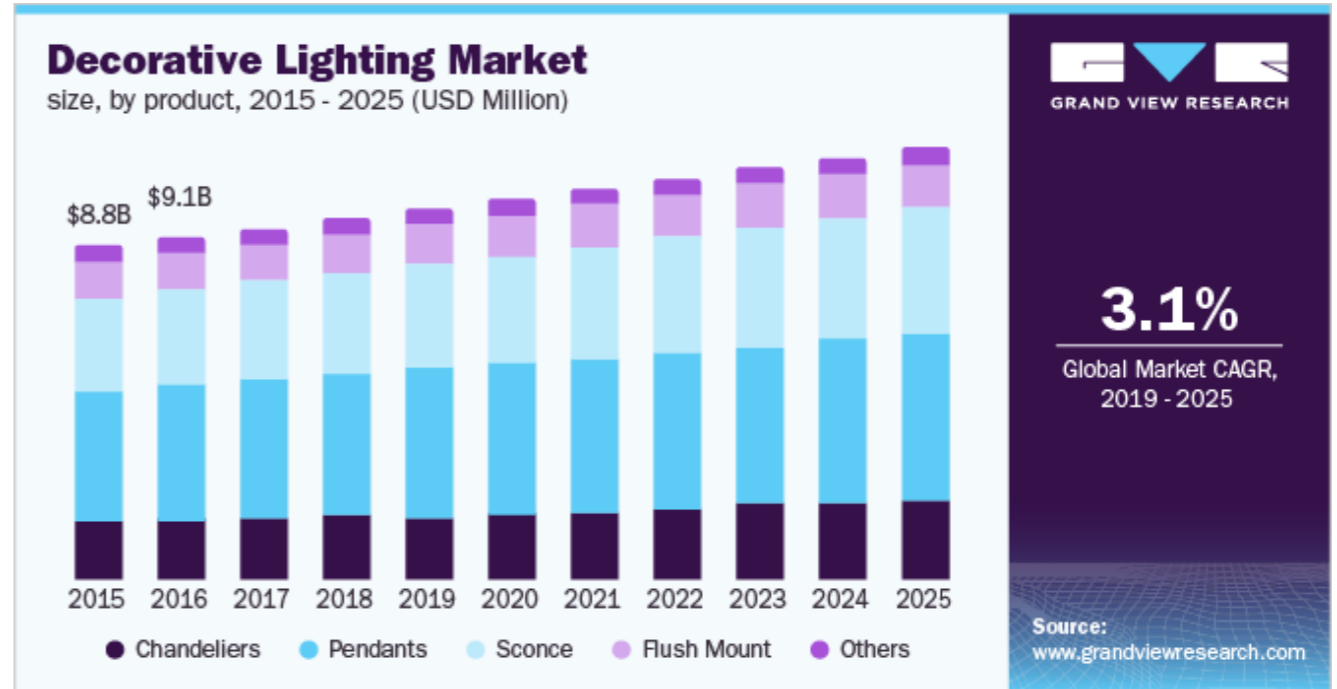
Product Analysis

Ideation

Concept Development

# Market Trends

- The market for decorative lighting is anticipated to reach a value of **USD 42.9 billion by 2025 and expand at a 3.1% CAGR** during the projected period. The utility of various ornamental lighting fixtures is anticipated to be enhanced by growing awareness of the role that the illuminating medium plays in creating the mood of the space.
- The brightness of a location alters how big it seems by making it visually interesting. Along with this, the suitable fixtures and appropriate lighting aid in giving the space a pleasing appearance.
- The ornamental lighting fixtures of today's interior design are seen as a seamless fusion of style and functionality. When modern furnishings are carefully picked to match the floor, furniture, and wall color, a warm, welcoming, and practical area is produced.
- Manufacturers have been keeping an eye on the rising demand and have developed decorative lighting innovations that combine fashion and utility.
- The expanding consumer influence of social media influencers and numerous home décor web series is driving up demand for various types of decorative lighting fixtures.



### Outlook for Products (Revenue, USD Million, 2015 - 2025)

- Chandeliers
  - Pendants
  - Sconce
  - Flush Mount
  - Others
- The global decorative lighting market report has been divided by product, light source, application, and region by Grand View Research.

### Outlook for Light Source (Revenue, USD Million, 2015 - 2025)

- LED
- Fluorescent
- Incandescent
- Others

### Application Outlook (Revenue, USD Million, 2015 - 2025)

- Commercial
- Household

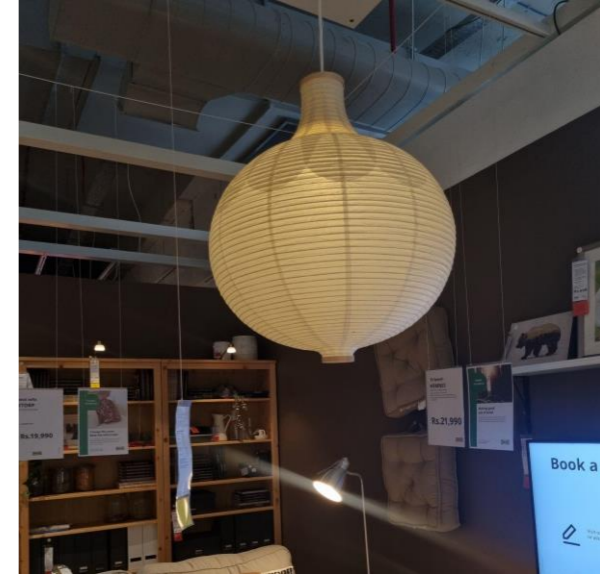
### Regional Prospects (Revenue, USD Million, 2015 - 2025)

- The Americas
- The U.S.
- Europe
- U.K.
- Germany
- Pacific Asia
- China
- India
- South and Central America
- Brazil
- Mideast and Africa
- S. Africa



The global decorative lighting market report has been divided by product, light source, application, and region by Grand View Research.

# Market Study: Ikea





Literature Study

User Study

Market Study

**Product Analysis**

Ideation

Concept Development

# Types of Lamps

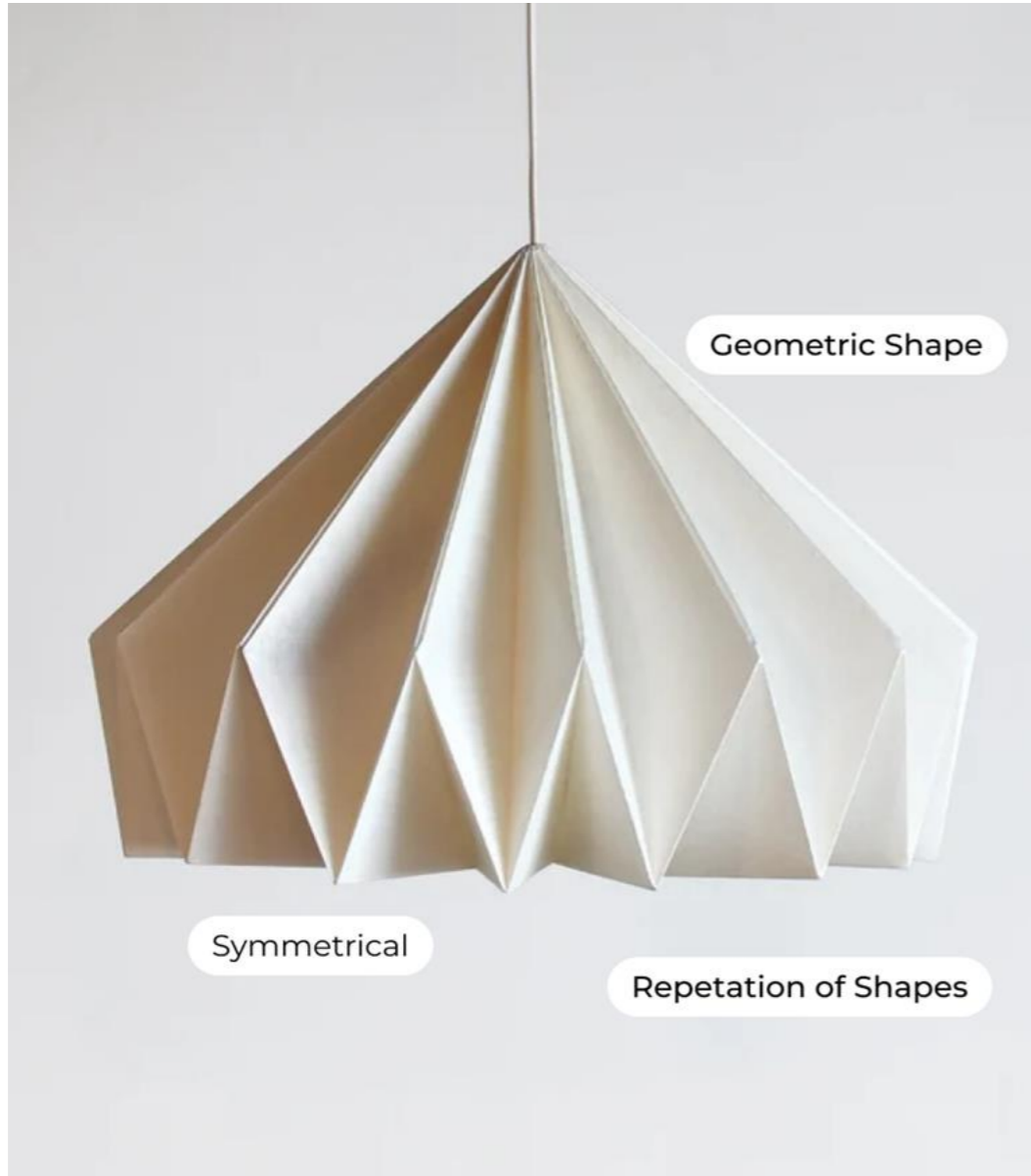
- Chandelier: Chandelier is a decorative ceiling-mounted fixture. Distinct types of pendant light.
- Wall-mounted fixture: Is used for indoor and outdoor lighting usually fits into ceiling.
- Track light: Is used for focusing on products. It is used in to retail and showrooms,
- Floor lamp: It is used as decorative products in to indoor and outdoor settings. It adds drama in to interior and makes it more aesthetics.
- Table lamp: Is used for adding aesthetics. It is used as task and ambient both.

Types of lighting fixtures include

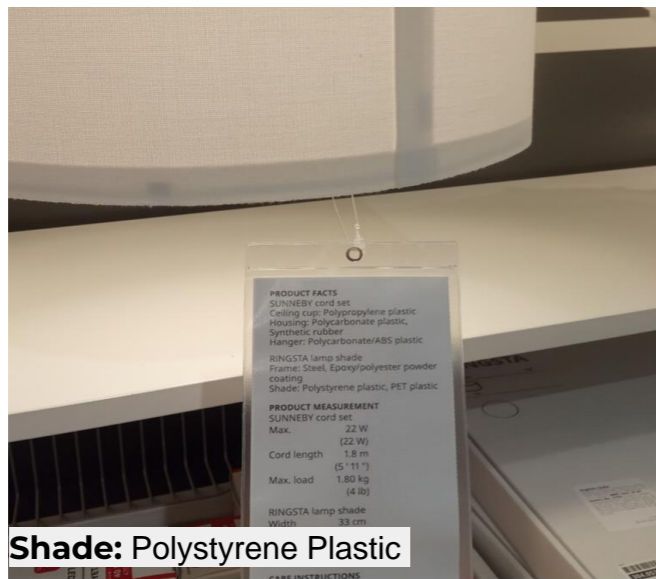
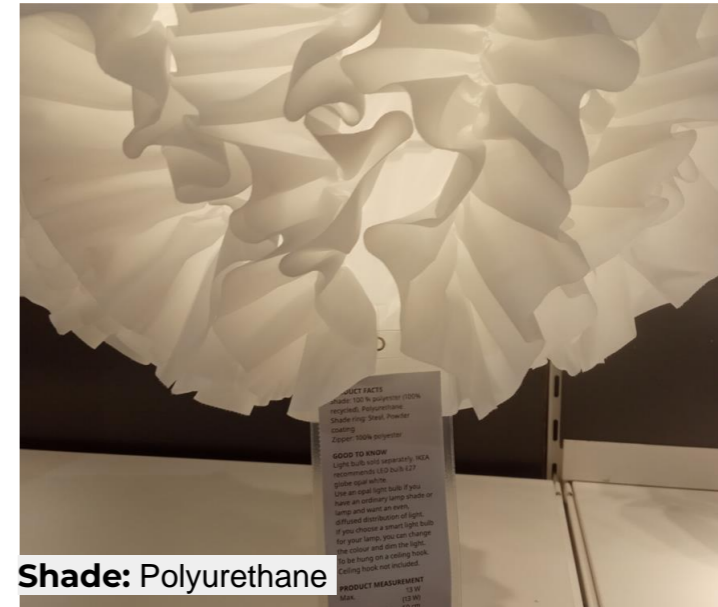
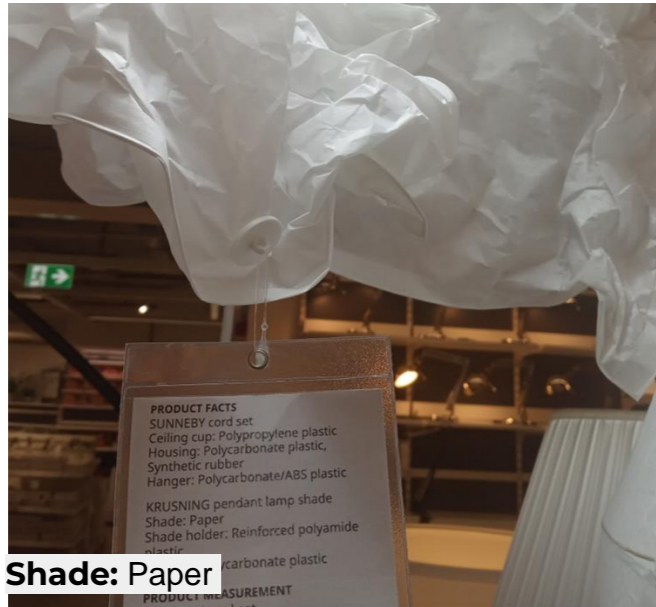
- (a) traditional table lamps
- (b) wall sconces
- (c) pendants
- (d) floor lamps
- (e) torchiers
- (f) chandeliers
- (g) theme table lamps
- (h) swing-arm lamps
- (i) desk lamps



