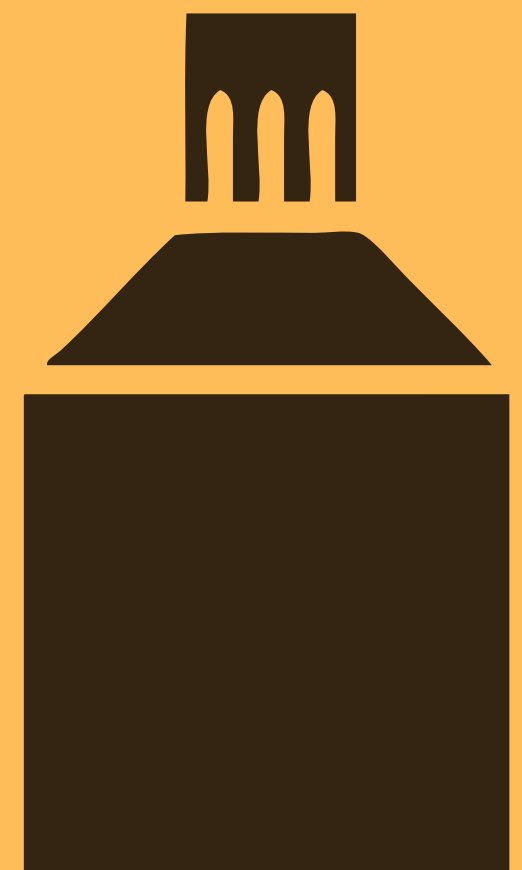


Product Design Project Studio Portfolio

Shashank Prabhakar
01FB16ECS356

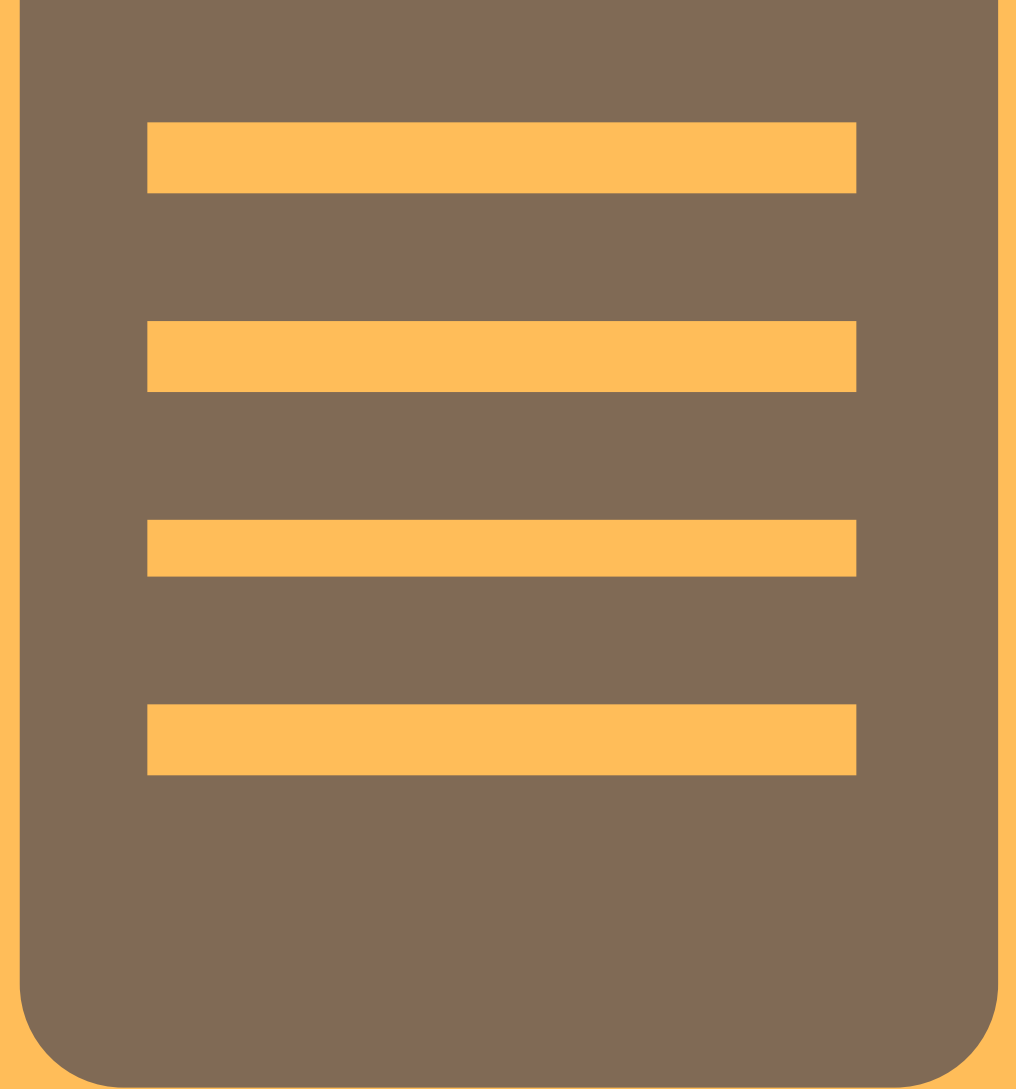
Mentors:
Prof. Bisheshwar Haorongbam
Prof. Divyadarshan

Toothpaste Cartridge



Contents

- Need Analysis
- The Plastic Problem
- Problem Statement
- Literature Survey
- Survey Questionnaire
- Survey Analysis
- Ideation
- Design Inspiration
- Consumption
- Mechanism
- Final Concept
- Material
- Future Trends in Dental Hygiene



The background of the slide is a solid light orange color. It features several large, faint, stylized question marks and circles scattered across the upper and middle sections. The question marks are drawn with thick, rounded lines, and the circles are also thick-lined. The overall aesthetic is clean and modern.

Need Analysis

Hard to squeeze
out the tube
content entirely.
There is always
some wastage.



Easy to lose the
toothpaste tube
cap.



Too much plastic
can be drastic.



Finally, toothpaste tubes aren't very aesthetically pleasing, especially when crumpled.





The Plastic Problem

- More than 1 billion plastic toothpaste tubes are thrown out each year, with harsh chemical residues.
- Contributes to the 8 million tonnes of plastic entering the ocean yearly.
- The plastic tubes can take upto 700 years to degrade.
- More than 100 million animals suffer and die in the U.S. every year in cruel chemical, drug, food, and cosmetics tests.
- Every year, the toothpaste tubes which end up in landfills or oceans, could cover the width of the entire European continent
- Excess toothpaste packaging contributes to a large waste of paper and cardboard.



<https://plasticgeneration.com/tubeless-plastic-free-toothpaste/>



<https://challenges.openideo.com/challenge/circular-design/ideas/toothpaste-1>





Problem Statement

To design a
toothpaste cartridge
refill system.



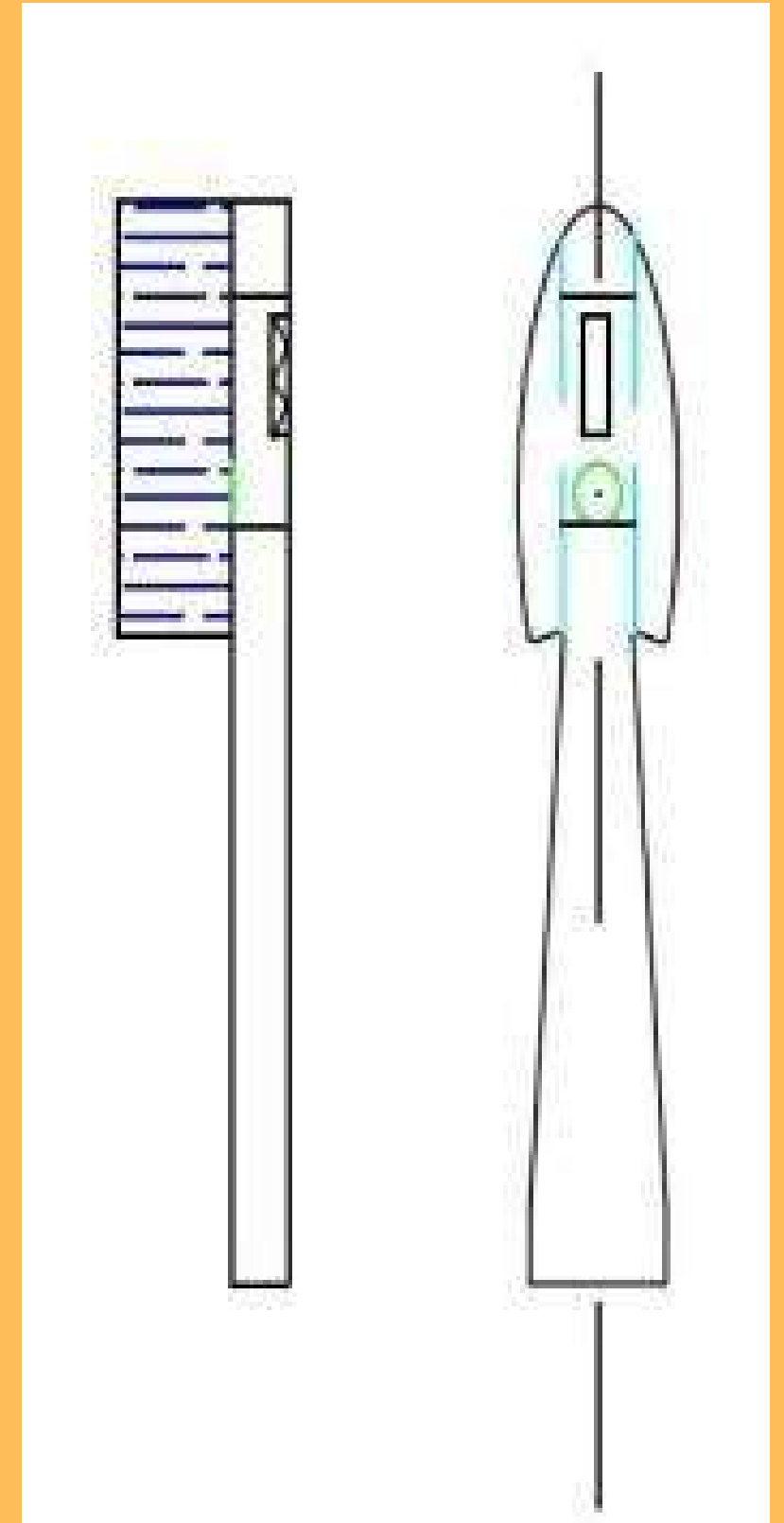
Literature Survey



1 Papers & Articles

"Innovative Design of Toothbrush by using Product Design Principles"

- The product design objective in this paper is concentrated on a toothbrush which has an integrated toothpaste dispenser.
- The mechanisms for the same can be classified as-
- push button operated, slider operated and with the ones with rotating input.
- freshness of the toothpaste should be maintained and Foreign substances must not travel into toothpaste chamber via bristles.
- The mechanism consists of a helix, collar and toothpaste pouch contained in a cylindrical body of the toothbrush.



"Your Main Squeeze: The Changing Shape of Toothpaste Packaging"

- Toothpaste tubes are getting "flatter", making it easier to store.
- Some brands store the standing tube with the dispenser facing down, other brands have chosen to keep the cap on top and flatten out the bottom.
- To help maintain product freshness and prevent that dreaded crusty toothpaste, many new packaging solutions provide a hinge to keep the cap attached to the tube at all times. Caps are getting bigger too, for easy handling.
- Pumps instead of squeezing mechanism for less mess and easy dispensing.



"Premiumisation of Toothpaste Packaging: A Global Trend"

- Higher disposable income among the masses allows for ability to spend on premium products for everyday use, like luxury toothpaste tubes.
- In terms of packaging, this results in smaller pack sizes overall (75ml, 100ml or 125 ml)
- In 2016, Sanofi launched its brand ACT, a toothpaste which aims at children from 2 years old. Comes in a colorful squeezable plastic tube, available in fruit punch and bubble gum flavors.
- Another example of product expansion launched in France in 2016 is by Colgate Palmolive with its Colgate Max Fresh in a new Ice Tea version.
- Unilever chose a new packaging for its Signal White Now brand in 2016. The folding carton presents a shiny finish and a clear view of the plastic tube.



"History of the world in 52 packs | Toothpaste tubes"

- The first commercial dental products, tooth powders, were marketed around the late 19th century.
- In 1886, Johnson & Johnson started selling tooth cream in a jar with a spoon to apply it with, avoiding having multiple toothbrushes dipping into the same jar.
- Later, J&J started selling tooth cream in collapsible metal tubes which were originally used to hold artists' paints.
- These early toothpaste tubes were made of tin and lead. But due to metal shortage during the WW2, companies started using mixed plastic tubes to store lotion.
- In 1990s, the toothpaste pump was introduced.







2 Products

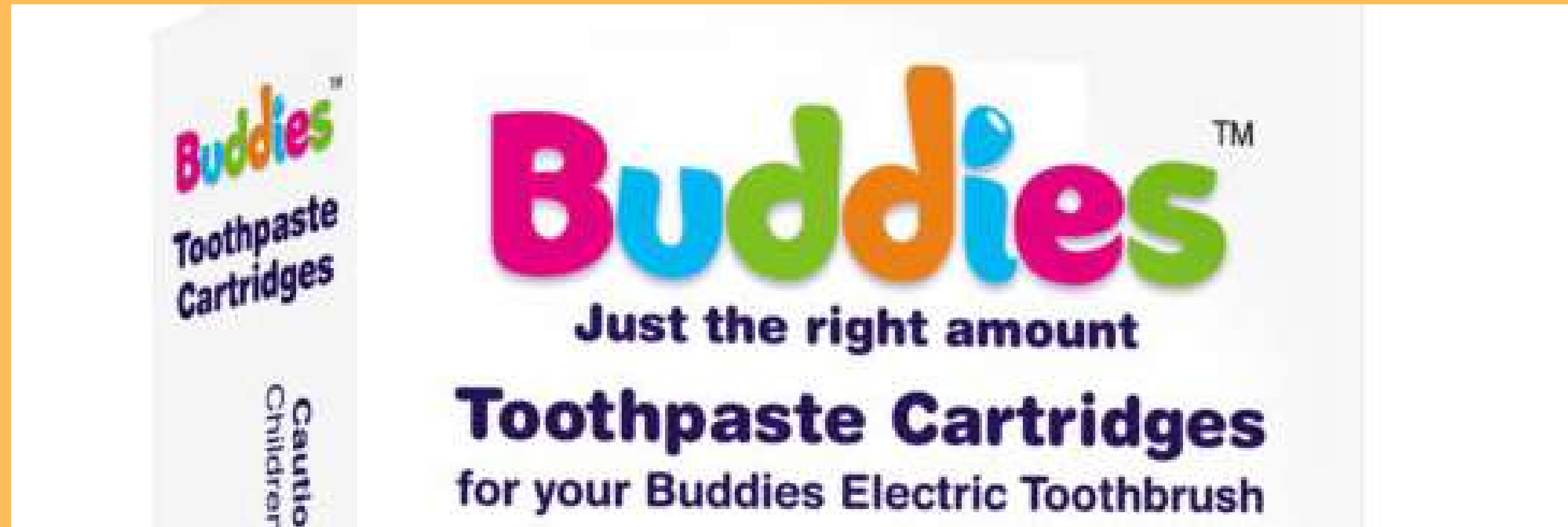
1. Philips Electric Toothbrushes



- Tube and brush in the same body
- Electric, needs batteries
- Toothpaste heads are not replaceable

- Cannot have different hardnesses for toothbrush heads (like soft and hard)
- Only custom cartridges fit
- Expensive, obviously

2. Buddies Toothpaste Cartridges



- Self-dispenses toothpaste with one push and doubles up as a nightlight.
- Sinks in to the bristles so stays on the brush
- Only custom cartridges fit
- The toothbrush has a mild, vibrating, sensation for the recommended brush time.