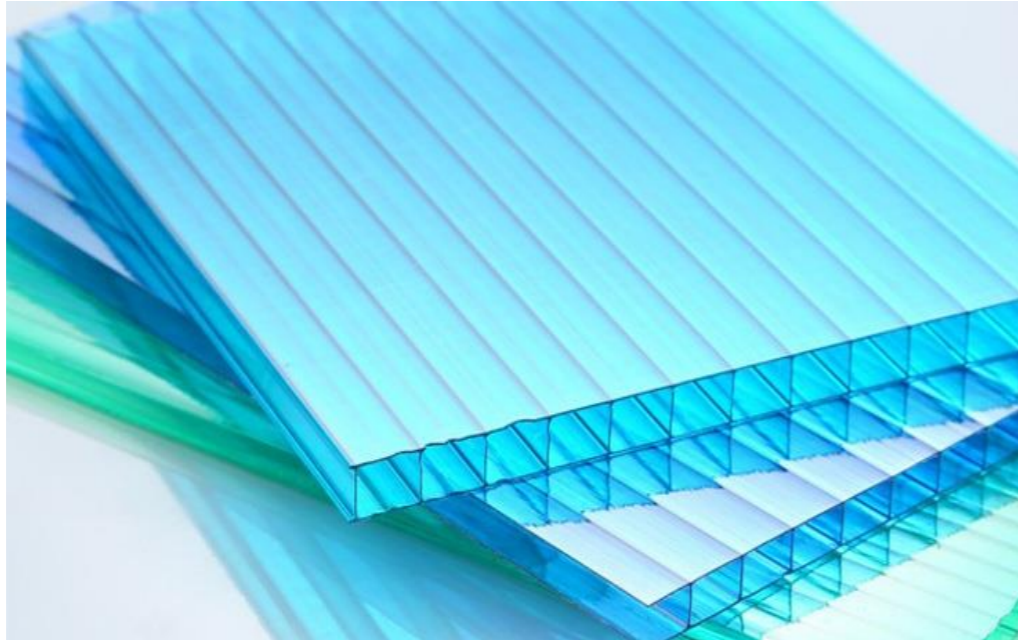
# Interpreting Origami-like Lamps



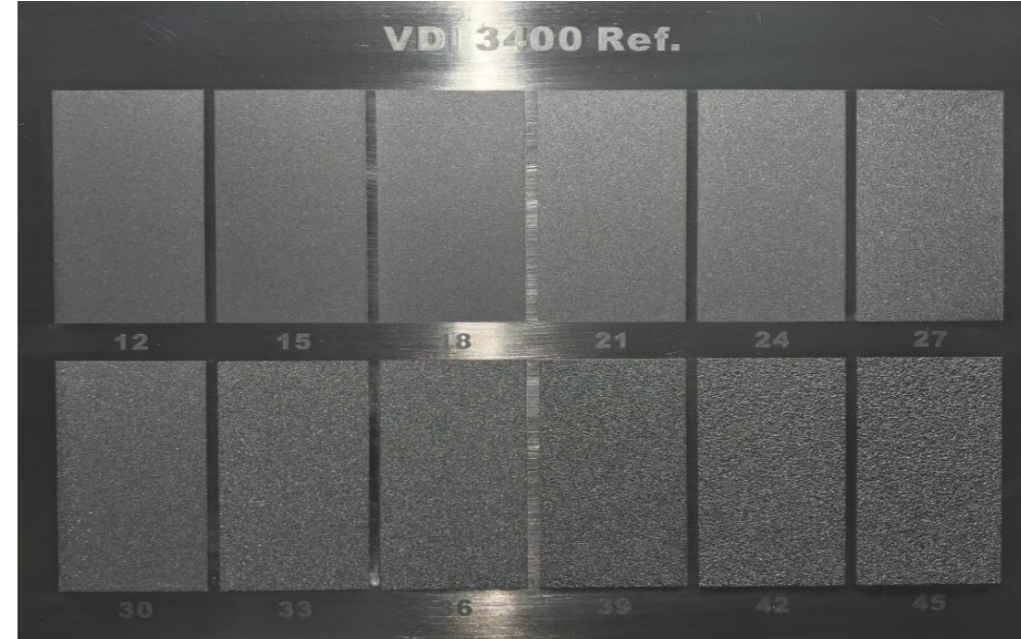
# Materials Trends: Ikea



# Types of Plastic : Polycarbonate



- **Polycarbonates (PC)** are a group of **thermoplastic** polymers containing **carbonate groups** in their chemical structures.
- Polycarbonates used in engineering are strong, **tough** materials, and some grades are optically transparent. They are easily worked, **molded**, and **thermoformed**. Because of these properties, polycarbonates find many applications
- The toughest grades have the highest molecular mass, but are more difficult to process



Available surface finish types include:

- Geometric shapes / patterns
- Grains, e.g., the **leather texture**
- Secondary finishes, e.g., paintings, print, etc.
- Etching
- Sand blast
- Glossy, matte, or satin finishes
- Mirror polishing or lens finishes



## Design Brief

To design an origami-inspired range of lighting solutions that can be mass manufactured for upper-middle-class residential spaces.

The lighting should incorporate origami in terms of its form or folding or usage such that it brings the serenity associated with origami forms to the spaces it is used in.

It should create a language that could be incorporated further to create a similar form or a range of lighting. The lighting should cater to different market segments in terms of its pricing depending on the usage of material and technology involved.



Literature Study

User Study

Market Study

Product Analysis

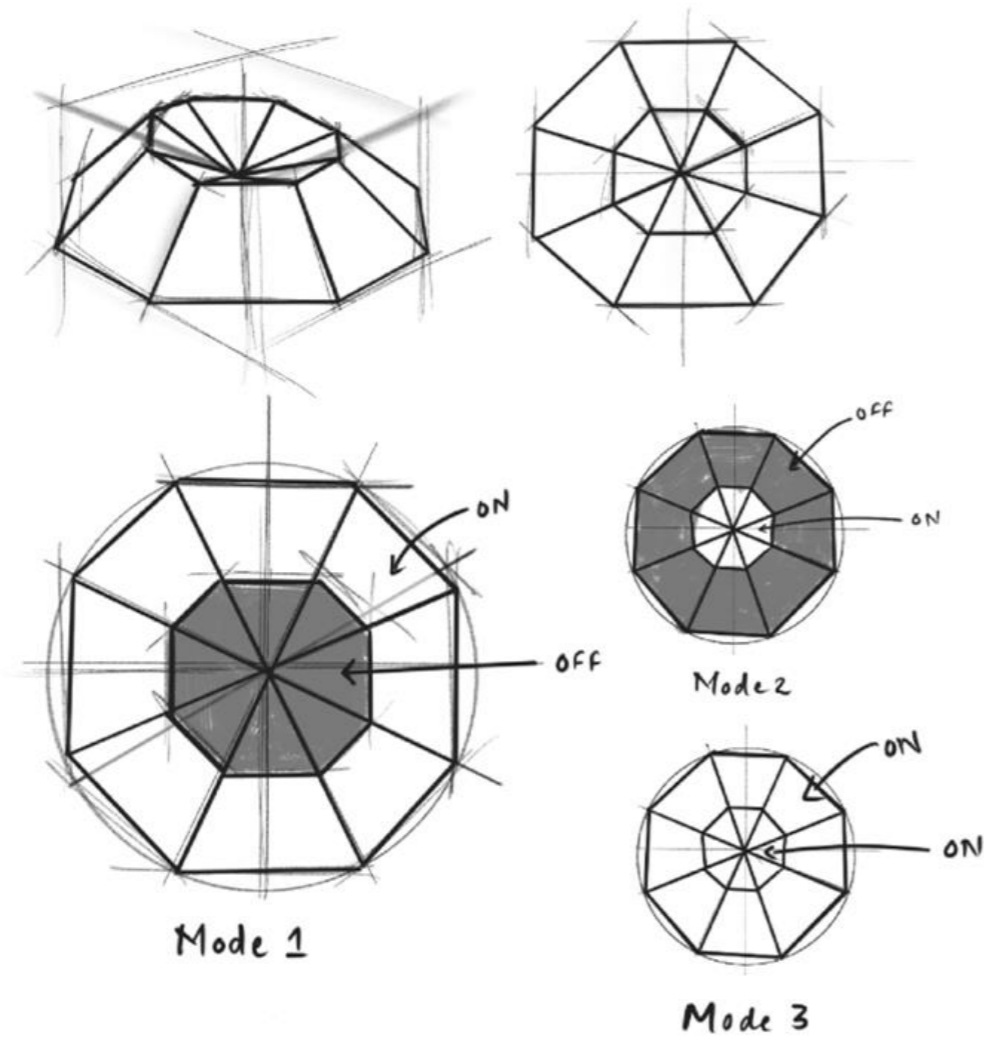
**Ideation**

Concept Development

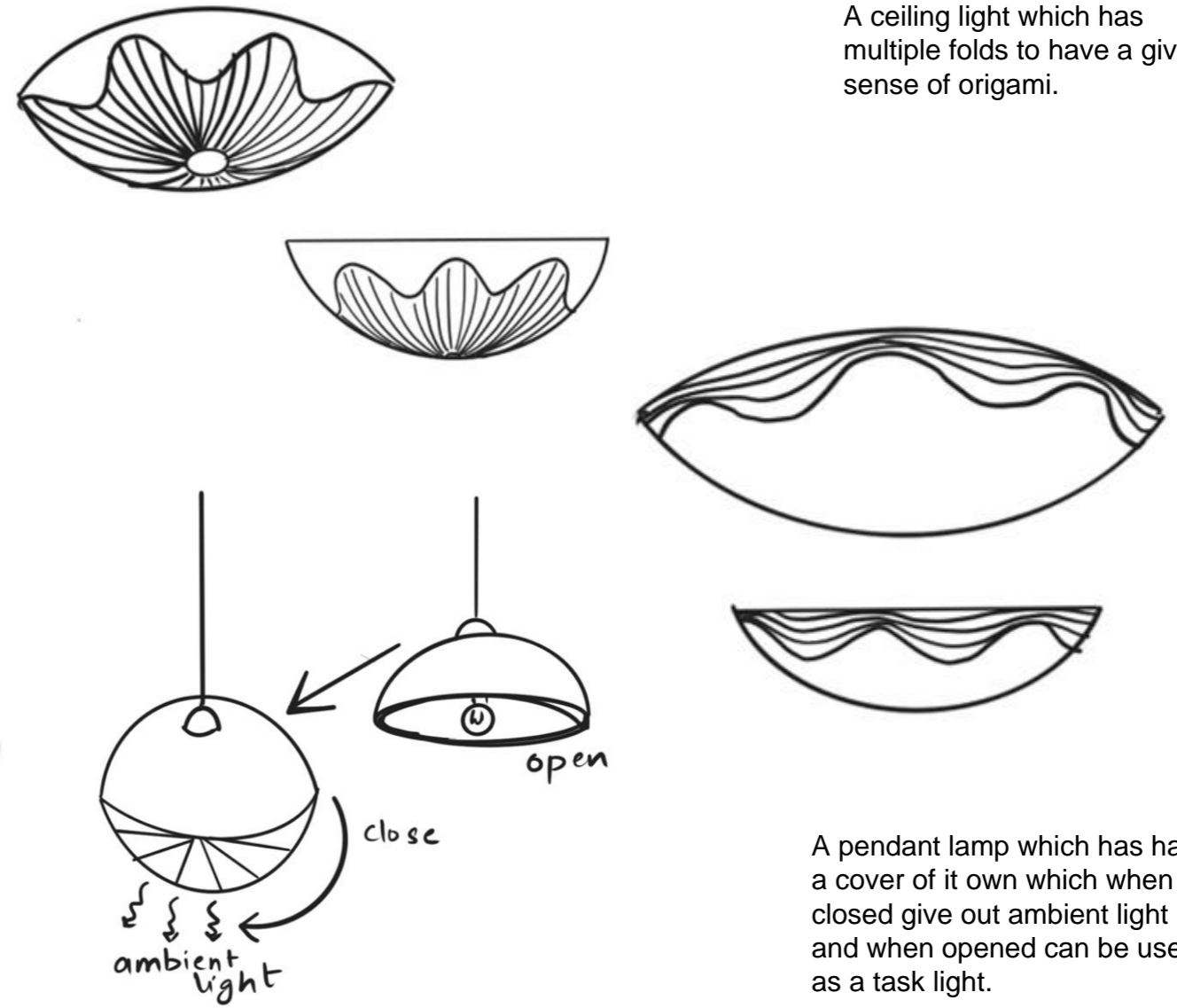
# Mood Board



# Ideations 01



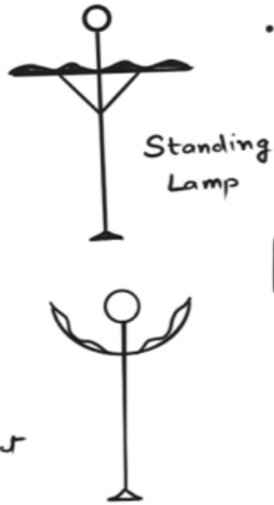
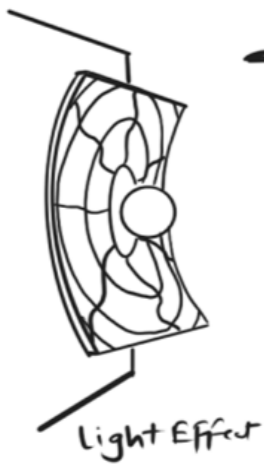
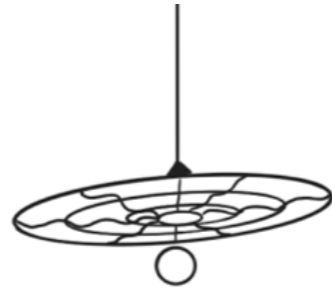
A basic geometric shape with different modes of lighting for creating various range of light intensity.



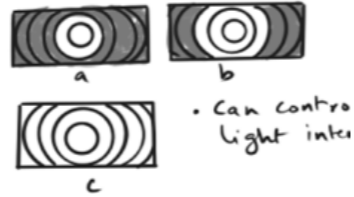
A ceiling light which has multiple folds to have a give a sense of origami.

A pendant lamp which has has a cover of it own which when closed give out ambient light and when opened can be used as a task light.

# Ideations 02



• Wall Lamp  
• Can start as a nipple in water



• Can control light inter



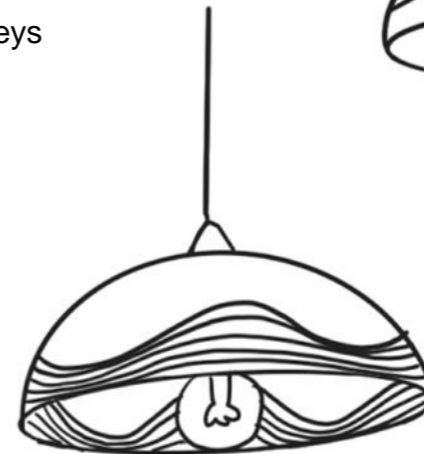
## Project Ripple

This ideation is based on ripples created by water and when used with glass how will the light interact with it.



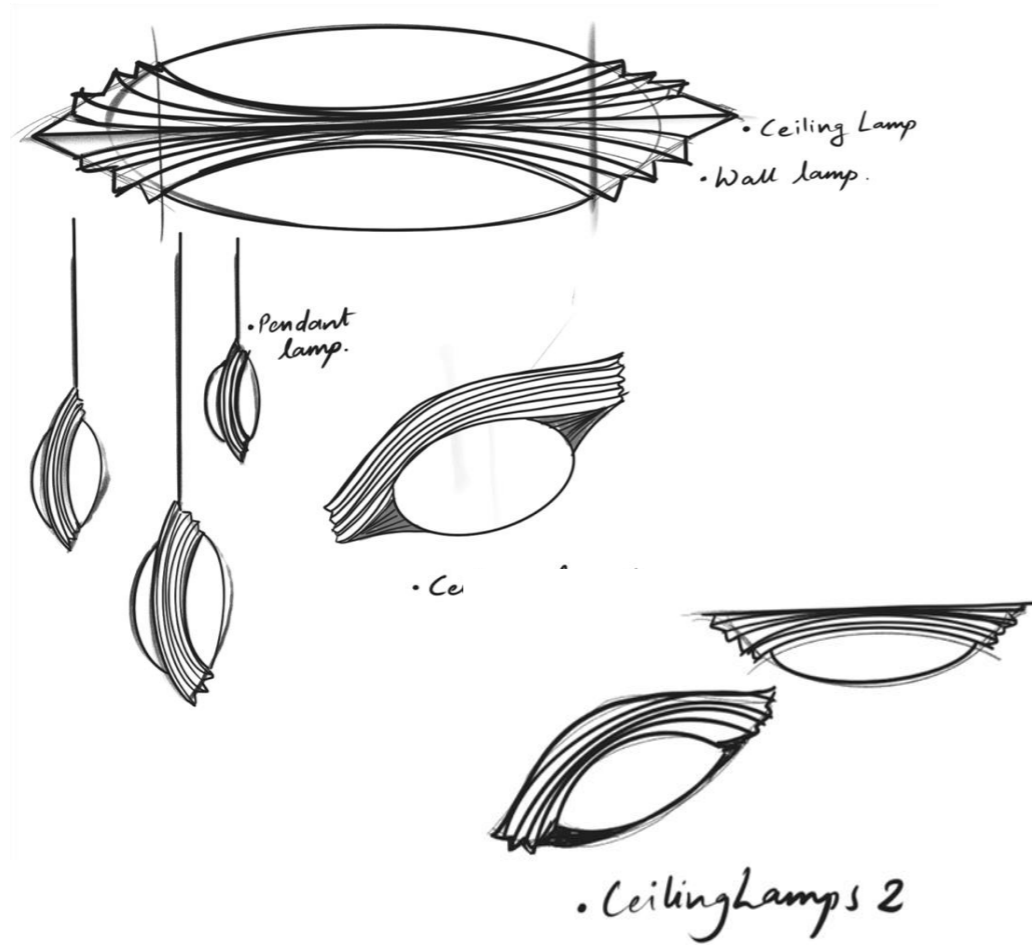
A ceiling light which can close and open to give a effect of ambient and point light.

This Ideation is for incorporating hills and valleys to the otherwise smooth surface of a lamp.



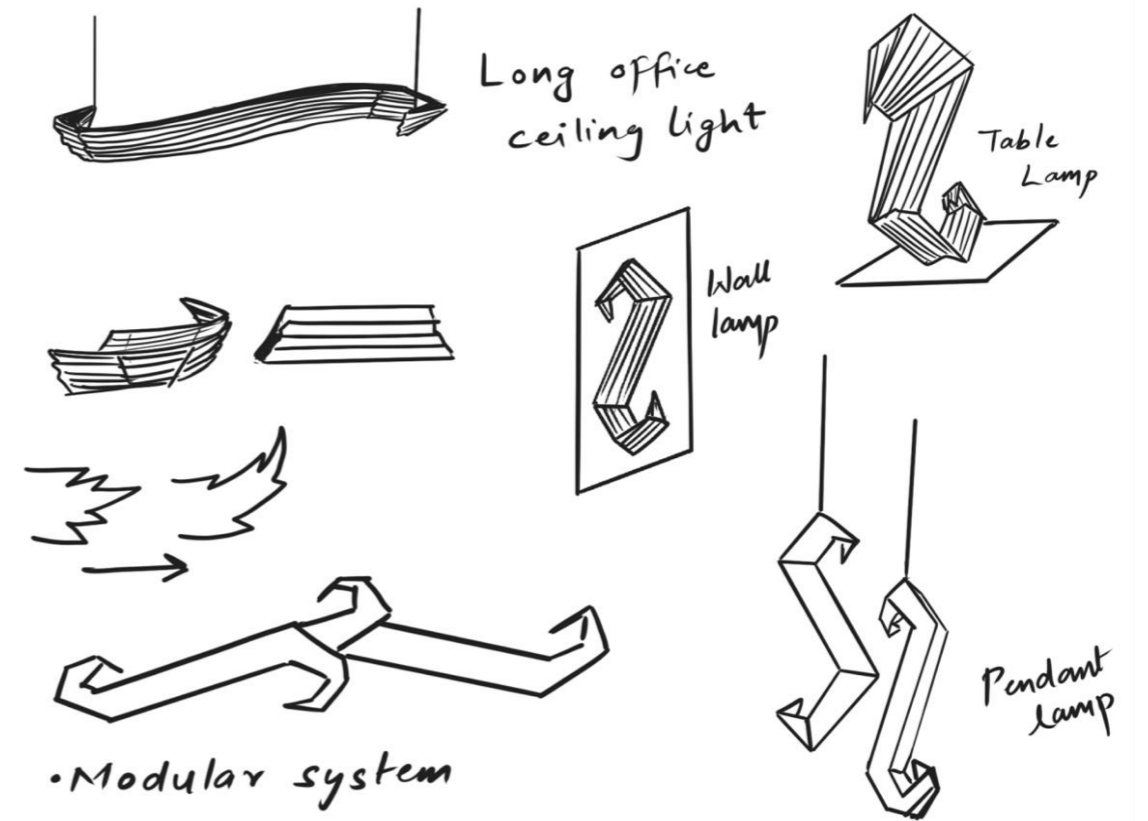
# Ideations 03

This Ideation is about adding elements of origami to a smooth cover.



## Project Growth

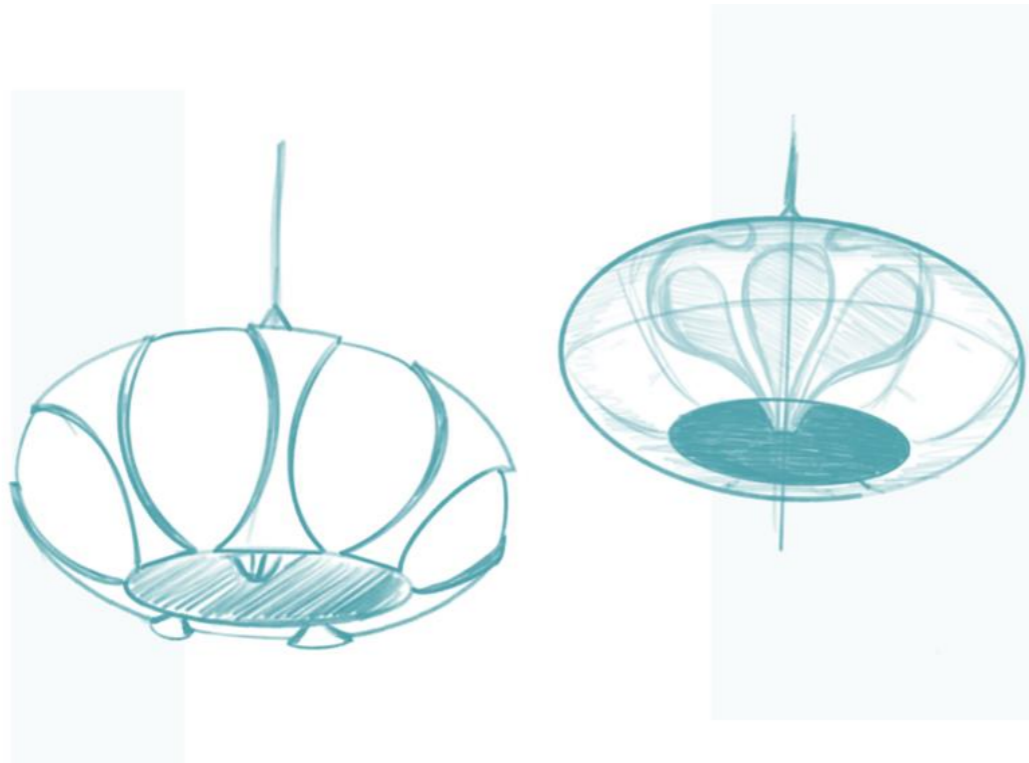
This Ideation is based on the concept of modularity where we can join different parts and and make your own unique ceiling Lamp.



## Ideations 04

Taking inspiration from Jun Mitani's idea of origami "The whipped cream" and developing it further in terms of light drives me toward developing this concept.

Where the whipped cream design encompasses the electric bulb which facilitates a soft light that then comes in contact with yet another layer, making the light softer and more serene to look at.