3. Chube Automated Toothpaste Dispenser



- Conserves toothpaste with even flow dispensing
- Squeezes out every last bit of toothpaste
- Motion controlled motor, senses toothbrush and dispenses the paste
- Only custom cartridges fit
- Recyclable cartridges
- Originally designed for arthritic patients
- Loop on the cap for easy handling

Product Comparisons

Philips Toothbrush

Combines toothbrush body with a refillable toothpaste holder

Can function with any toothpaste tube of the right size

Tube may still contain toothpaste which goes to waste

Very expensive
Rs.5000 to Rs.11000



Buddies Cartridge

Uses toothpaste cartridges with a replaceable toothbrush head

Can be used only with Buddies Electric Toothbrush body

Tube may still contain toothpaste which goes to waste

Expensive
Rs.3000 with brush



Chube Dispenser

Separate from the toothbrush, dispenses the toothpaste using a motion detector

Works with any regular toothbrush, electric or not

Squeezes out every last bit of toothpaste from the bottle

Reasonable price
Rs.400 to Rs.800



Survey Questionnaire

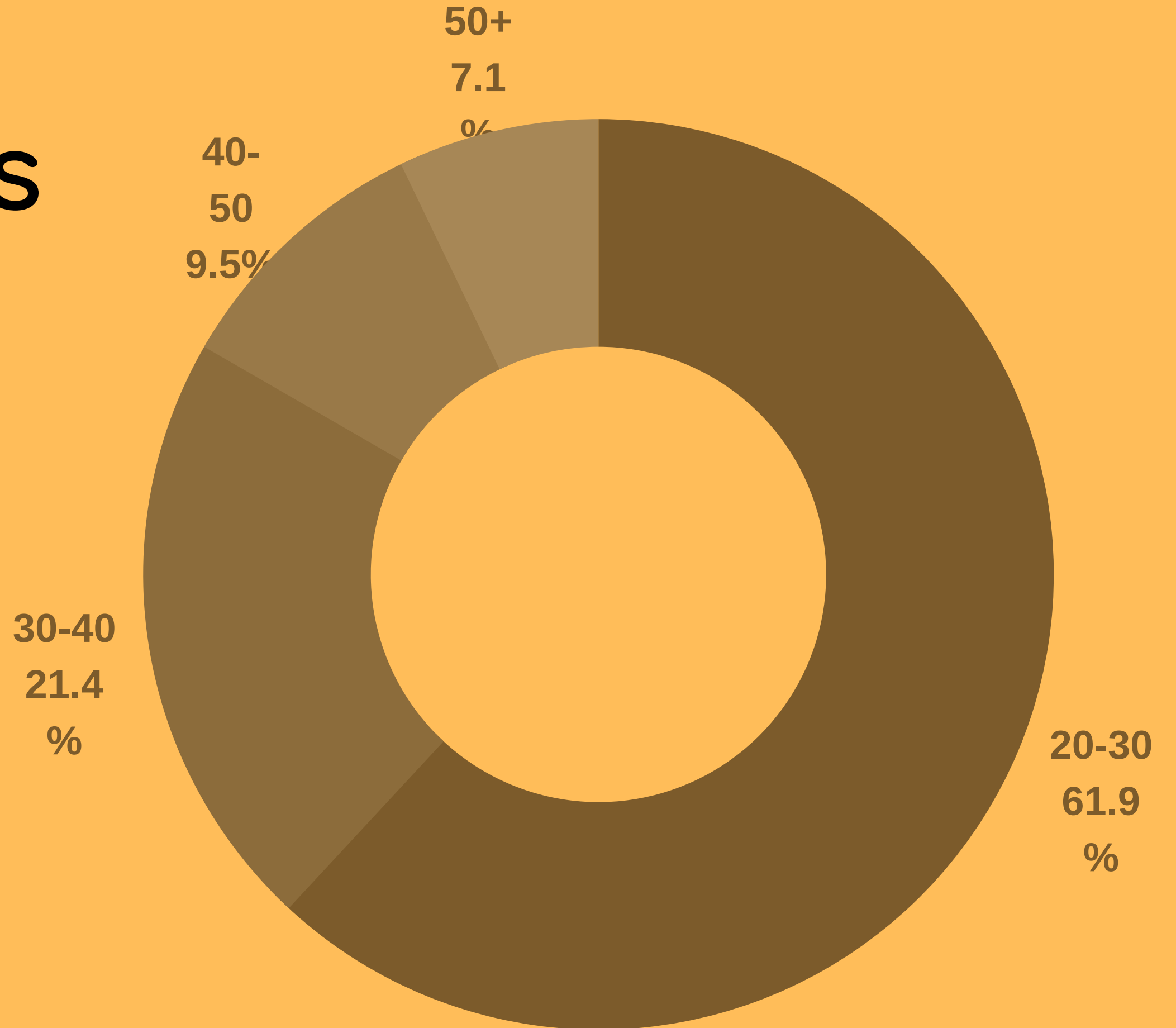
Questions asked to the surveyed users

- Please provide your name, age and contact info
- How often do you change your toothpaste?
- How many members are present in your family?
- How much do you usually spend on toothpaste monthly?
- Do you usually have trouble with getting the entire quantity of paste out of the tube?
- Do you believe that the continuous replacement of plastic tubes is contributing to more waste generation and pollution?
- Would you consider an alternate solution where replaceable biodegradable cartridges can be used with a single main body for holding the toothpaste?
- What other solutions would you consider feasible to fix the problems with current toothpaste tubes?

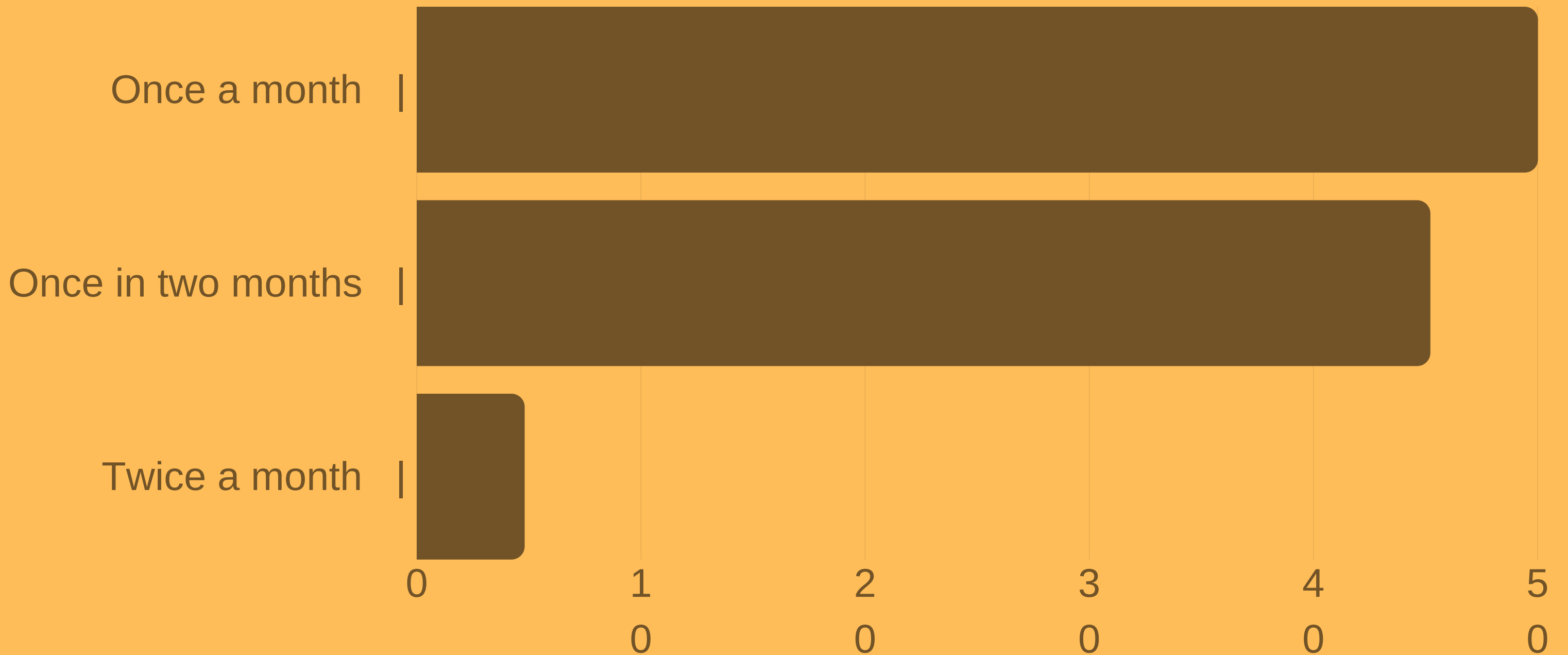


Survey
Analysis

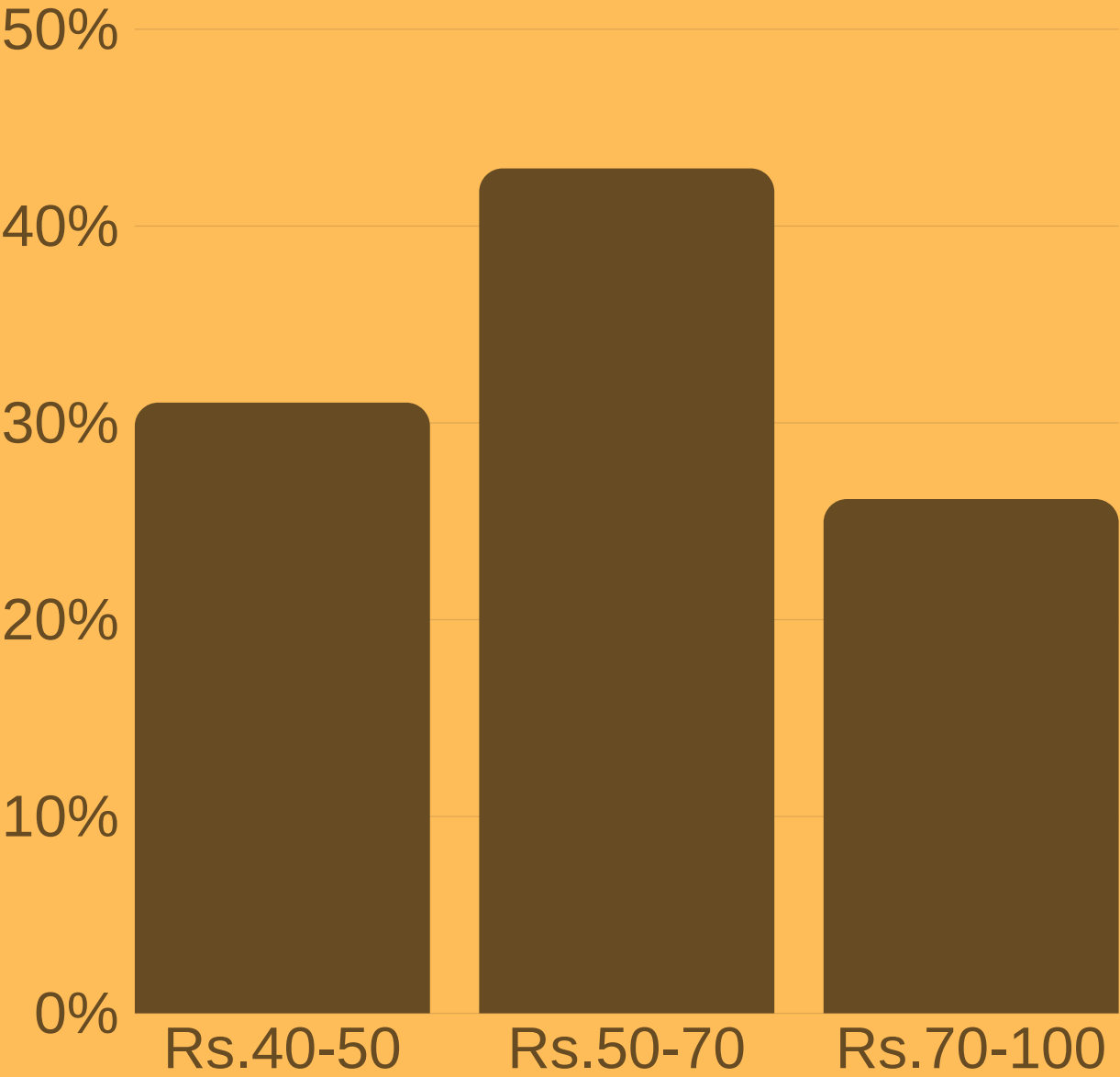
Age Groups



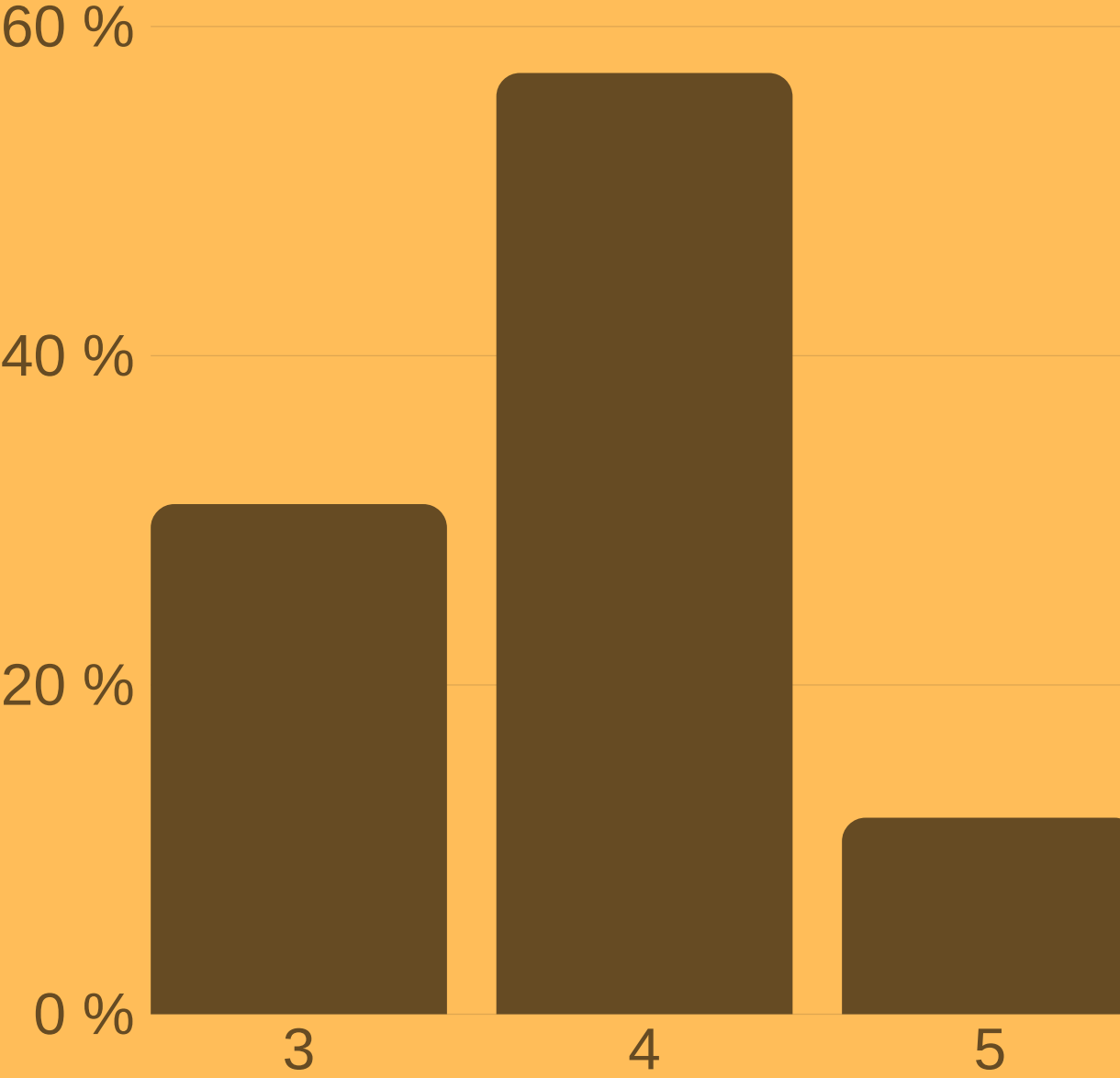
How often do you change your toothpaste?