## Ideations 05



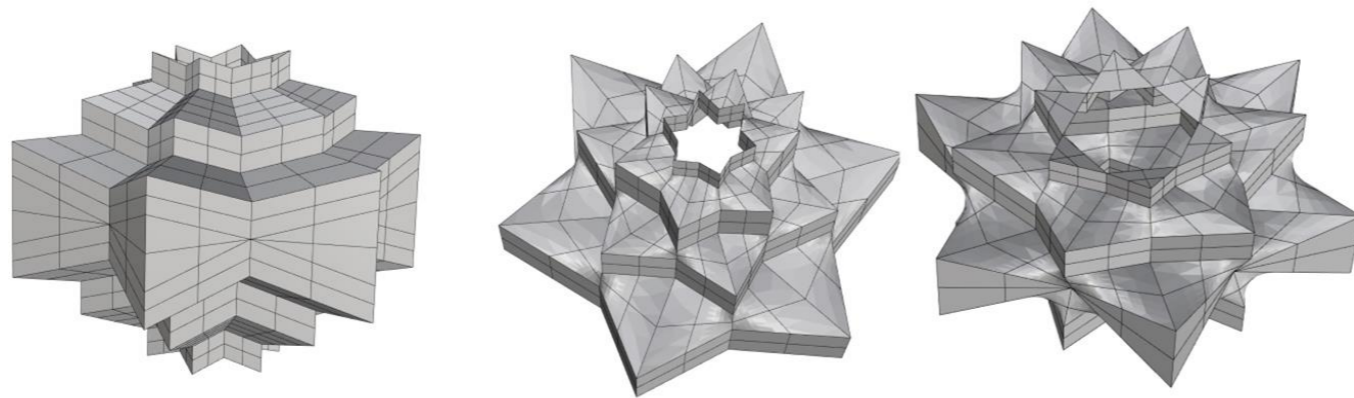
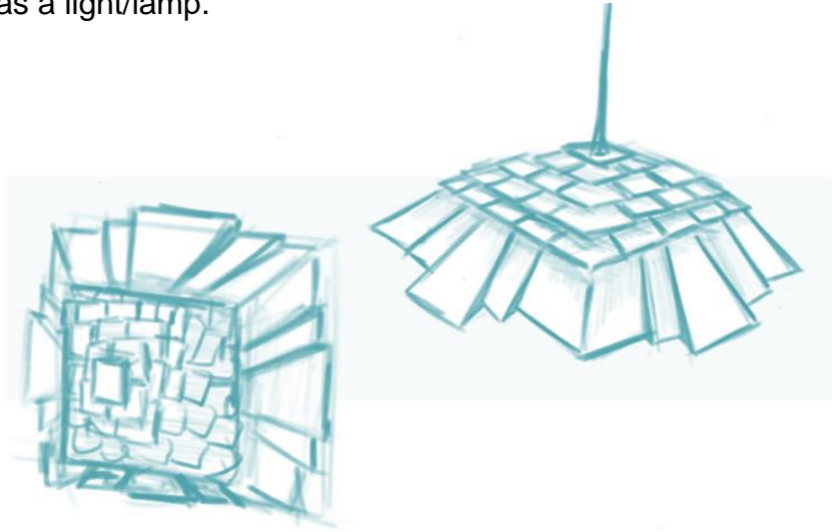
# Form Exploration



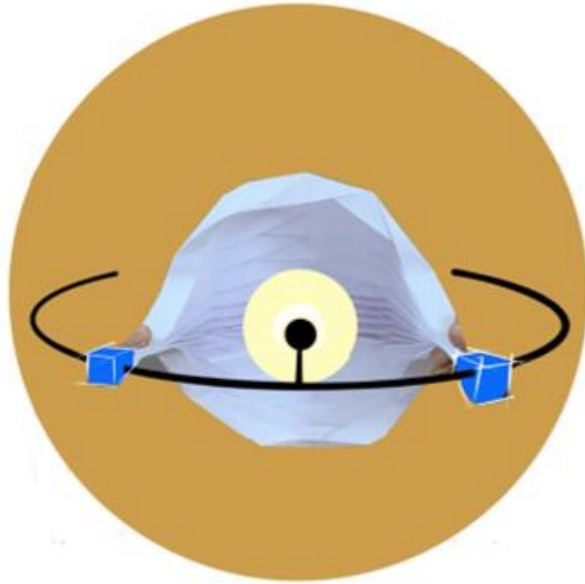
## Ideation 05

Creating tessellations itself is very time-consuming and it needs a lot of practice to achieve desired results.

Tessellation is the repetitive pattern made by folding a single sheet of paper. This in turn can provide us with interesting light effects when used as a light/lamp.



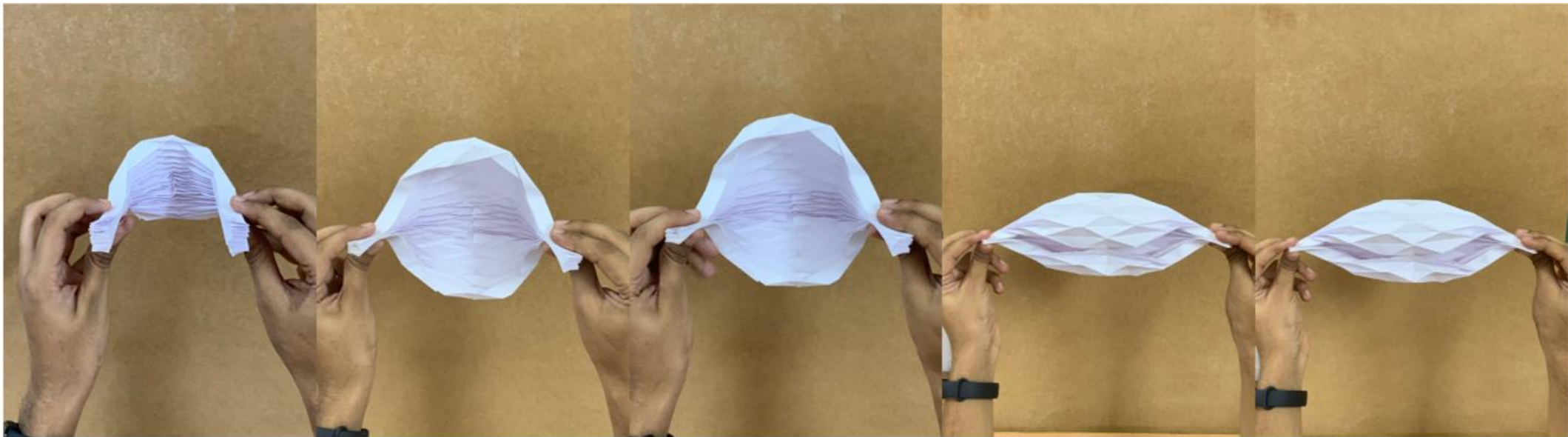
## Ideation 06



For my next idea, I was thinking of using the flexibility of origami when folded in a certain way to make a kinetic lamp which when used can give both accent and direct light.

Kinetic lights and kinetic light sculptures are more than just innovative and unique moving light fixtures; they are functional works of art that physically change shape.

And with the help of origami and its property to collapse and expand we can make a kinetic lamp.

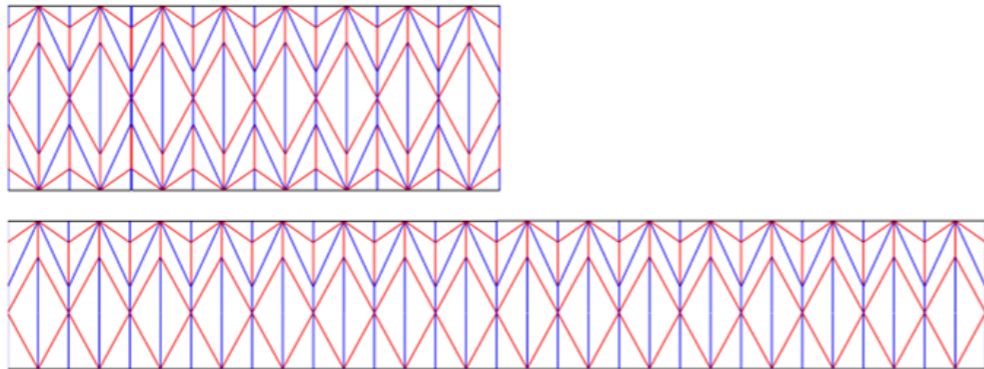


## Ideation 06

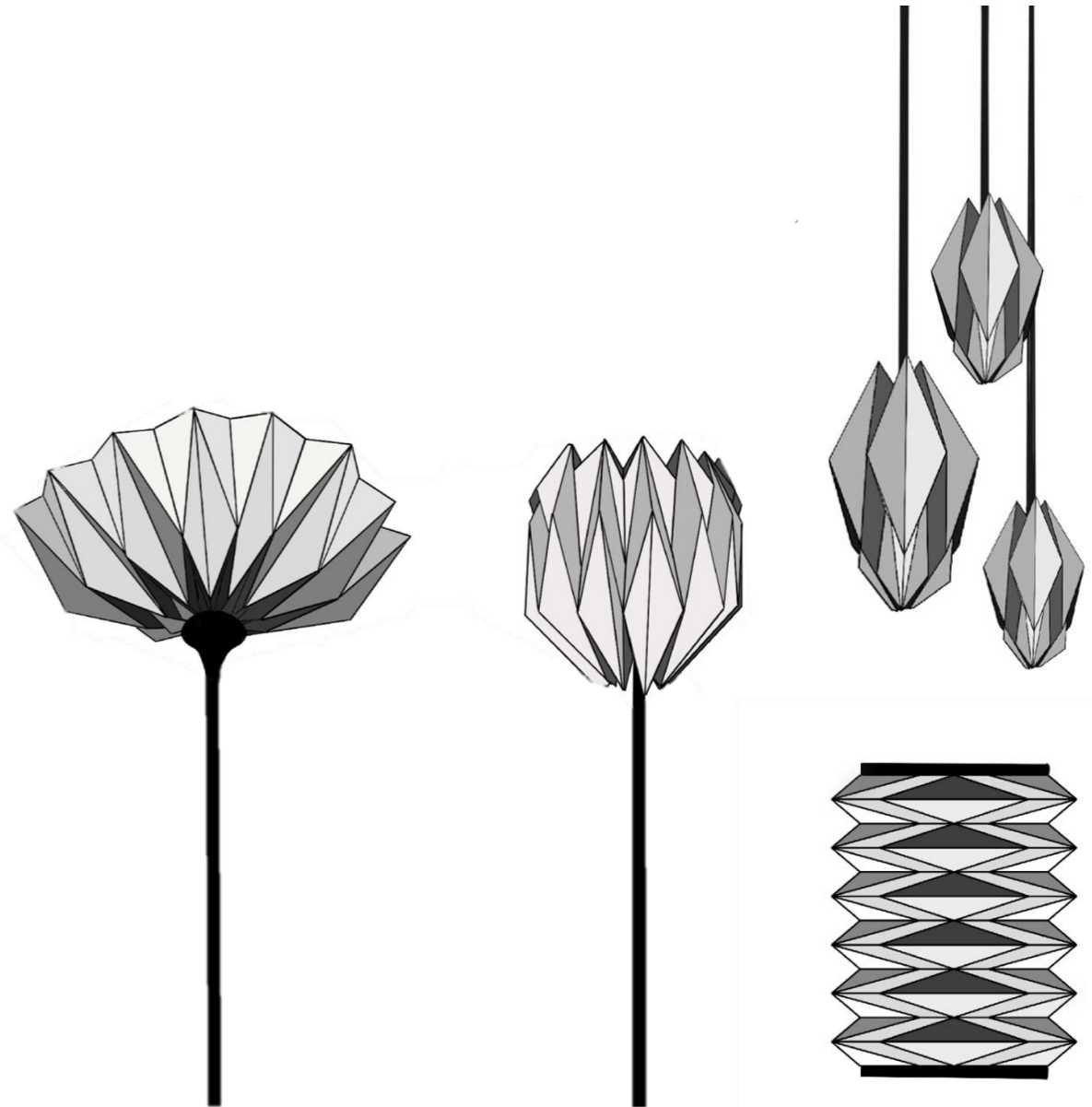
By getting insights from people about how they perceive origami and If I intend to incorporate origami into the light form, what are the factors that I need to consider?

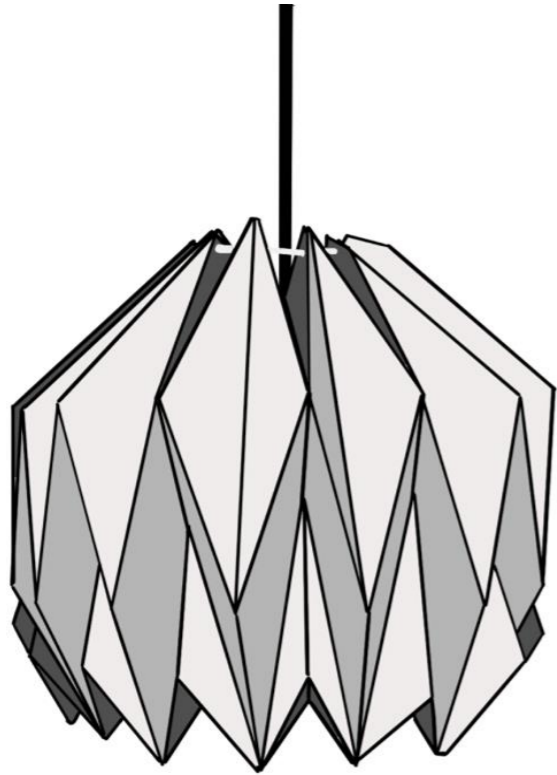
A lot of facets, geometric shape, sharp edges, converting flat surface into 3D etc. were some of the insights that I gained when I asked some people.

So I started incorporating those factors into my ideation and thought of making a range of light fixtures.

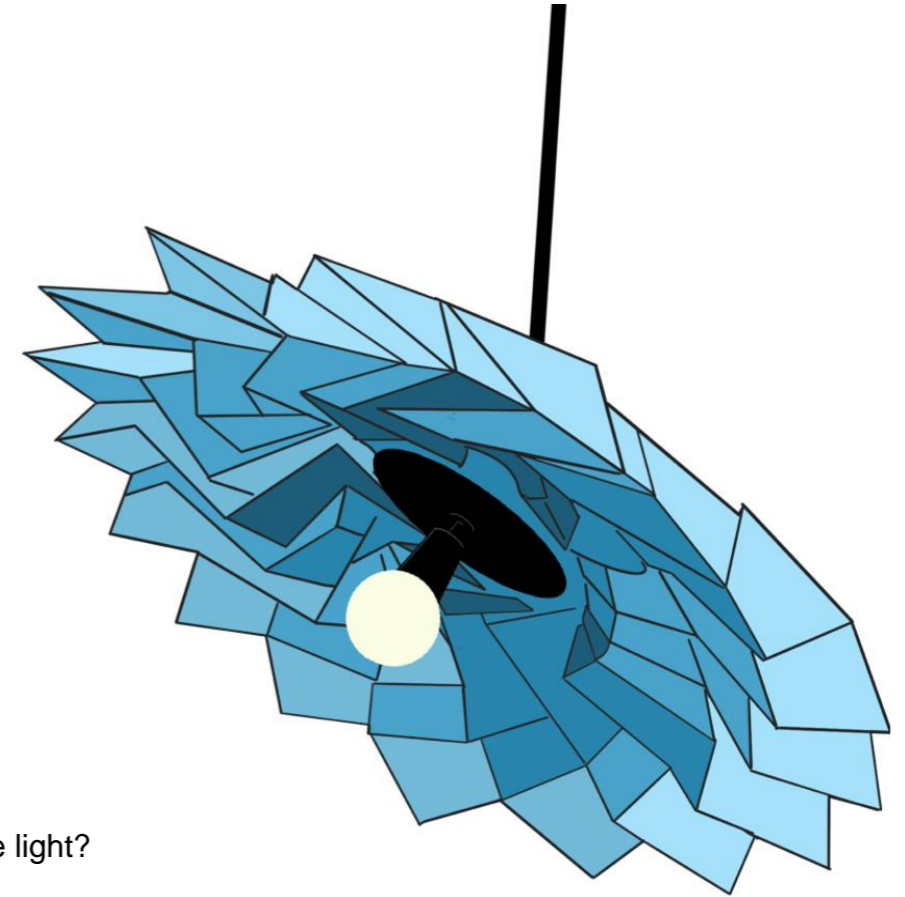


**Crease Pattern**





## Ideation 07



Why do I have to cover the light?  
Why can it be exposed?