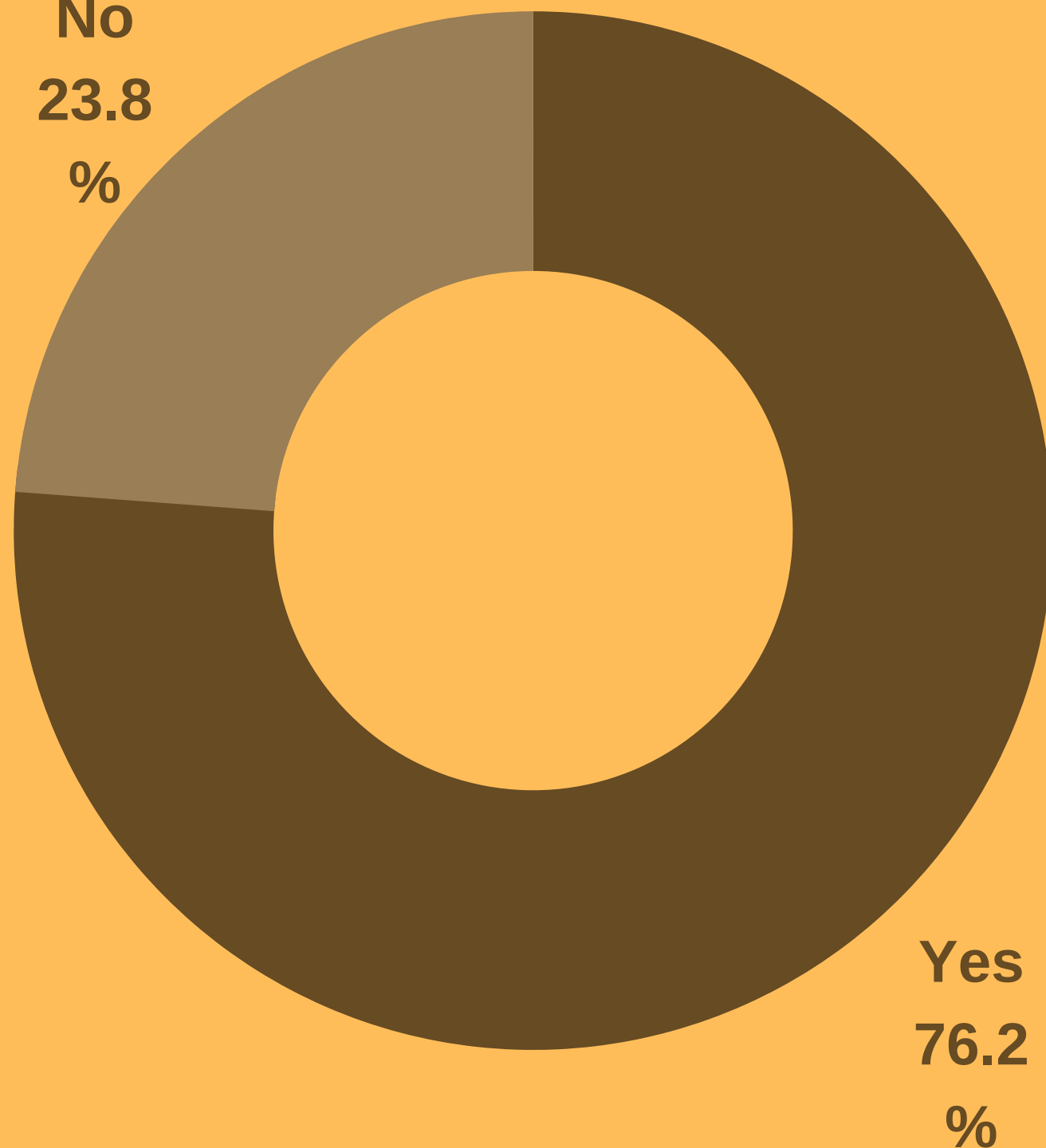
How much do you spend on toothpaste per month?



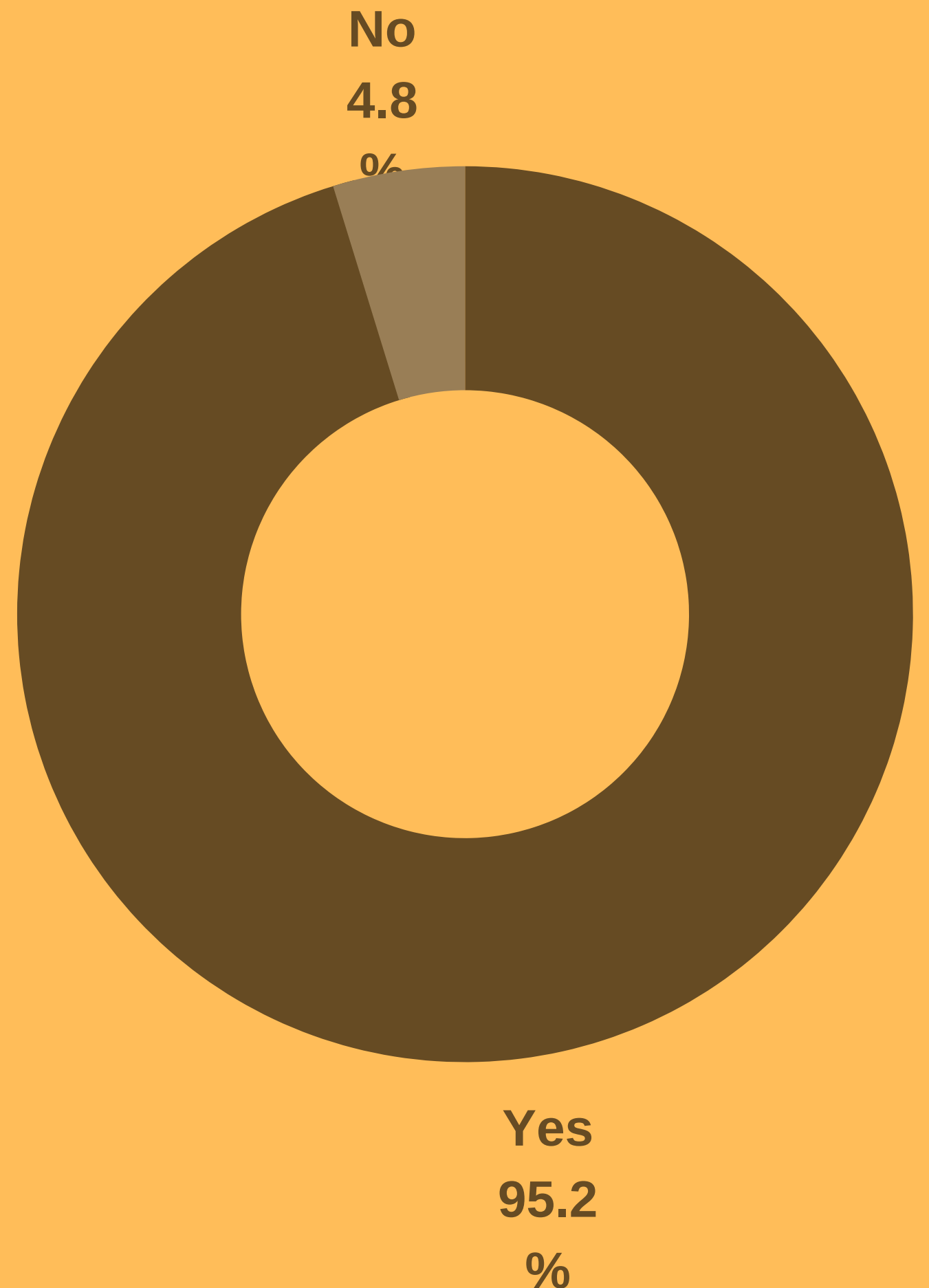
How many members are there in your family?



Do you have trouble
with getting the
entire quantity of
paste out of the
tube?



Do you believe that the continuous replacement of plastic tubes is contributing to more waste generation and pollution?



100% of the surveyed individuals were ready for the product proposed as a replacement for the current toothpaste tubes.

Some suggestions were:

- Refillable cartridges
- Degradable plastic
- Tin containers
- Soap-type dispensers
- Foam texture similar to shaving cream
- Change shape of container
- Water soluble toothpaste balls
- Change mechanism of applying paste
- Solid toothpaste tablets

Persona - 1

- Name: Prabhakar
- Age: 55
- Occupation: Investor
- Residence: #377, 5th Main Road, Hanumanthanagar, Basavanagudi, Bangalore - 560050
- Number of member in the family: 4
- Changes toothpaste once a month.
- Spends 70-100 INR on toothpaste a month.
- Struggles to get all the paste out the tube.
- Believes that the tubes cause harm to the environment.
- Suggestion: "Some mechanism to easily but fully squeeze out the paste from the tube. Change the shape/design of the tube so that the last bit of the paste too is easily extractable."



Persona - II

- Name: Sanjay
- Age: 21
- Occupation: Student
- Residence: JP Nanagr 6th Phase, Bangalore - 560078
- Currently studying at BITS, Goa
- Number of member in the family: 6
- Changes toothpaste once in two months.
- Spends 50-70 INR on toothpaste a month.
- Struggles to get all the paste out the tube.
- Worried about environmental hazards of discarding plastic so often.
- Suggestion: "Better design in order to extract all the paste from a tube."

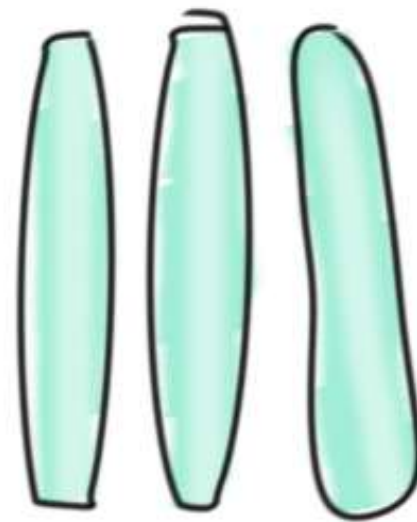
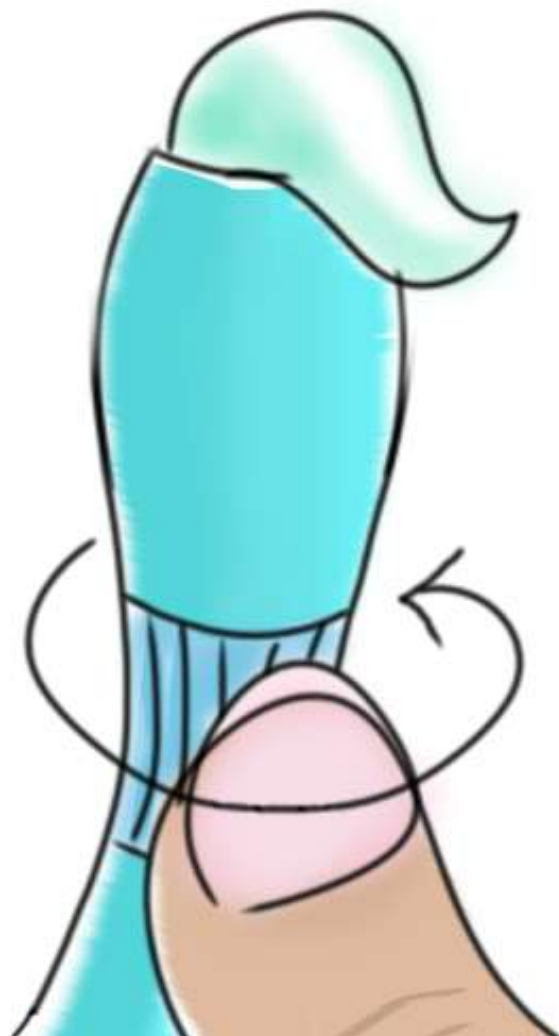
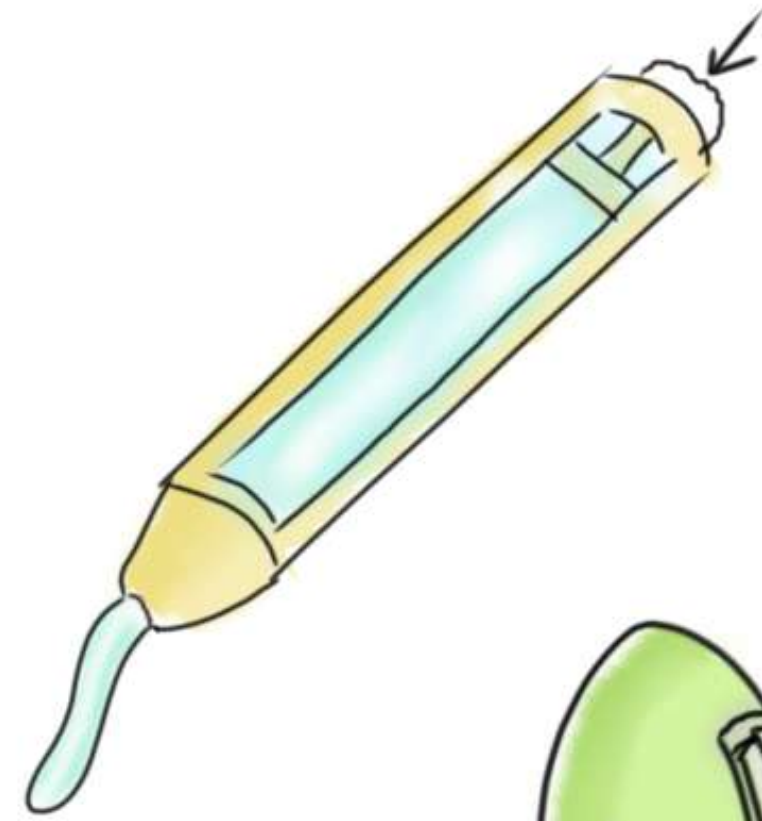


Survey Inferences

- Most of the people who responded to the survey belonged to the age group 20-30 years.
- Majority of the people change their toothpaste once a month.
- On an average, people spend 50-70 INR on toothpaste every month.
- 4-people families are most common.
- Majority of the people find it difficult to squeeze out the entire paste out of the tube.
- Almost everyone is concerned about the environmental hazards caused by plastic.
- 100% of the surveyed individuals were ready for the product proposed as a replacement for the current toothpaste tubes.



Ideation



Cartridges

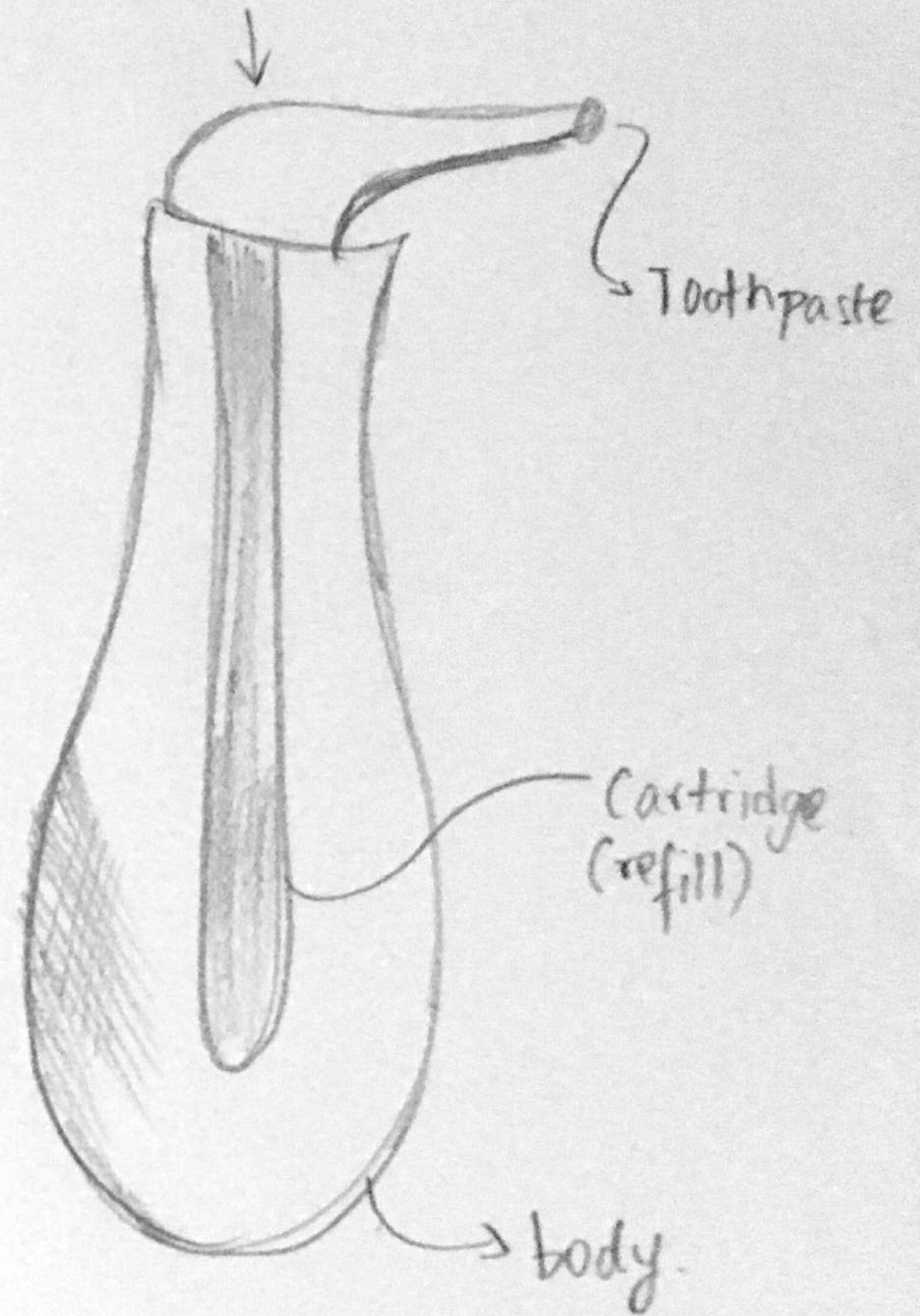
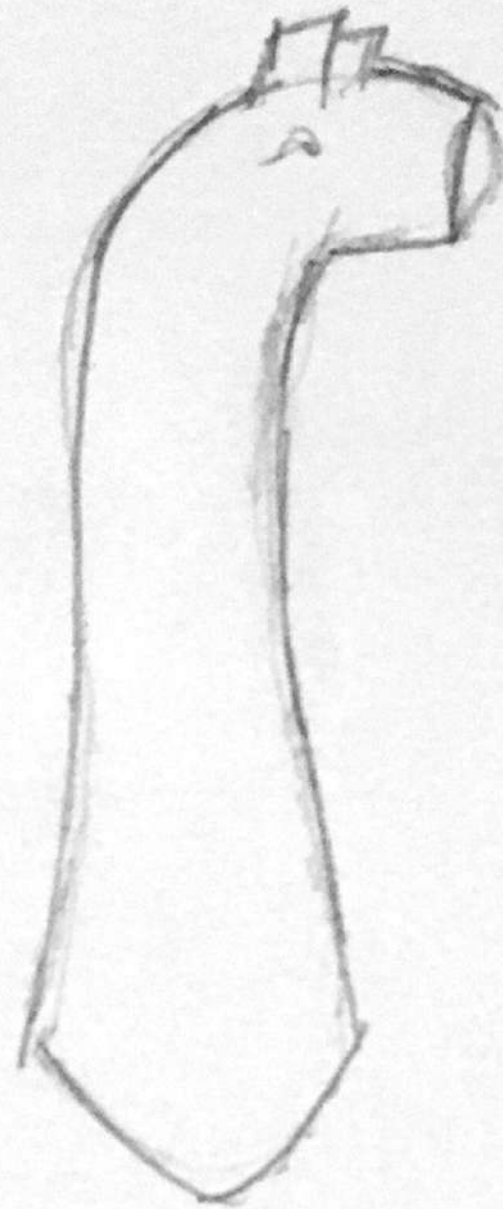




Design Inspiration

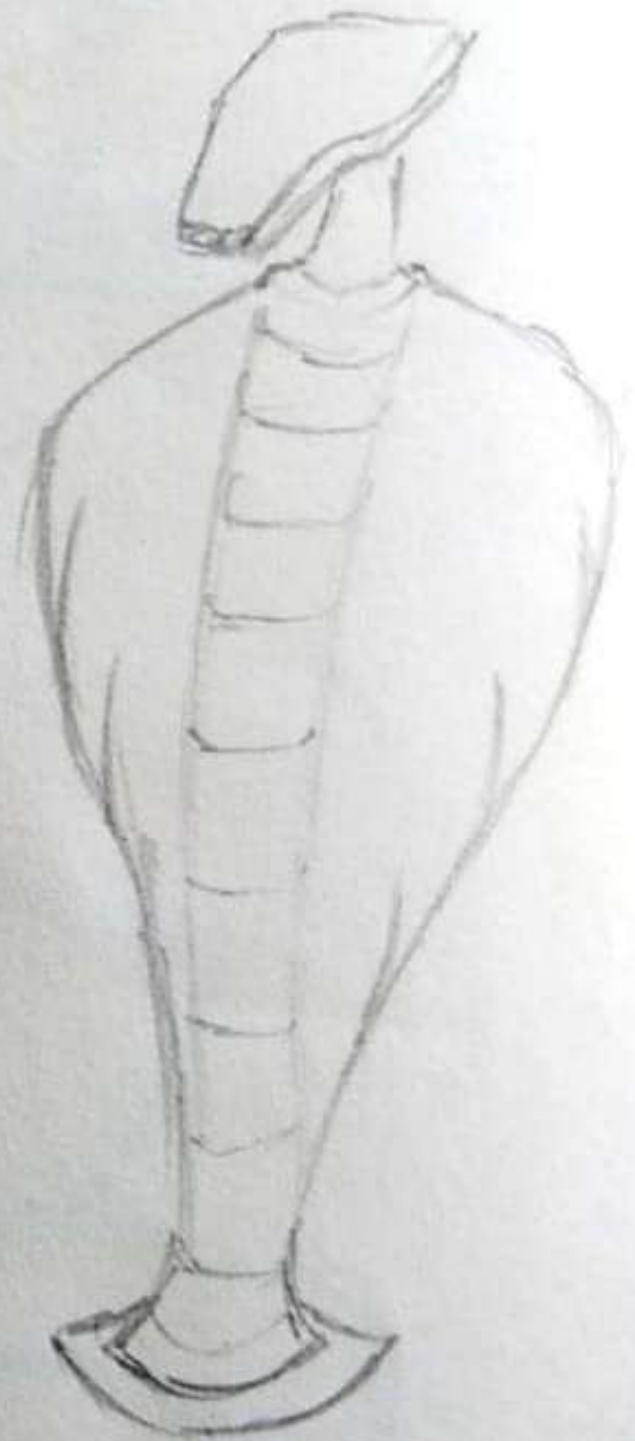
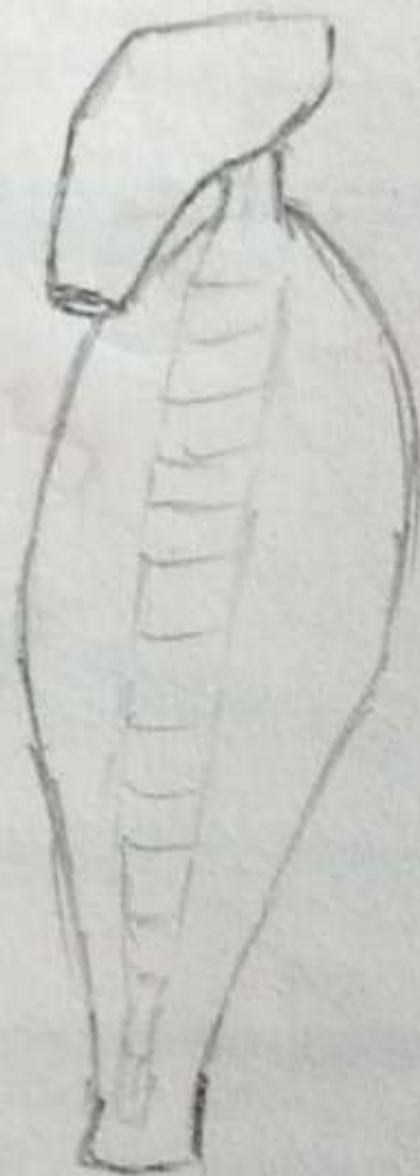


Giraffe

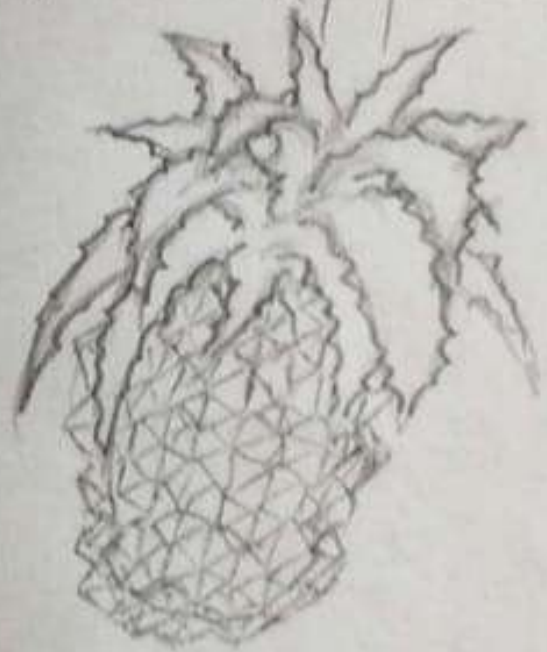


INSPIRATION FROM NATURE - MAMMALS

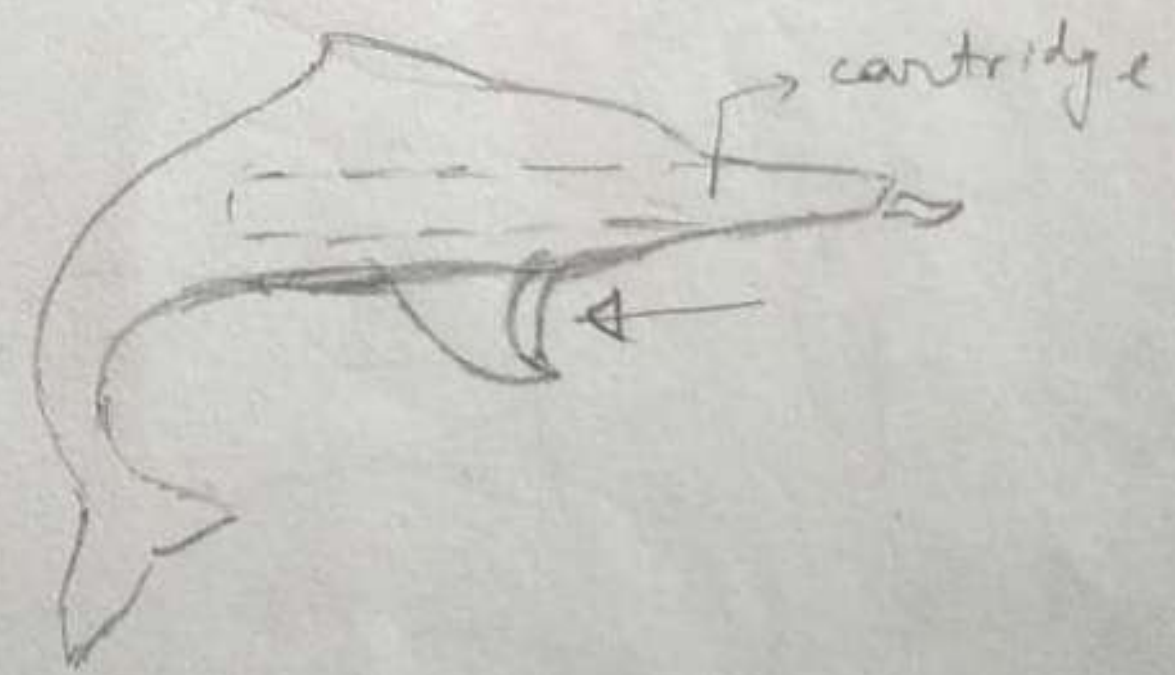
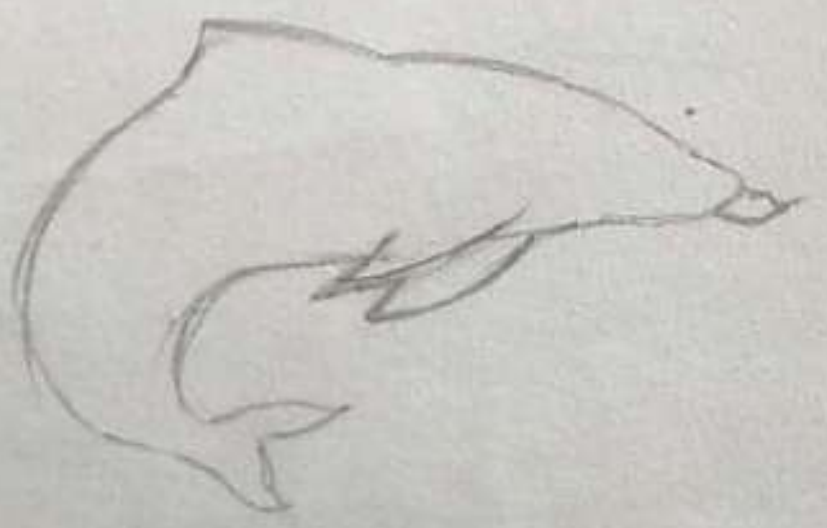
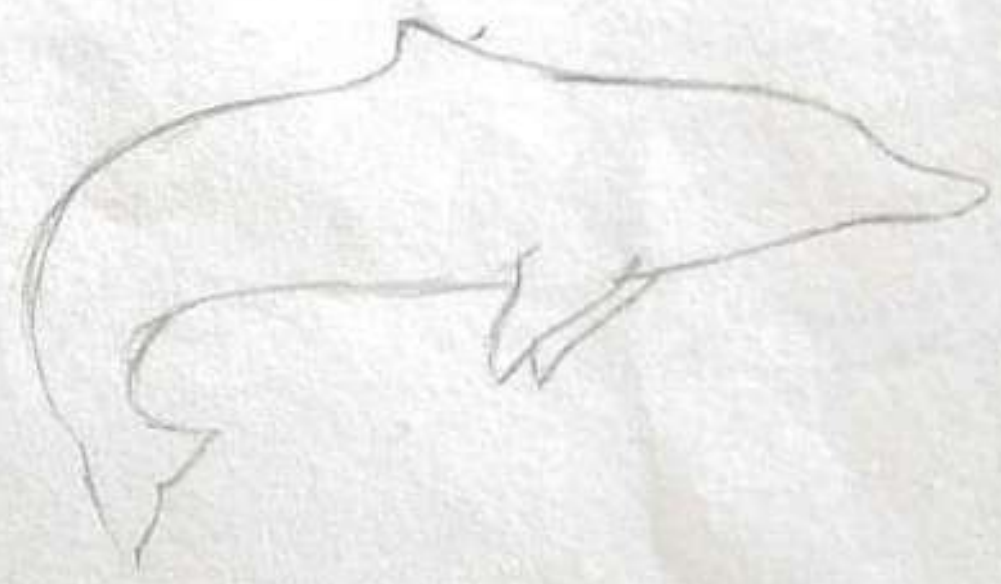
Reptile (snake)