Taking inspiration from Robert J Lang's Idea of origami, this ideation was based on the bulb being positioned below the shade, and as it evenly distributes light throughout the area below, it illuminates the folded pattern.

We can make more variations by using tessellations and can create a range out of it.



Literature Study

User Study

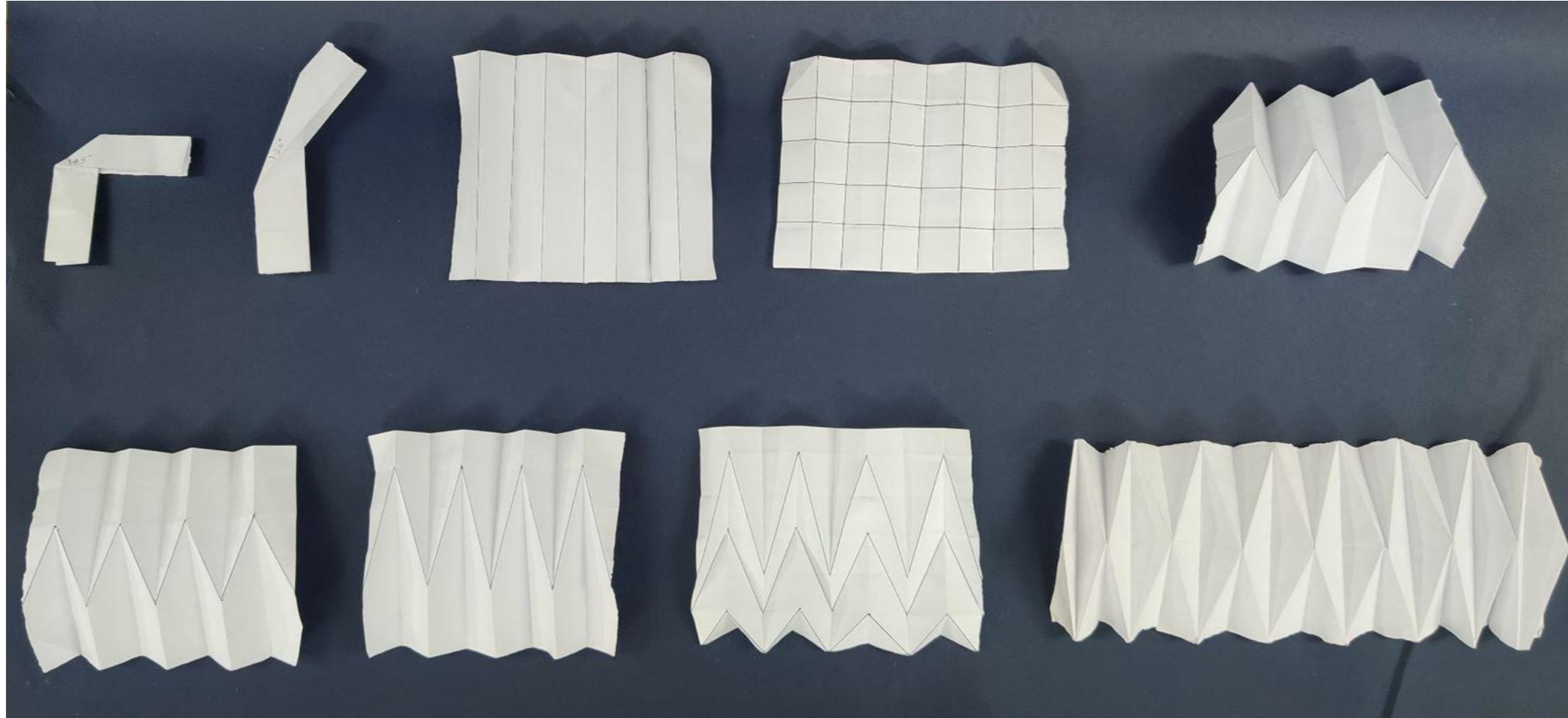
Market Study

Product Analysis

Ideation

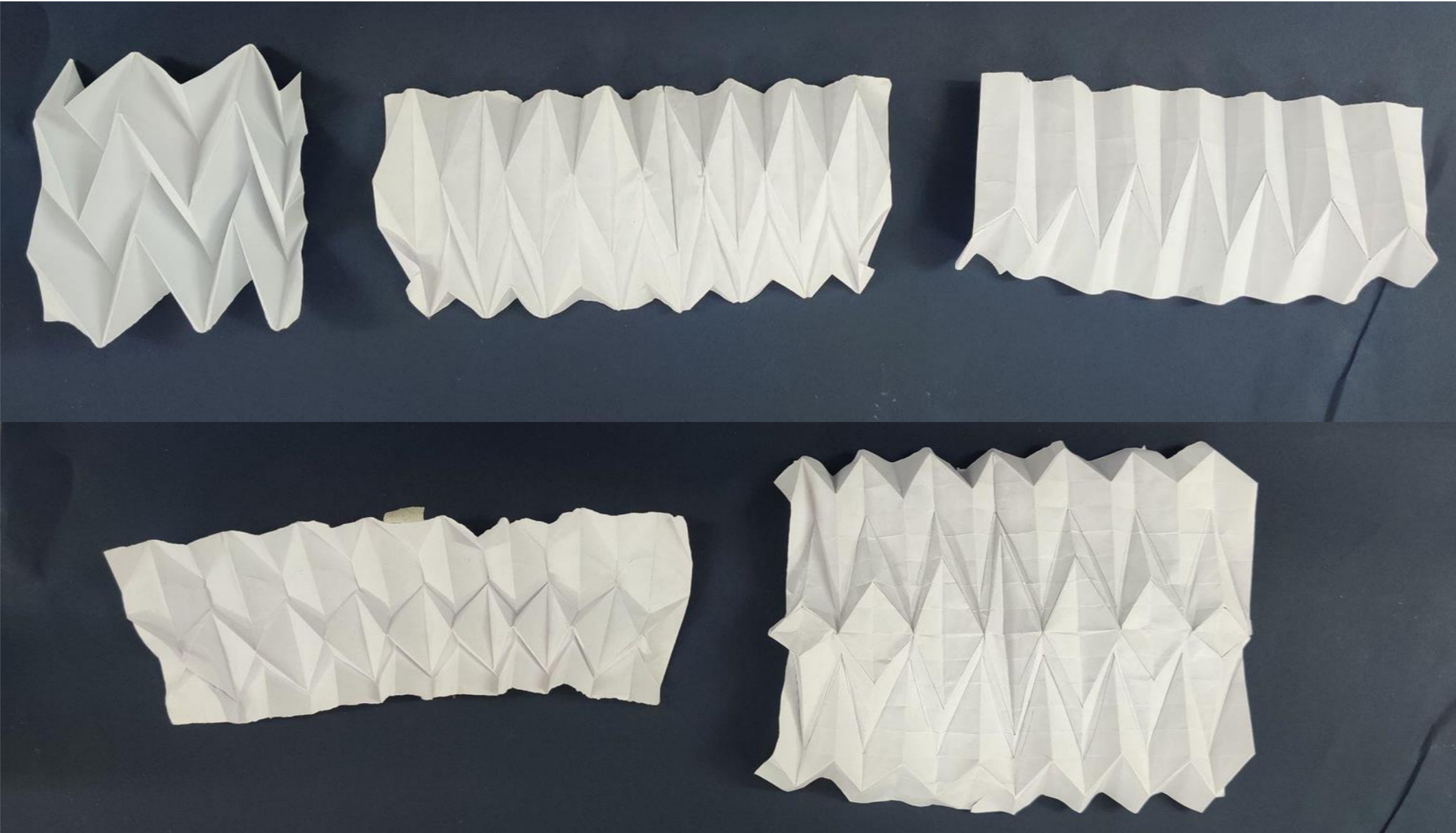
**Concept Development**

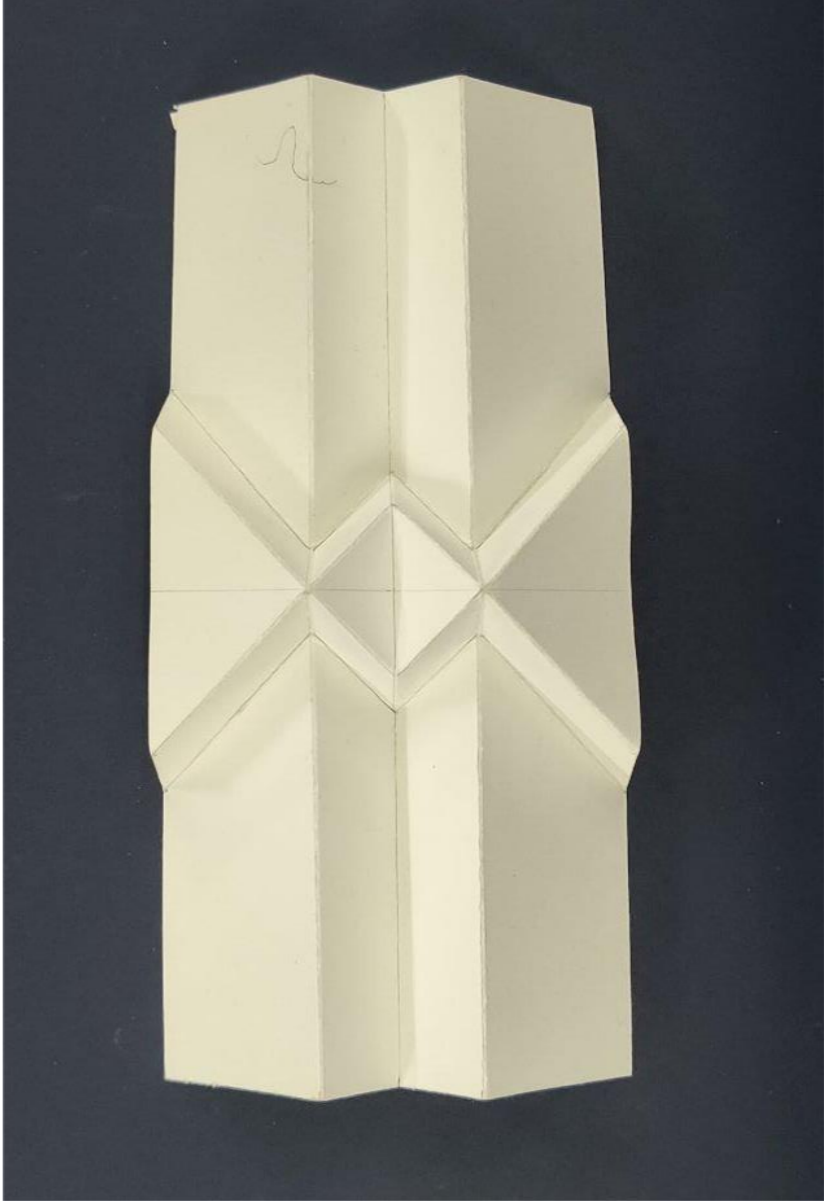
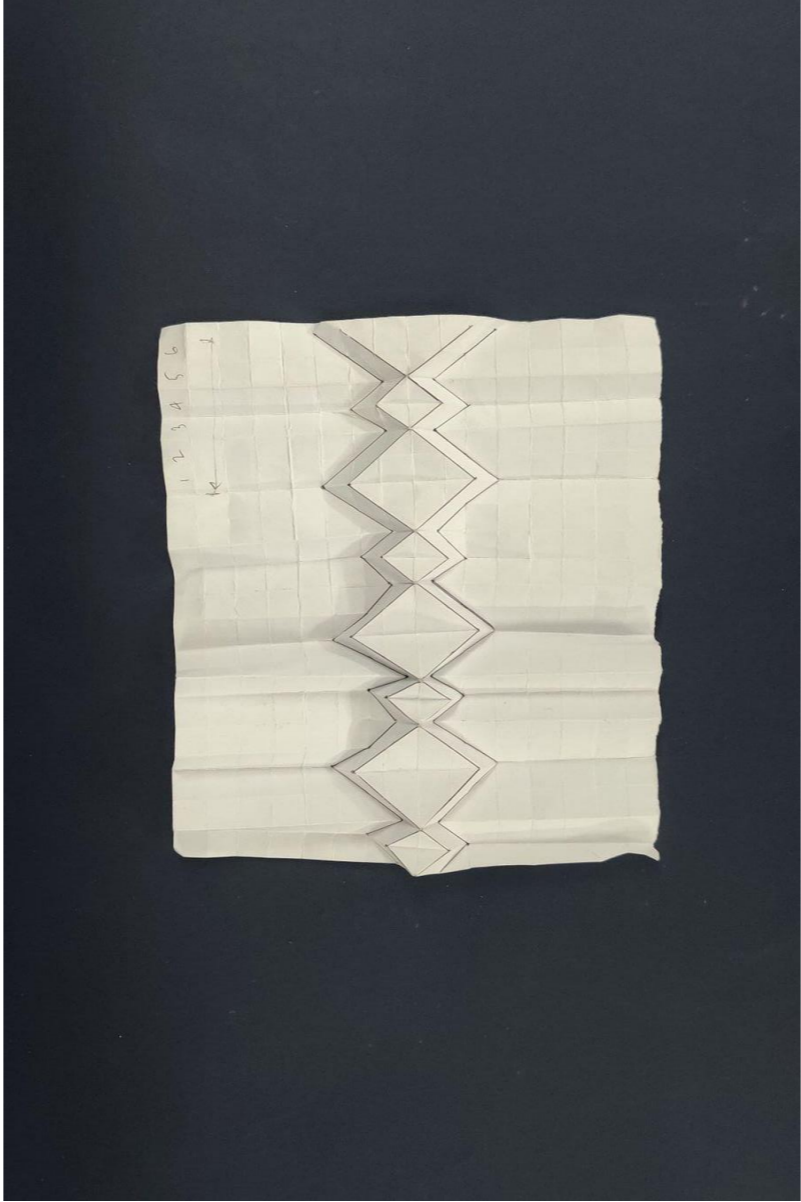
# Repository of Explorations