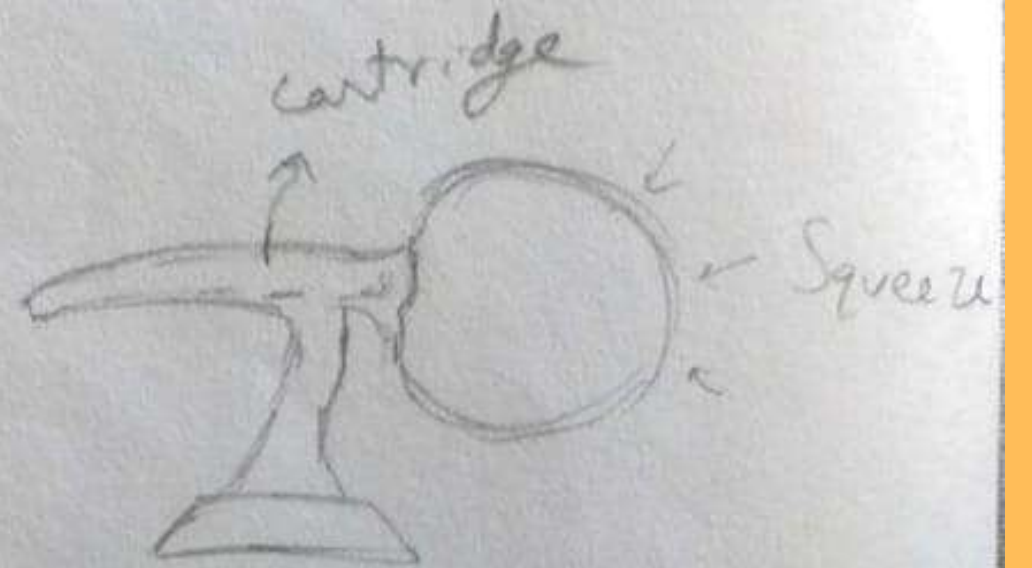
Pineapple



Dolphin



Mushrooms



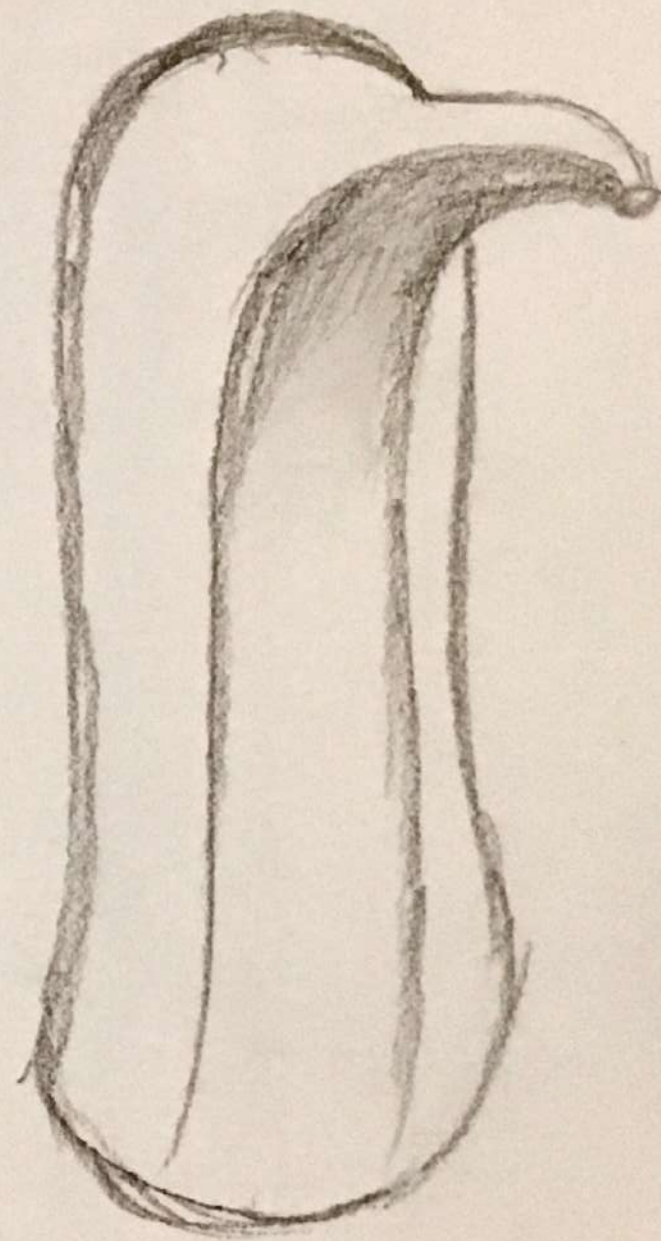
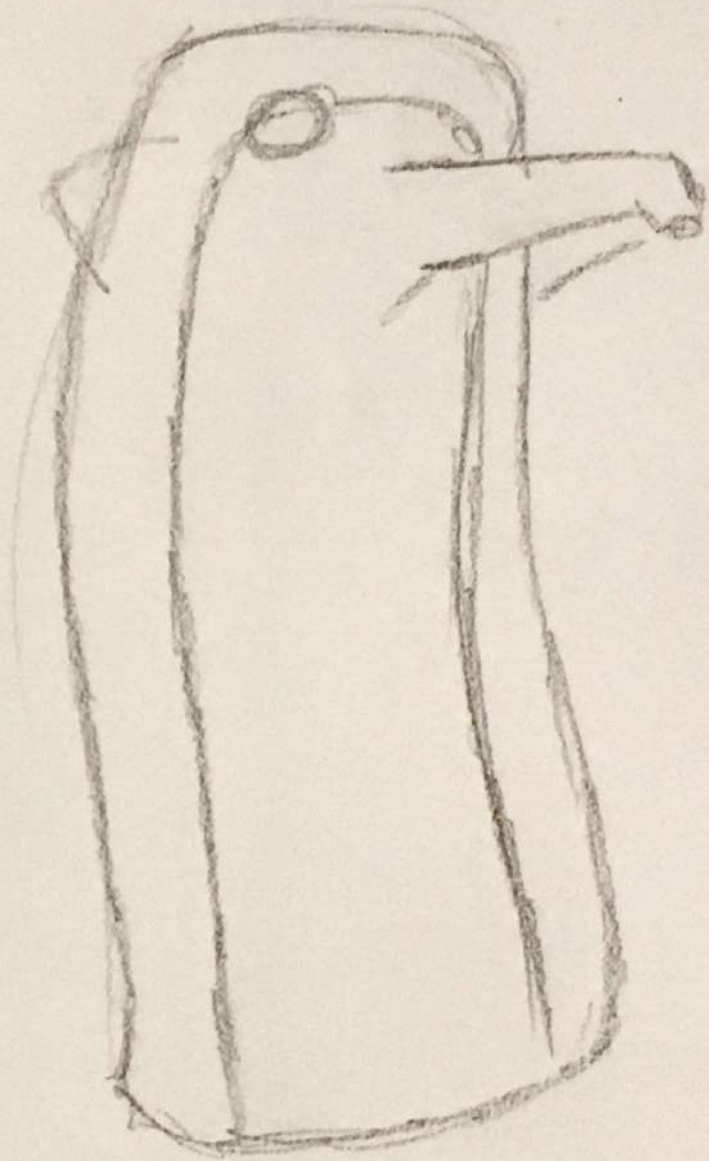
Mantis

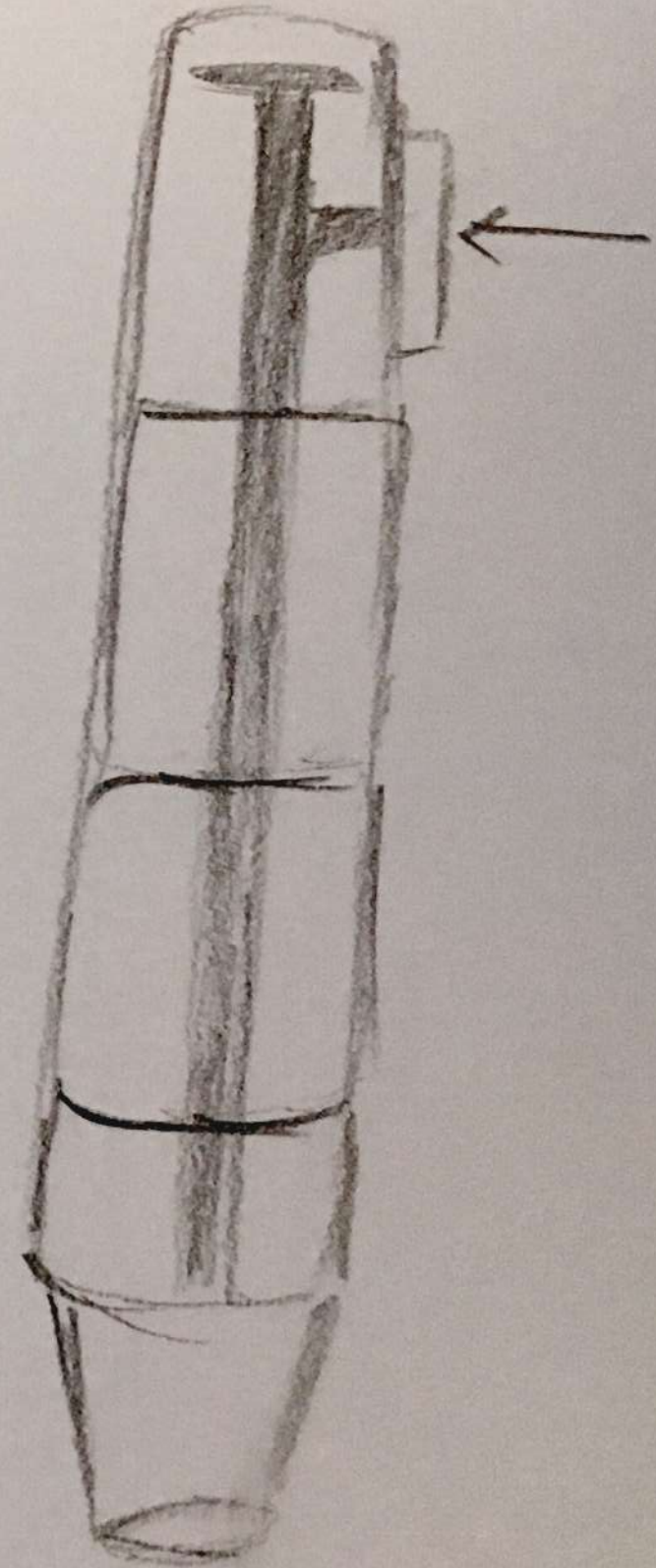
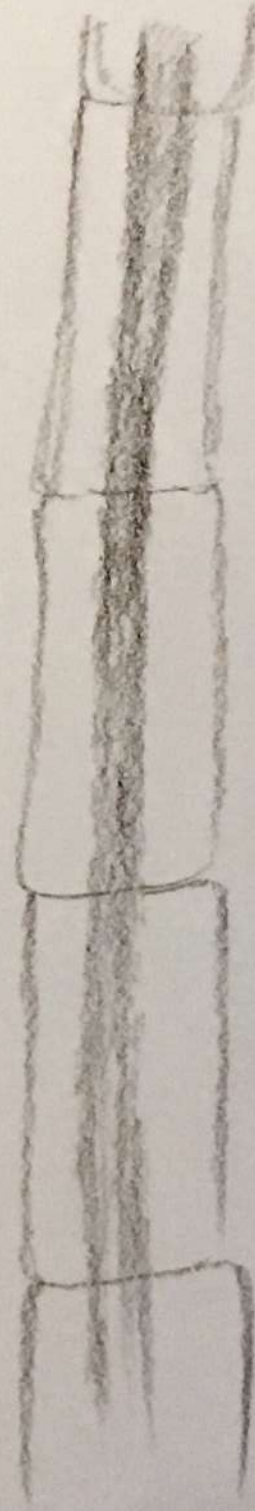
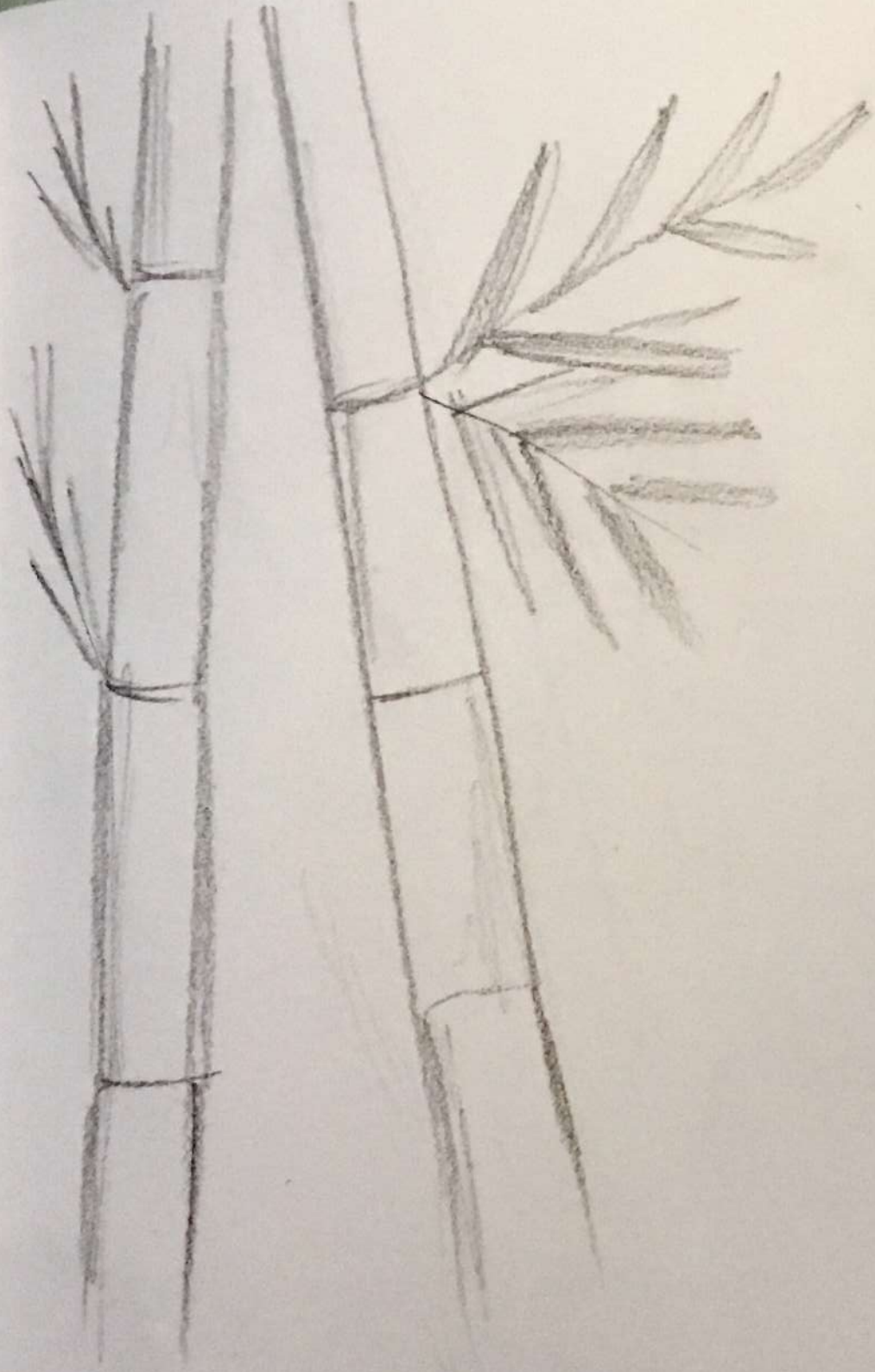
17-18



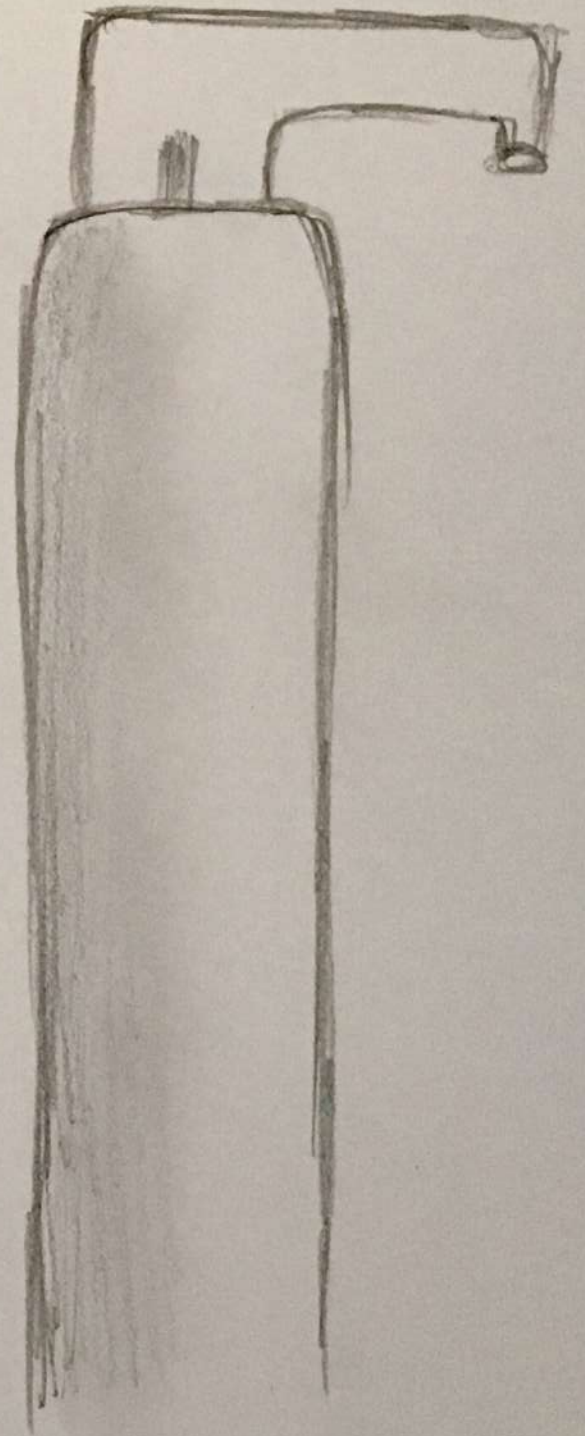
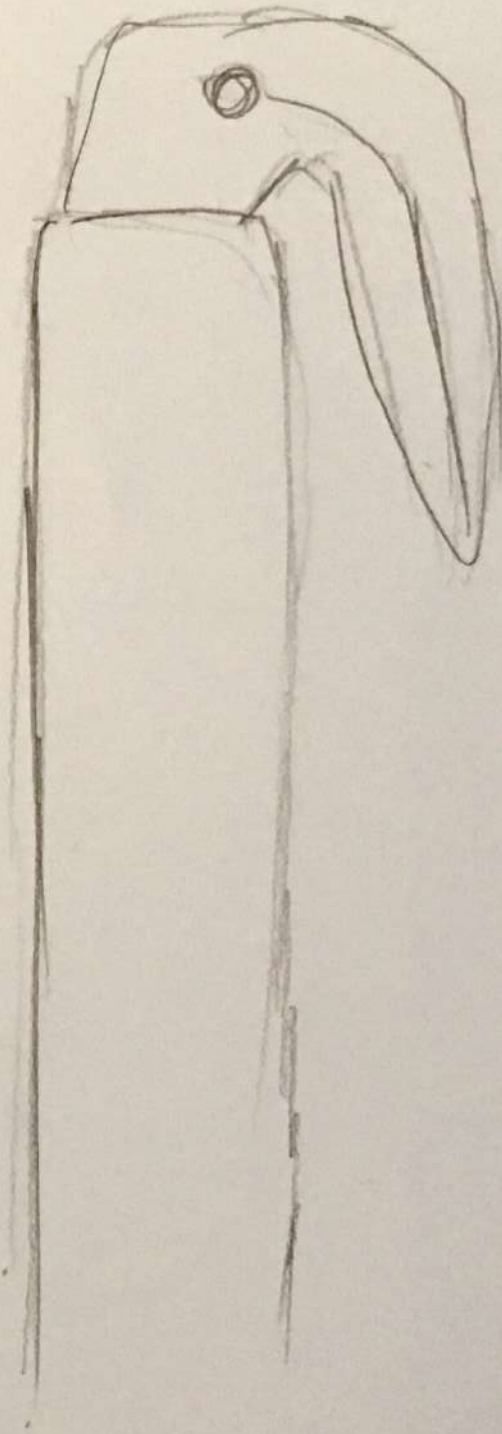
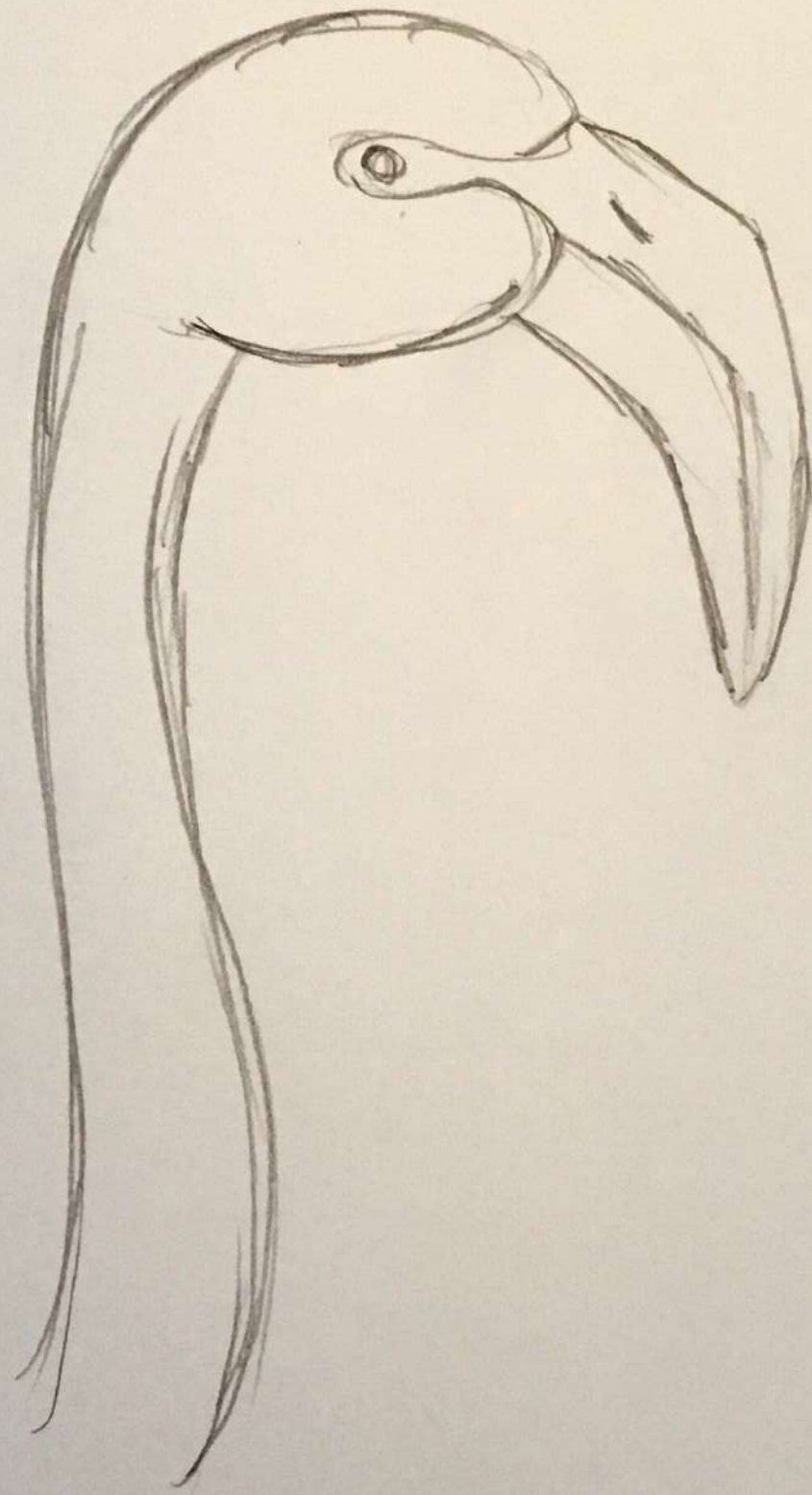