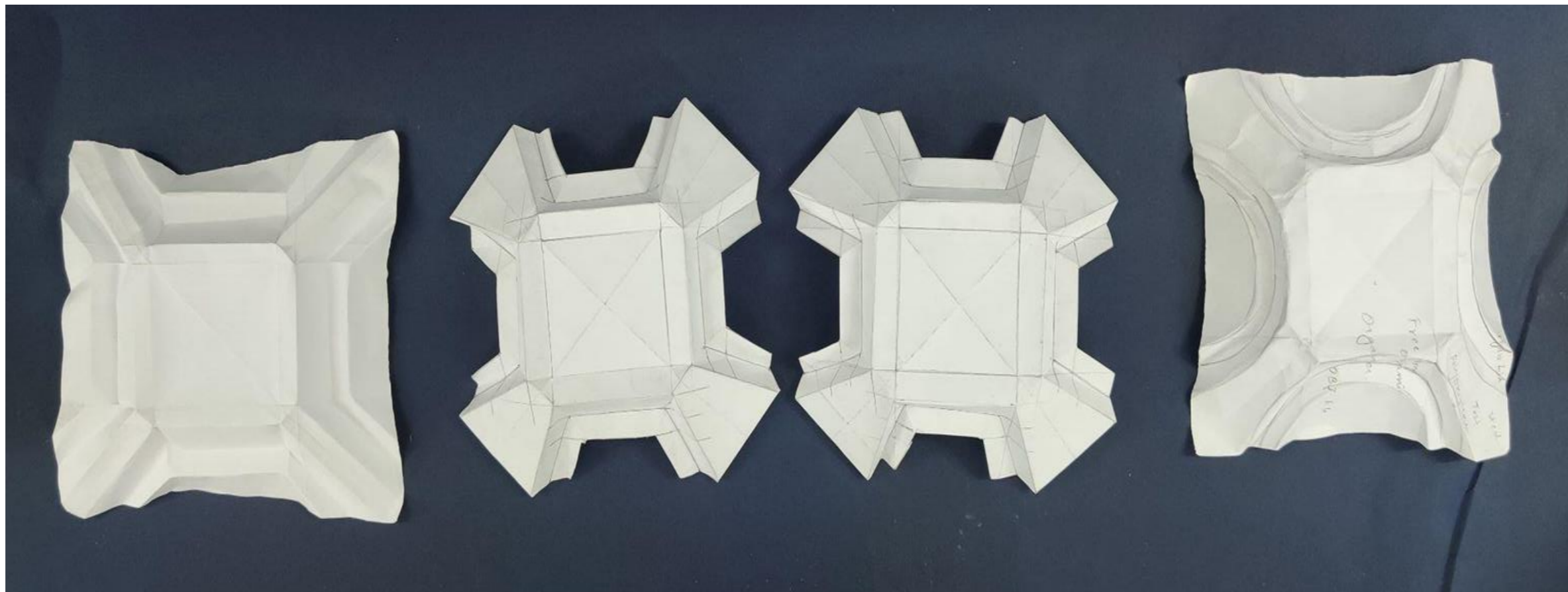


I started my exploration in origami from just one valley fold and one mountain fold. These folds propagated to square grids to different angled folds to combination of both angles and folds etc.

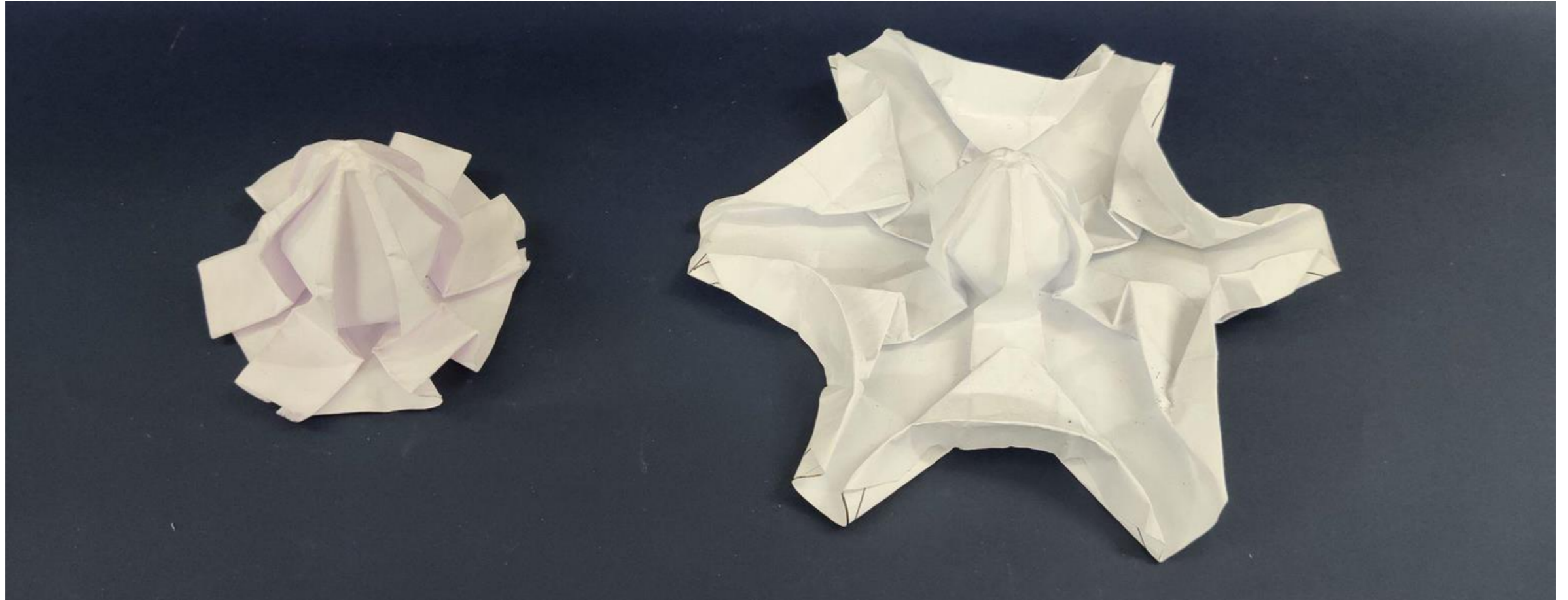
Different combinations of angles gave different shapes and angles of paper making it 3D from a 2D flat paper sheet.







Angles and square grids were not the only technique that i explored. I also thought of making those rigid geometric folds into soft curved folds. Just to see how it affects the origaminess of the form.



Apart from that I also explored Jun Mitani idea of origami incorporating the curviness in the form.



I also started exploring by making a hyperbolic curve with multiple hills and valleys at varying angles at each fold.

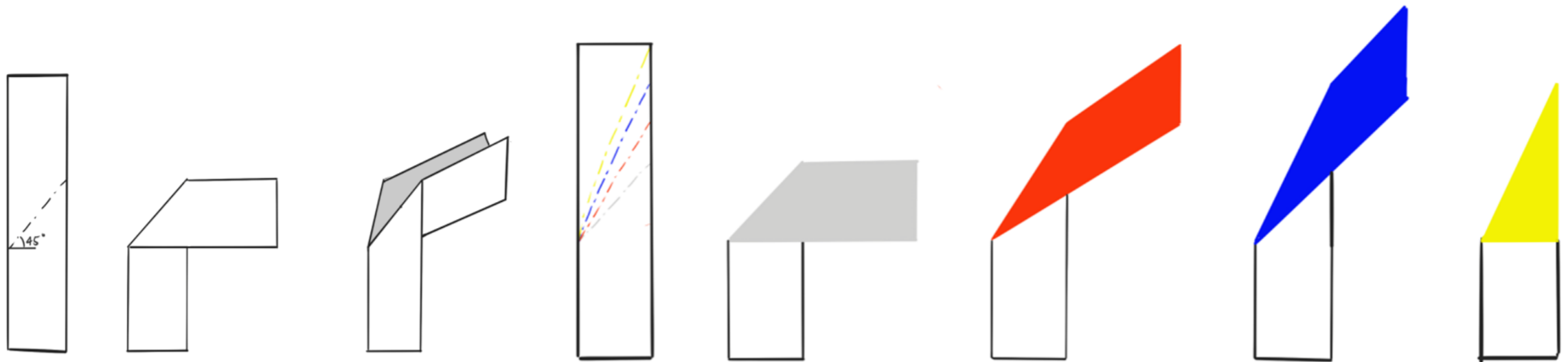
I also explored Chiaroscuro effect in origami where directional light will have a light and dark effect revealing some kind of pattern to the form.

# Observations

The angle at which you crease the accordion fold determines the angle and direction of the fold. If you crease the fold at 45 degrees you will get a 90-degree fold as shown in the figure.

You can go lower or higher than the 45-degree mark.

The higher or the lower the angle, will decide how the fold will look as shown in the below figure.

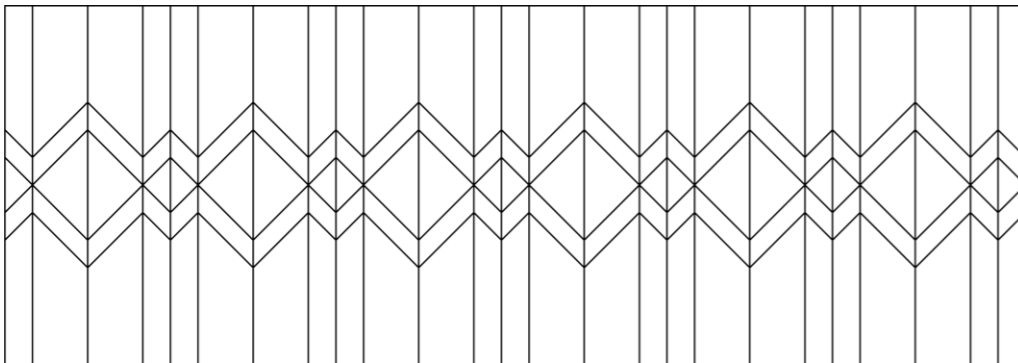


# Concept Development

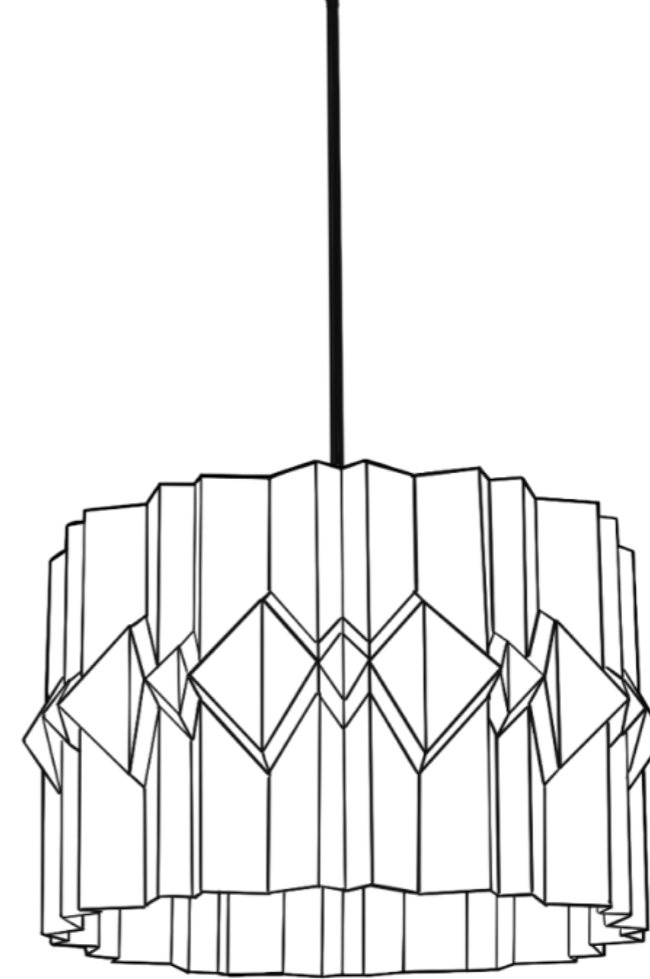
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A lot of facets, geometric shape, sharp edges, converting flat surface into 3D etc. were some of the insights that I gained when I asked some people.