Otter

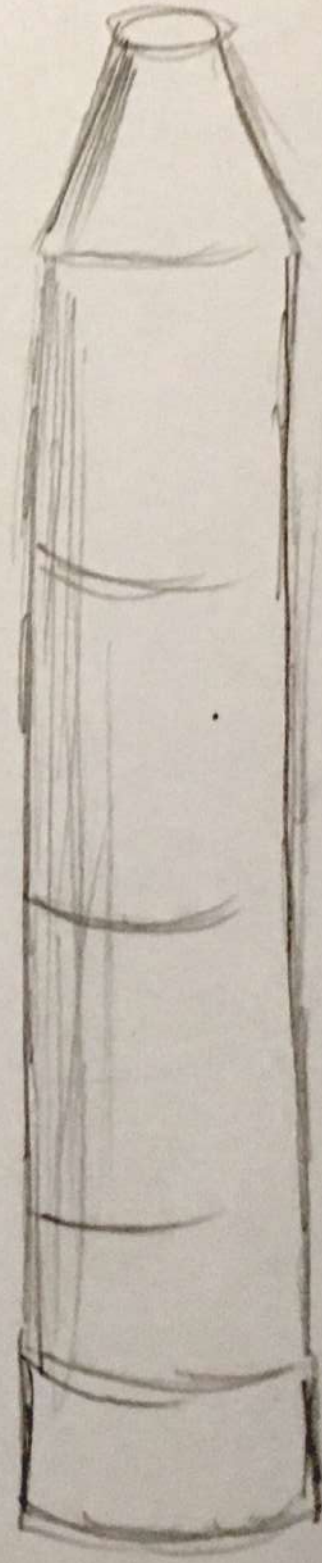
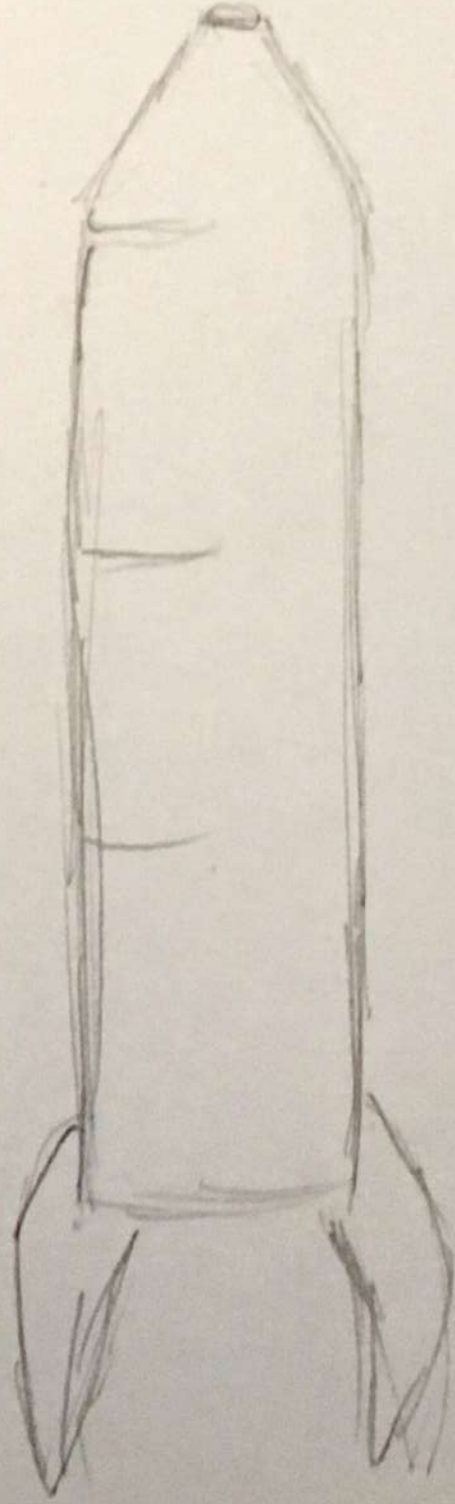
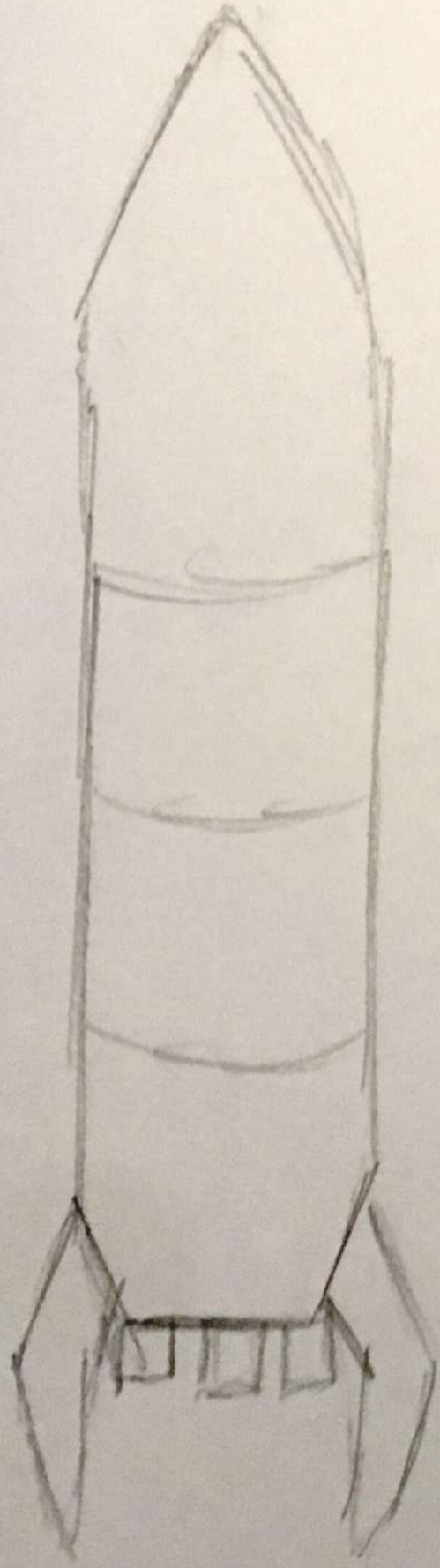




Bamboo



Flamingo

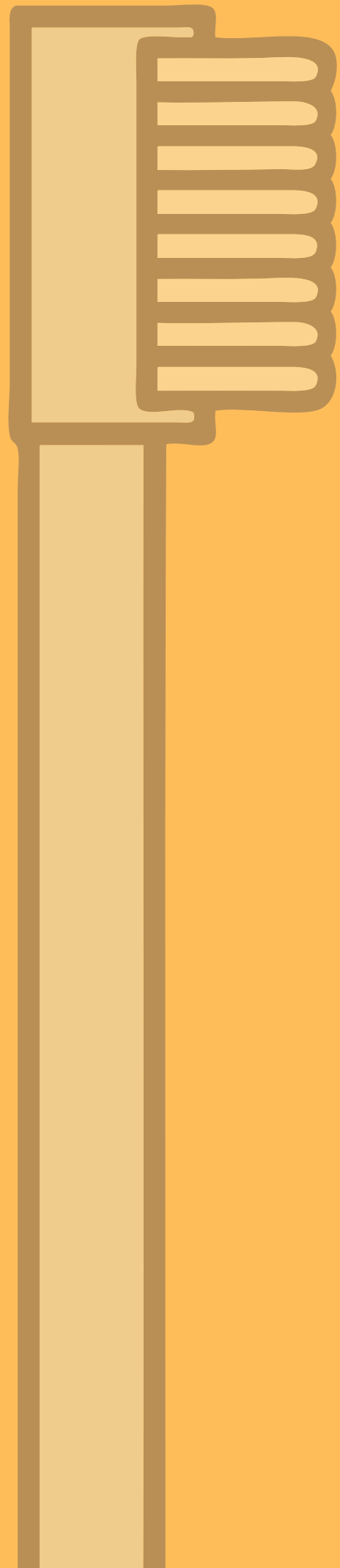


Rockets

Moodboard

TOOTHPASTE DISPENSER



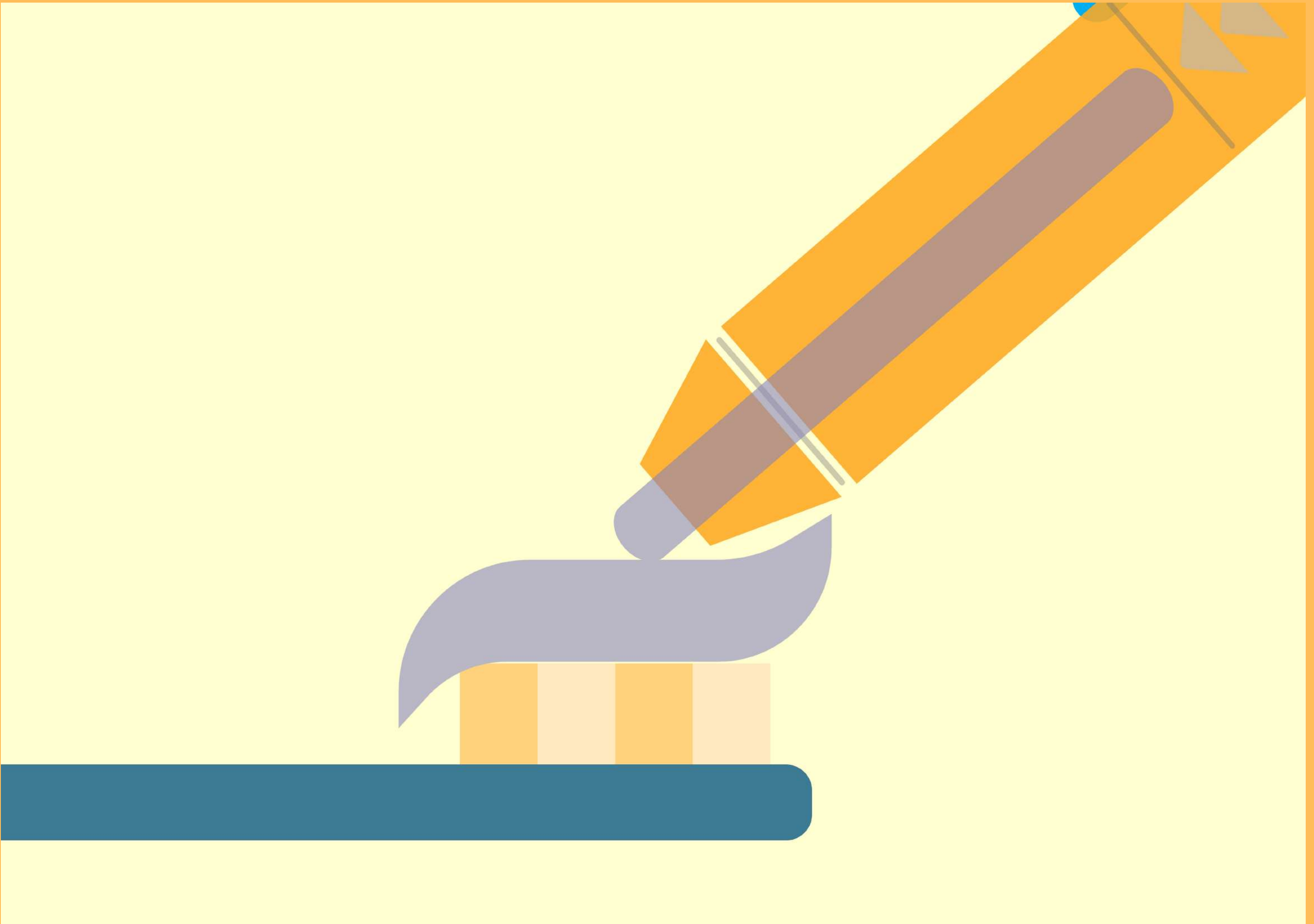


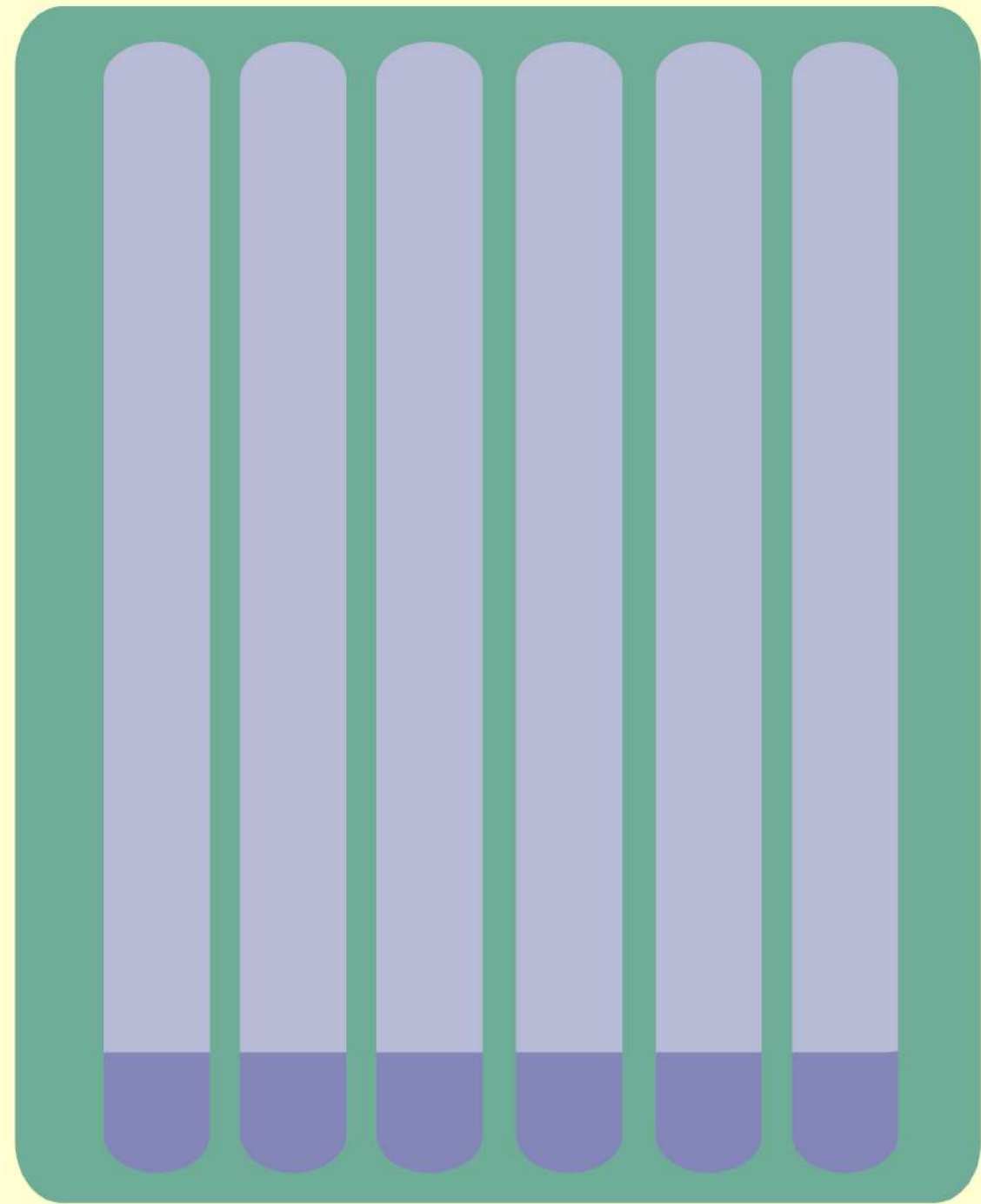
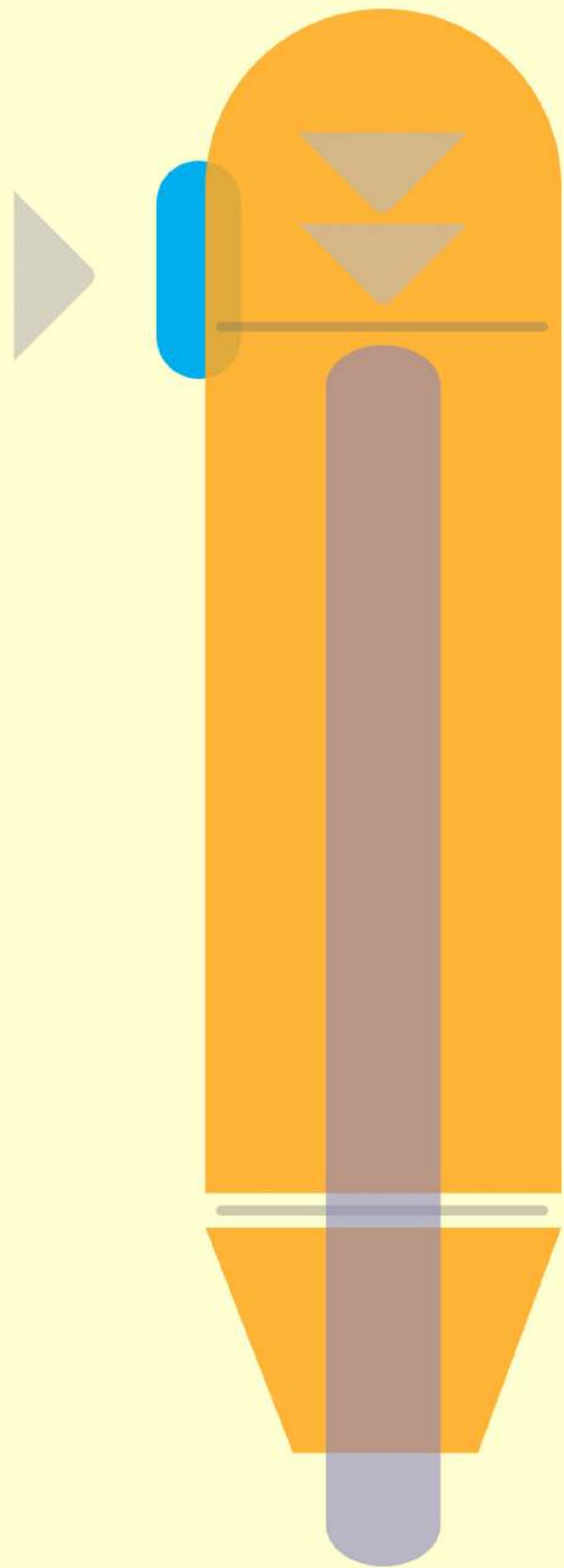
Consumption

- Dentists recommend that roughly 1 gram of toothpaste should be applied when brushing one's teeth.
- Based on the average density of toothpaste (1.33 g/L), this translates to around 0.75 mL per use.
- We decided to keep our toothpaste cartridges 2 cm in diameter and 10 cm in length for a total volume of 30 mL per tube.
- This volume of toothpaste would last for 40 uses, so a person who brushes twice a day could use just one cartridge for almost 3 weeks.

Mechanism

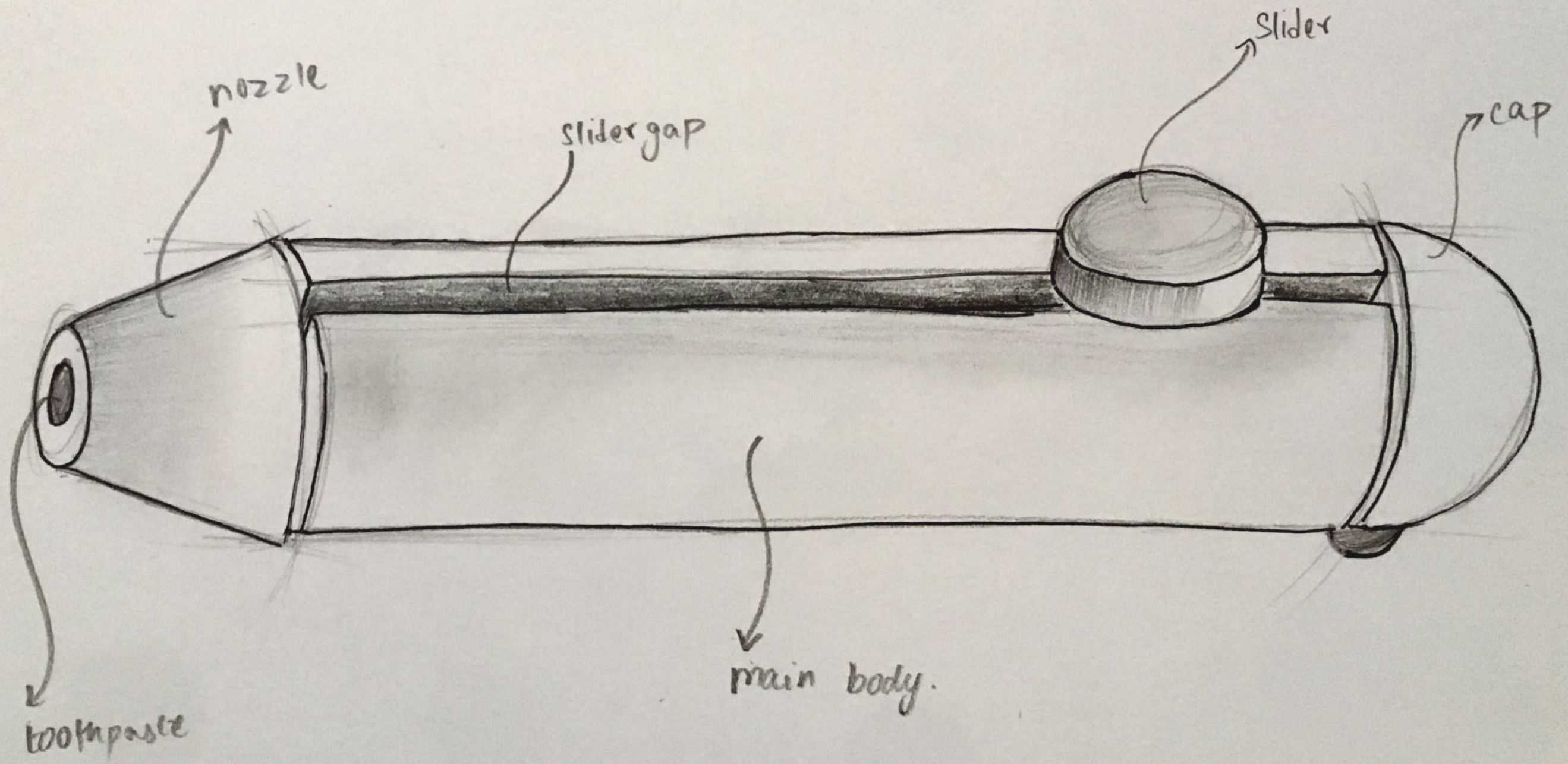
- A cartridge holder with a slider that pushes the paste out of the cartridge using a circular plate.
- The cartridge itself, with toothpaste wrapped in a bio-degradable material which slips into the holder.
- The tube has a smaller hole towards the nozzle so that the cartridge cover crumples against it and allows the paste to exit the tube.
- The nozzle can be removed to discard the used cartridge.

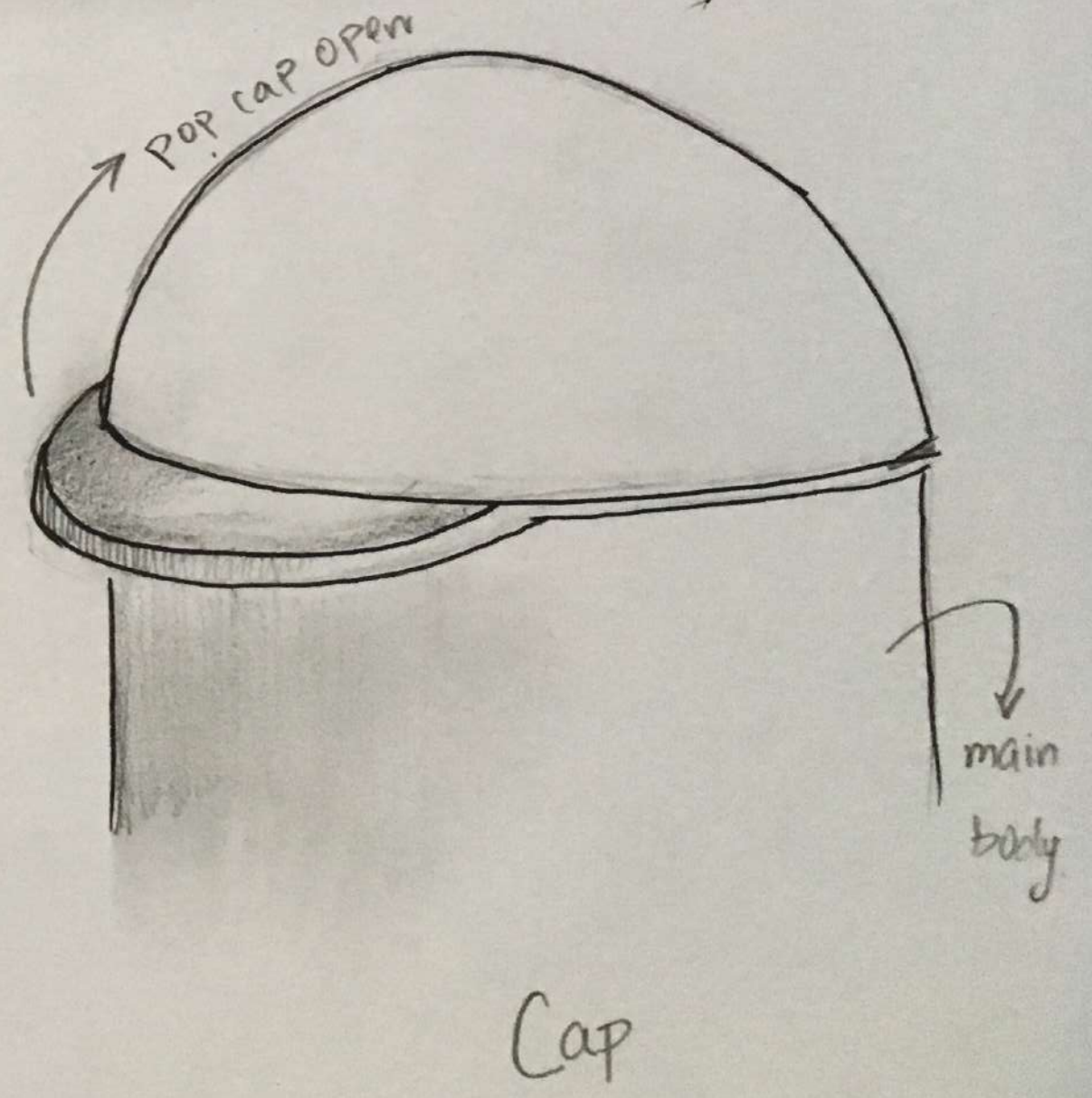
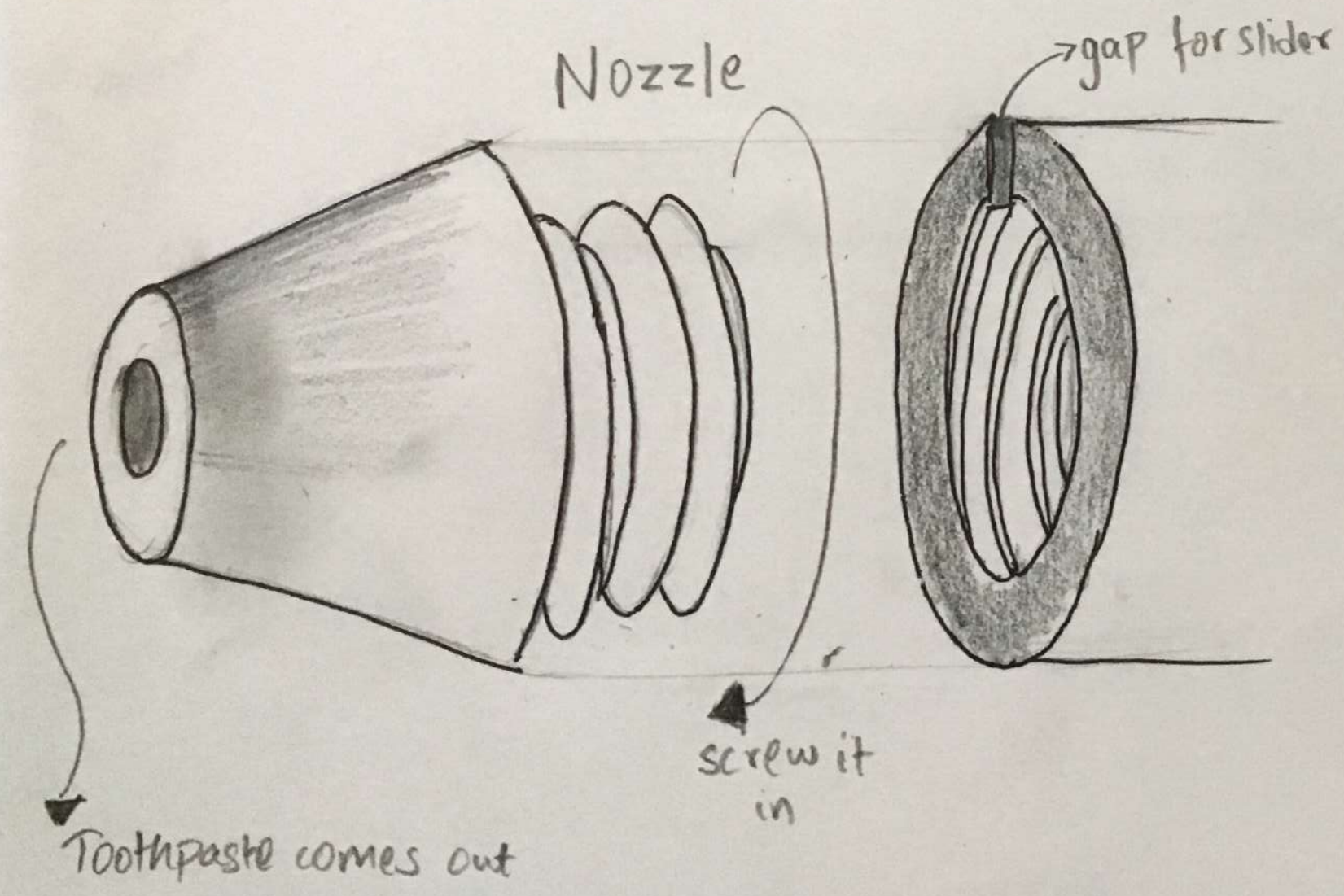
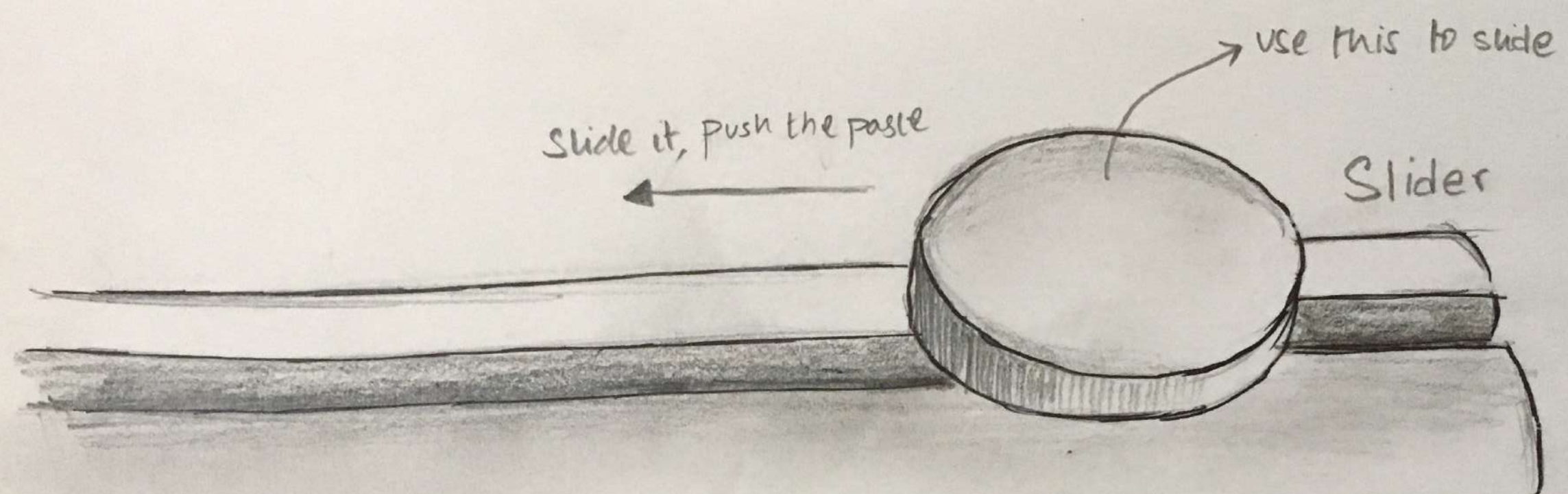