So I started incorporating those factors into my concept and thought of making a range of light fixtures.



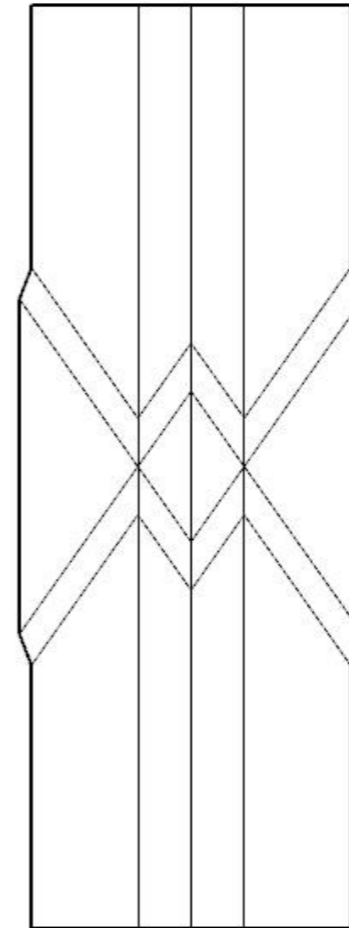
**Crease Pattern**



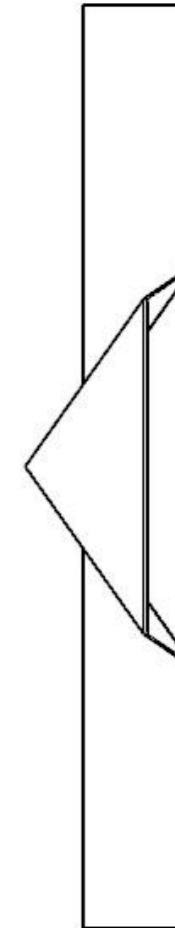
**Pendant Lamp**

## Adding Modularity

As we can see the patterns in origami is always repeating, we can take one single repeating pattern and make a single injection moulded module which can be repeated to make the lamp.

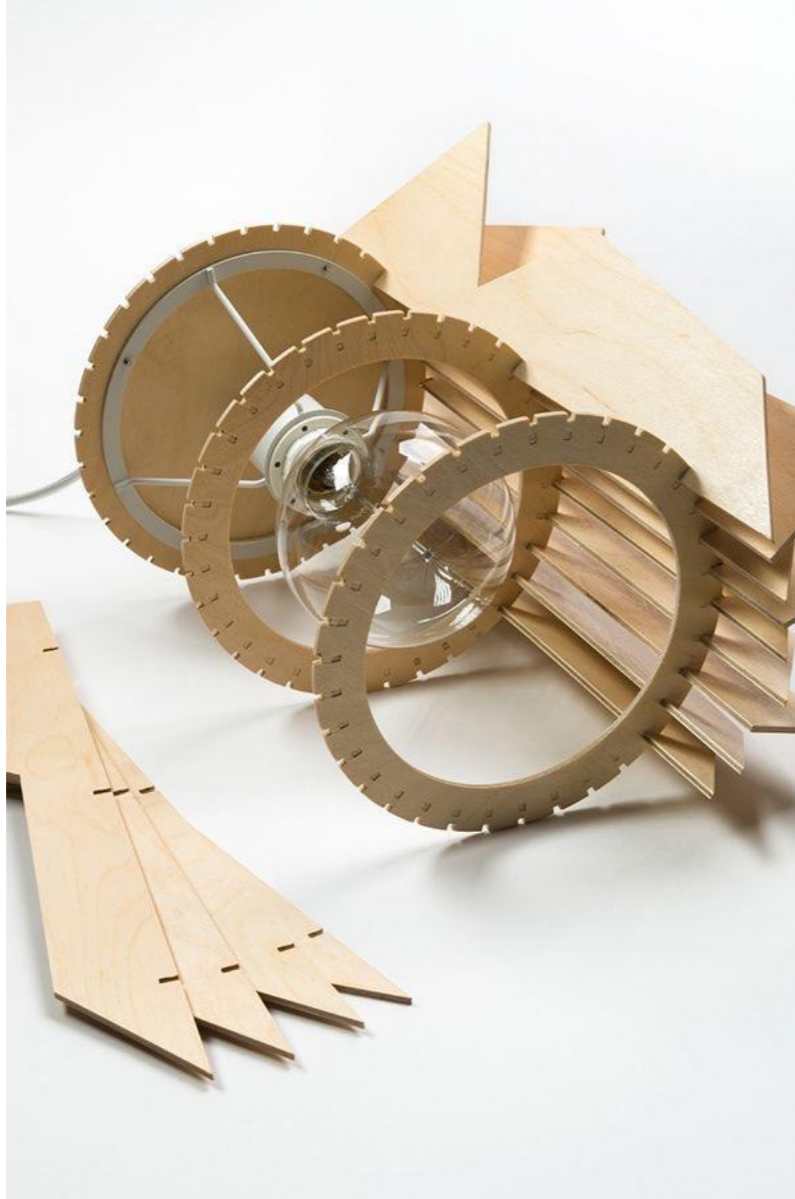


**Module Front View**



**Module Side View**

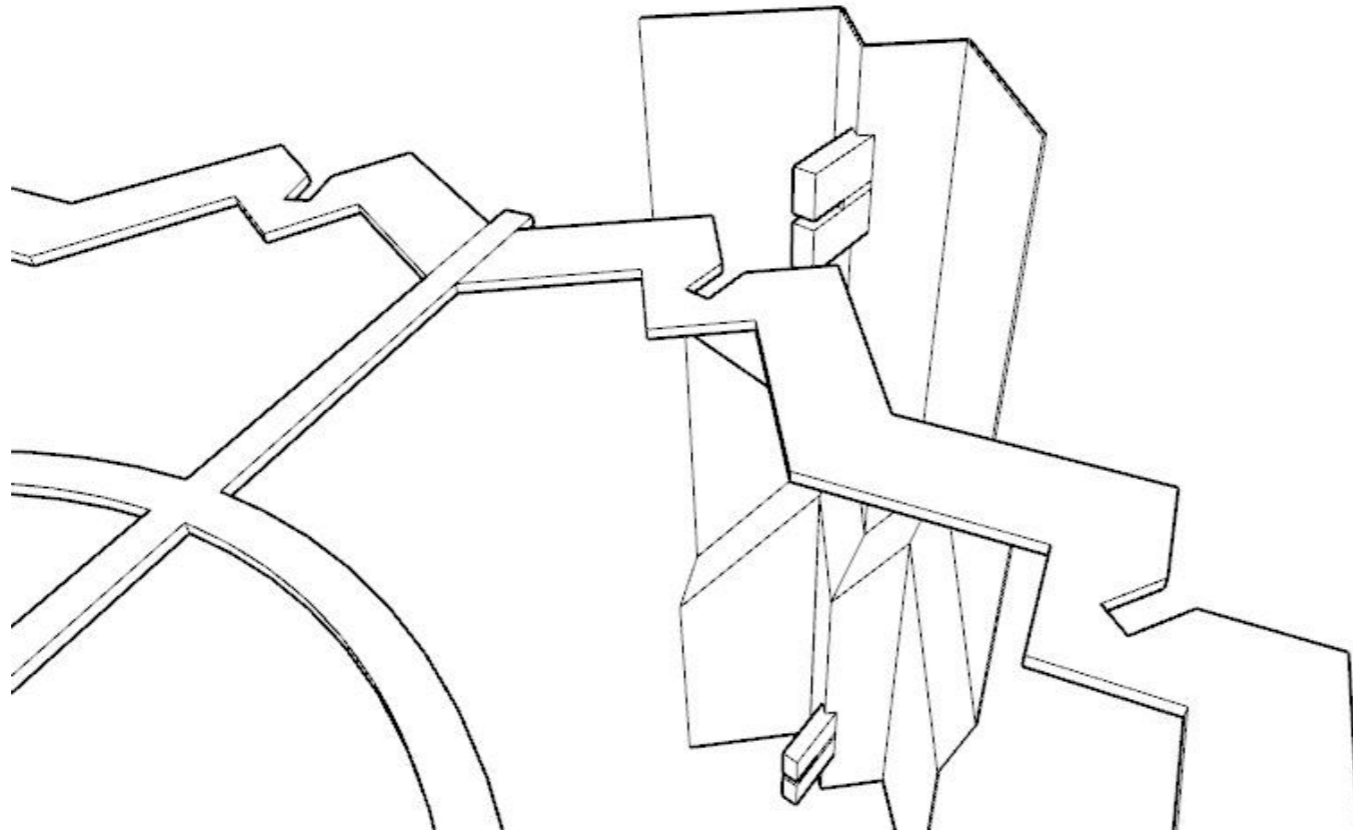
## Joinery Details



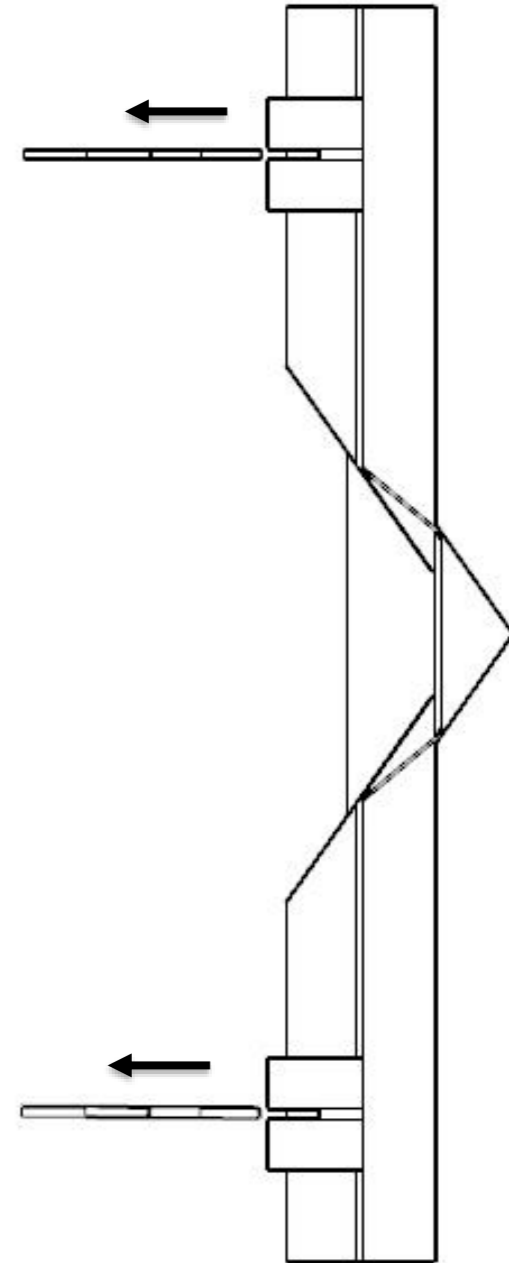
I came across two types of joints that I can incorporate in my design one was a simple snap fit mechanism and the other one was a groove and tongue mechanism.

## Joinery Details

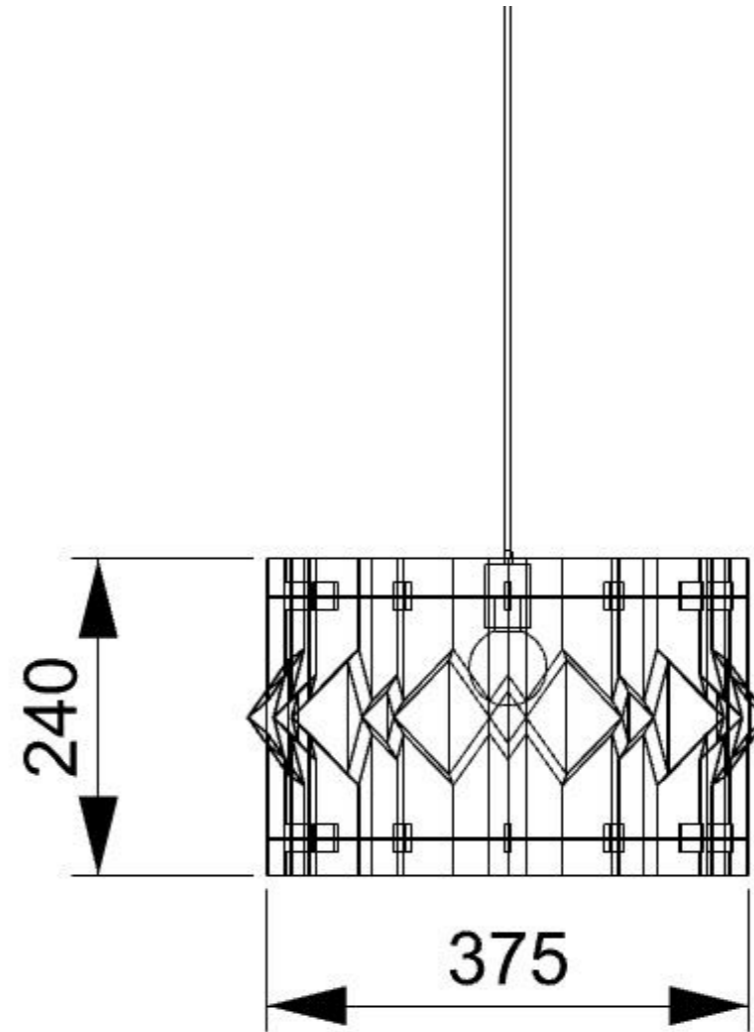
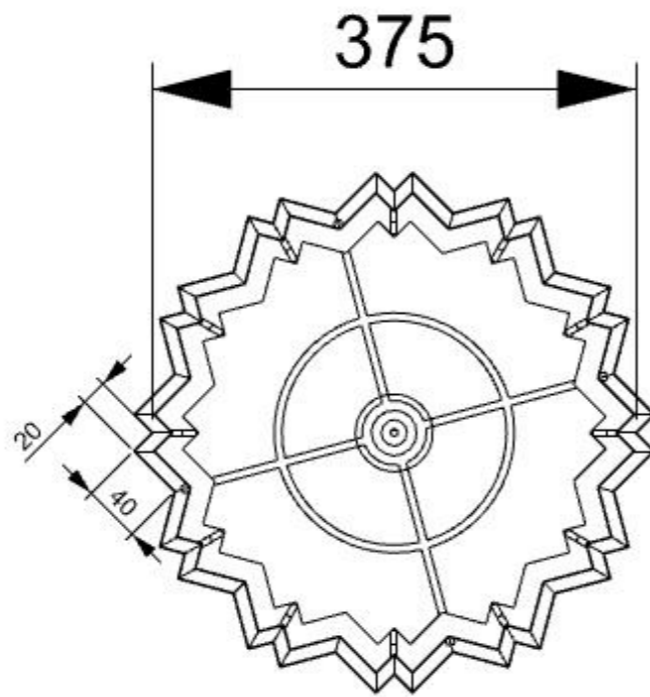
One injection moulded module will get fixed on the armature where the entire lamp will rest on.



Armature will be present on both top and bottom side to make the lamp more stable

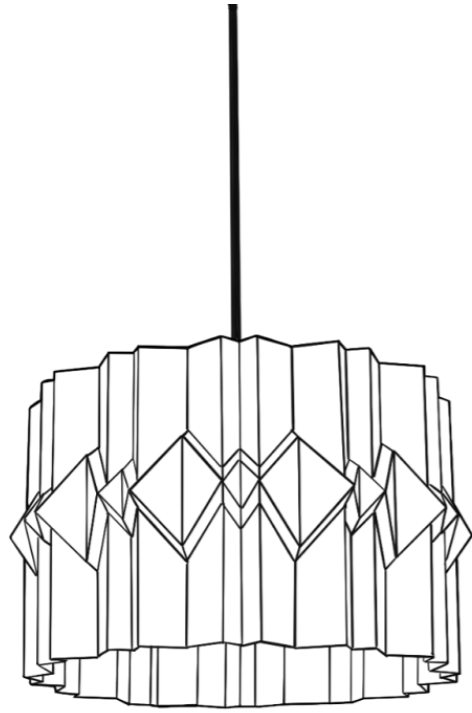


## Pendant Lamp Detailing





# Lamp Range



Pendant Lamp

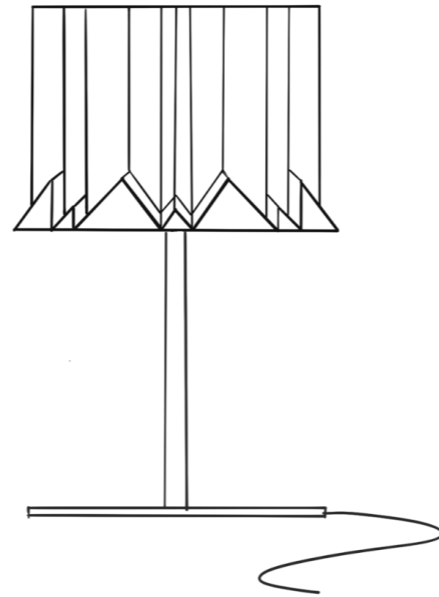
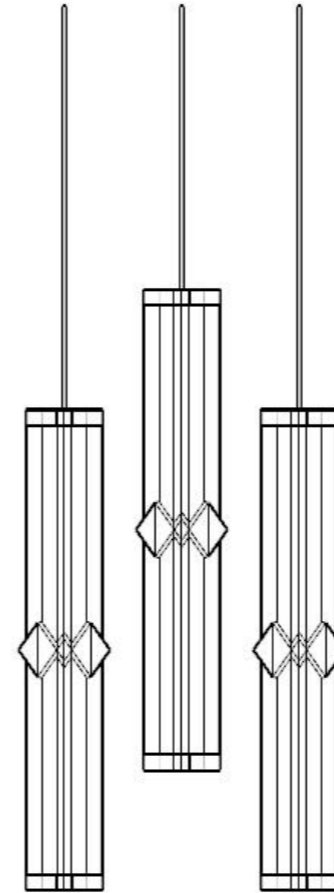
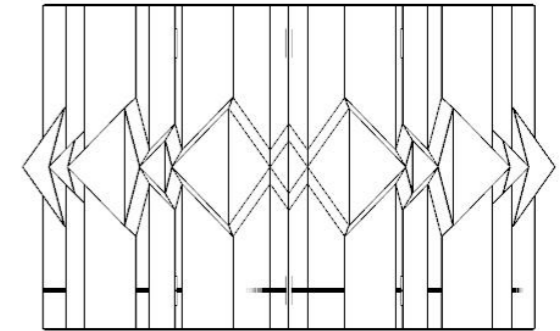


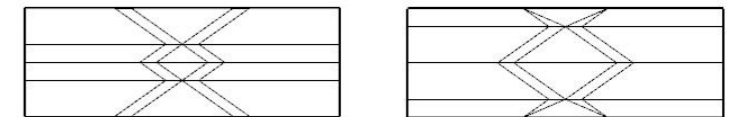
Table Lamp



Pendant Lamp 2



Wall Lamp



Panel Lights

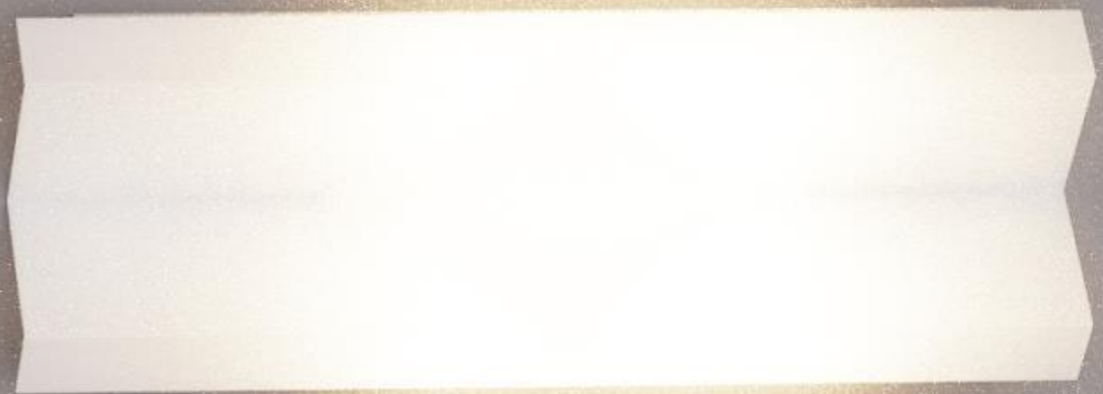




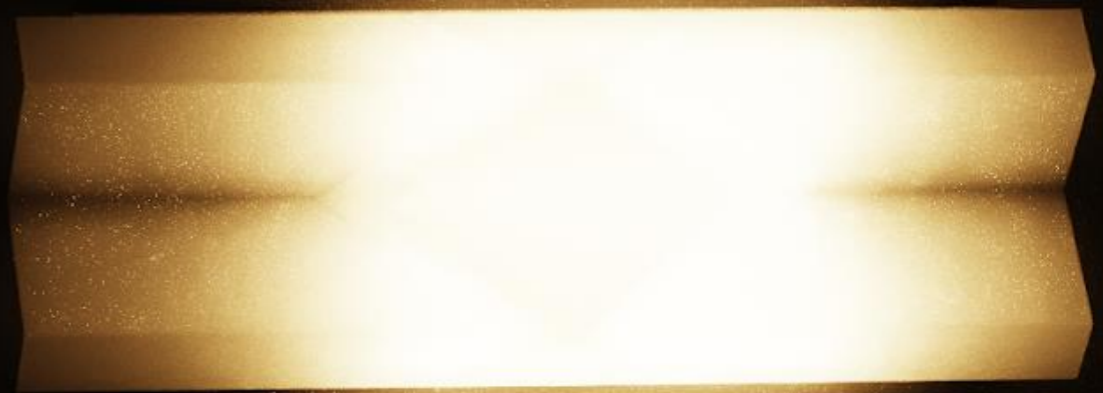
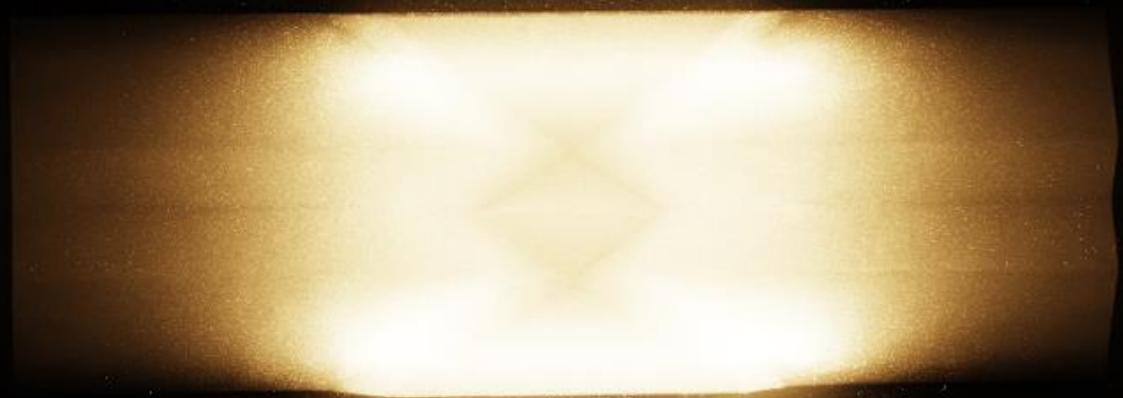




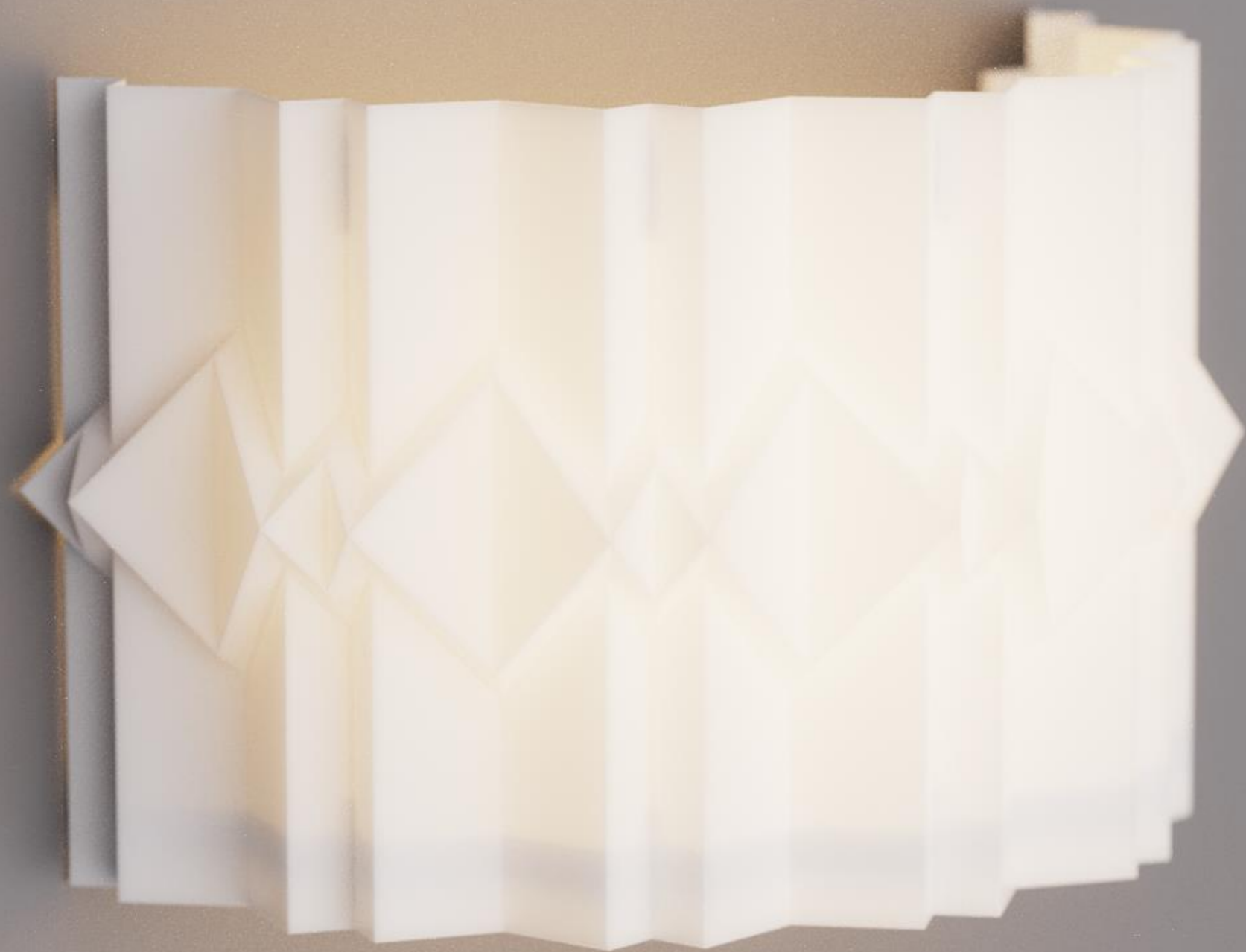














**Thank You all!**