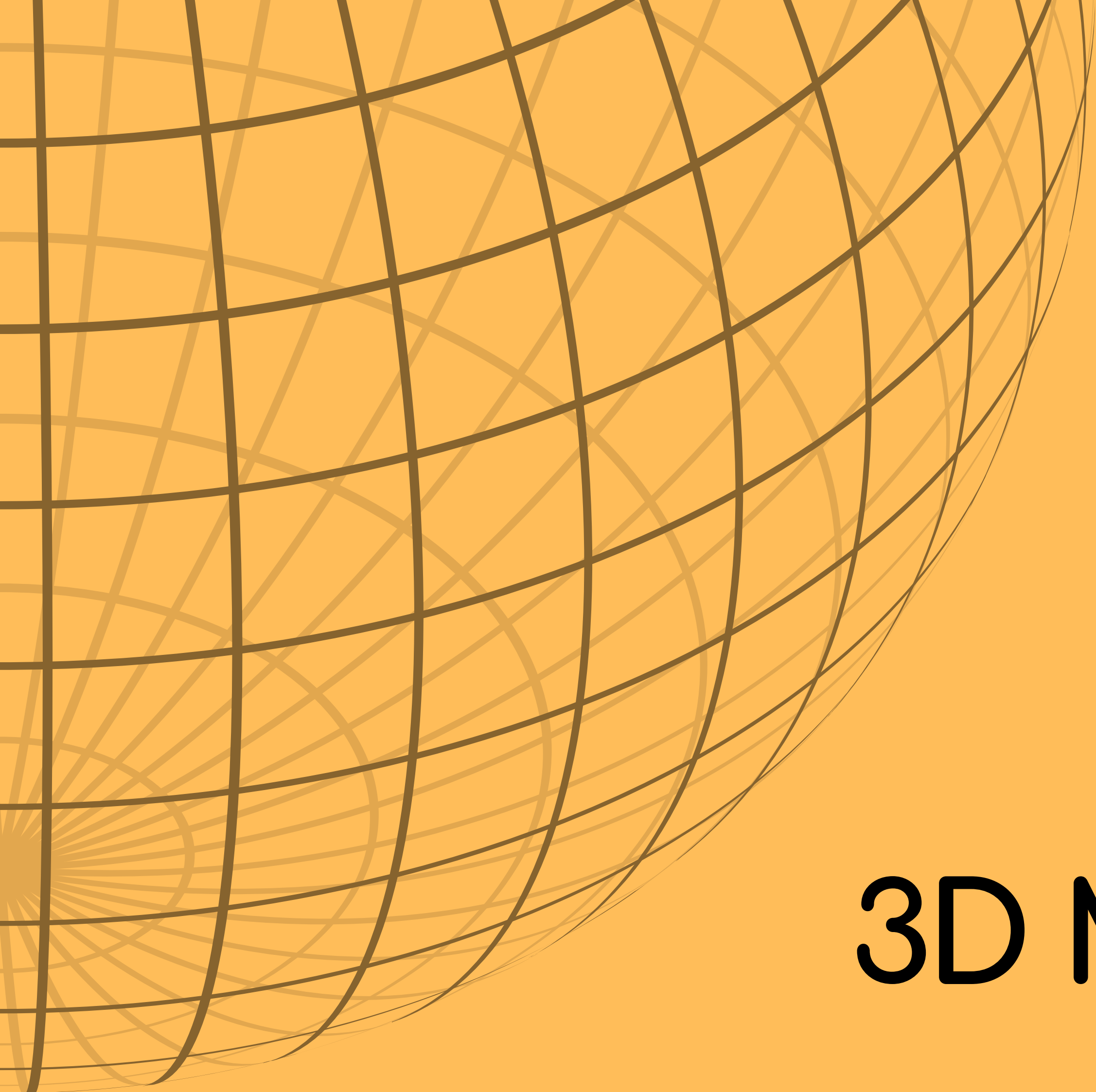


Toothpaste cartridges

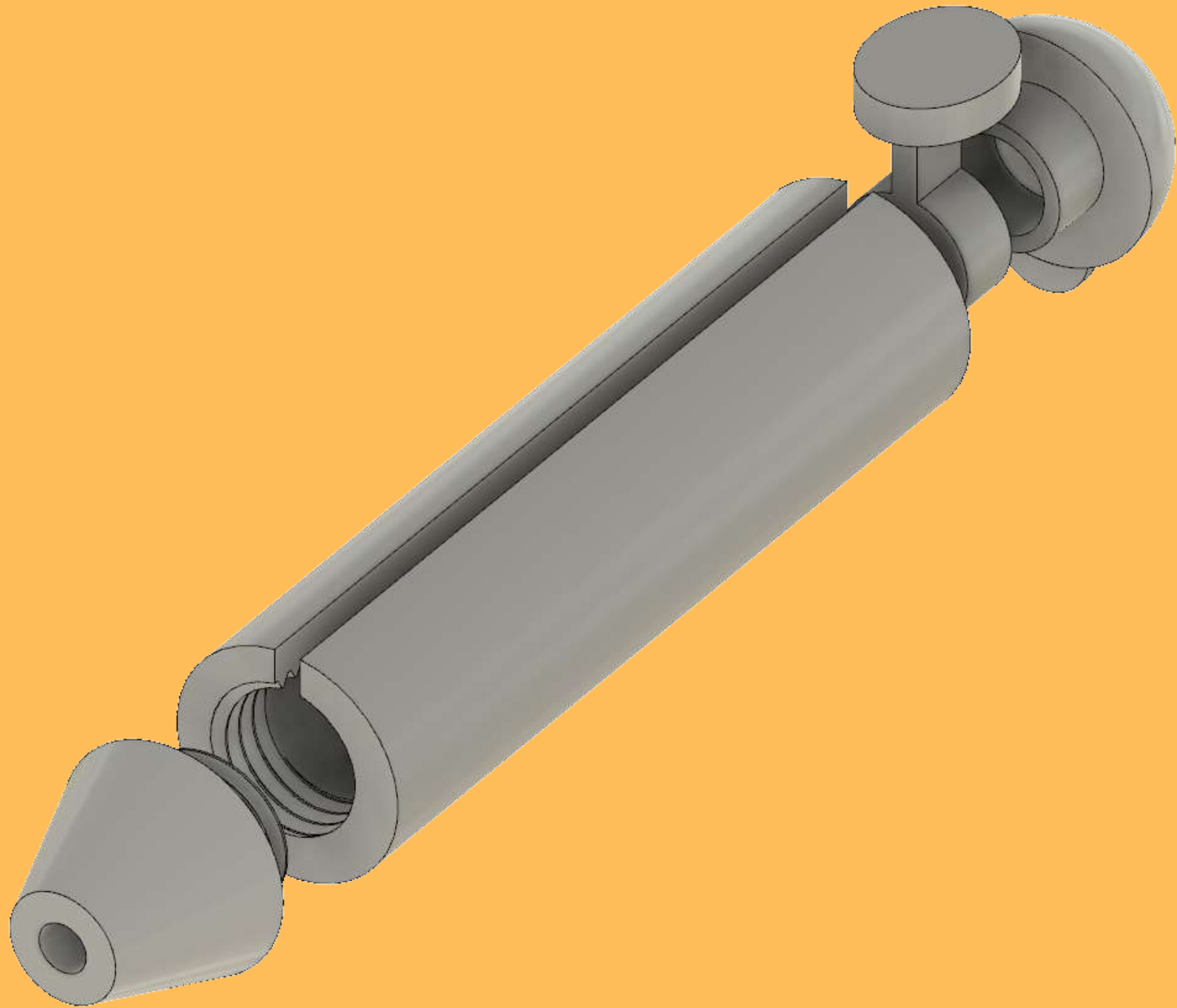
Final Concept

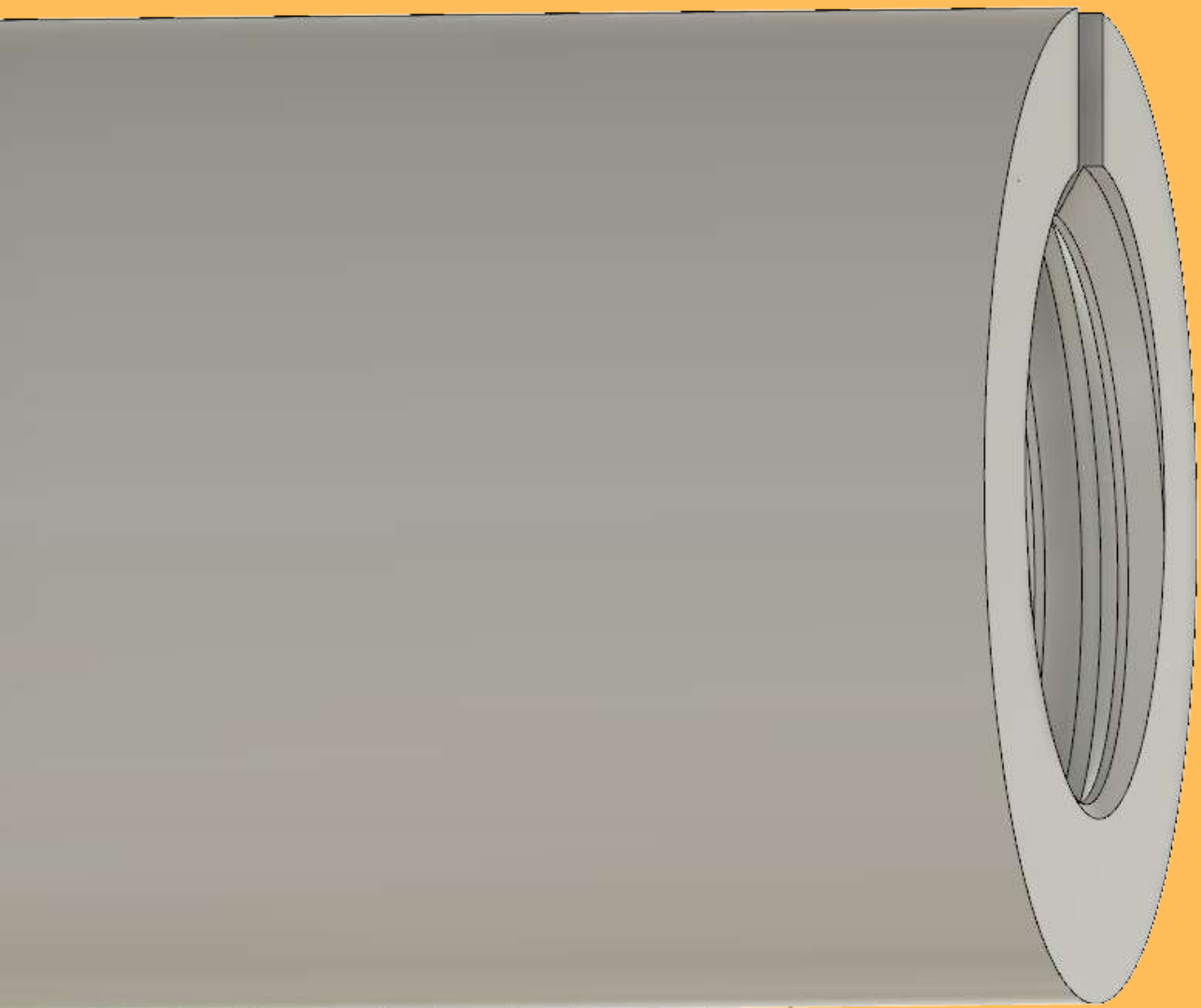


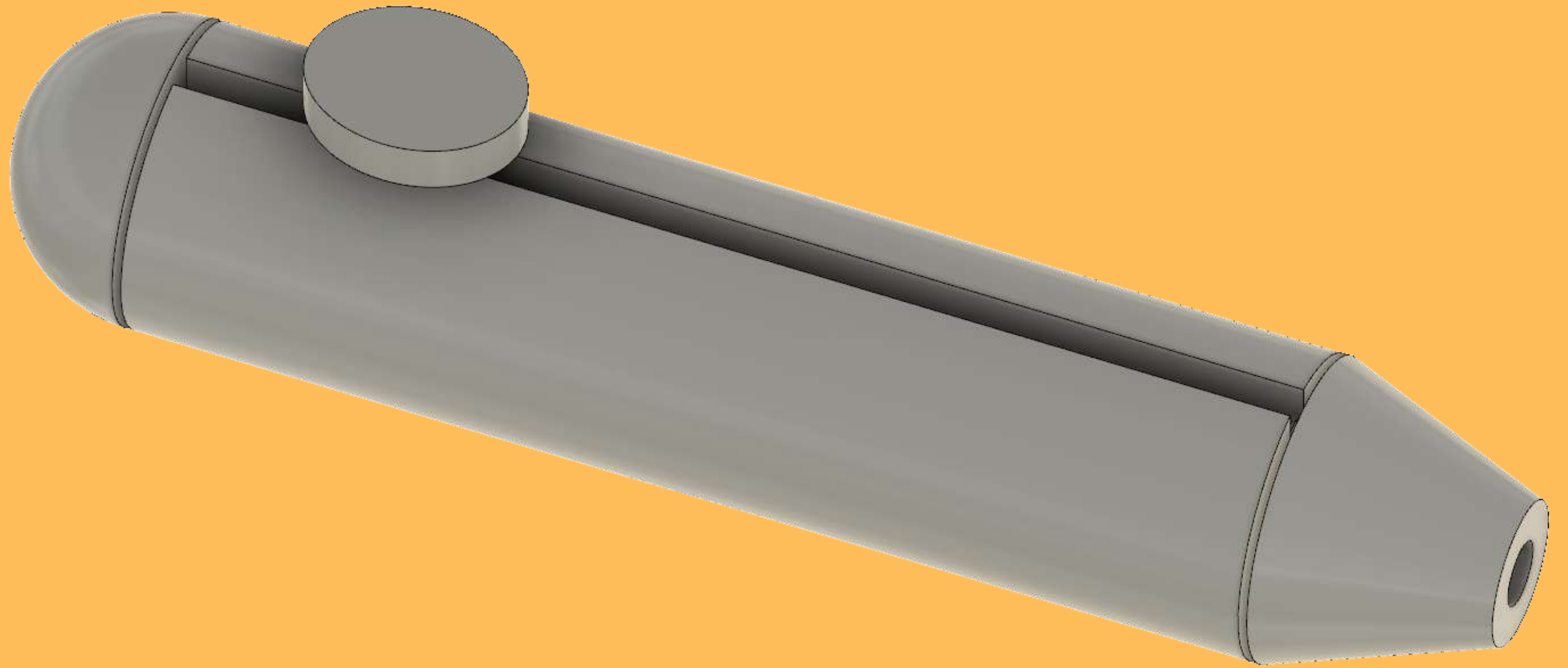




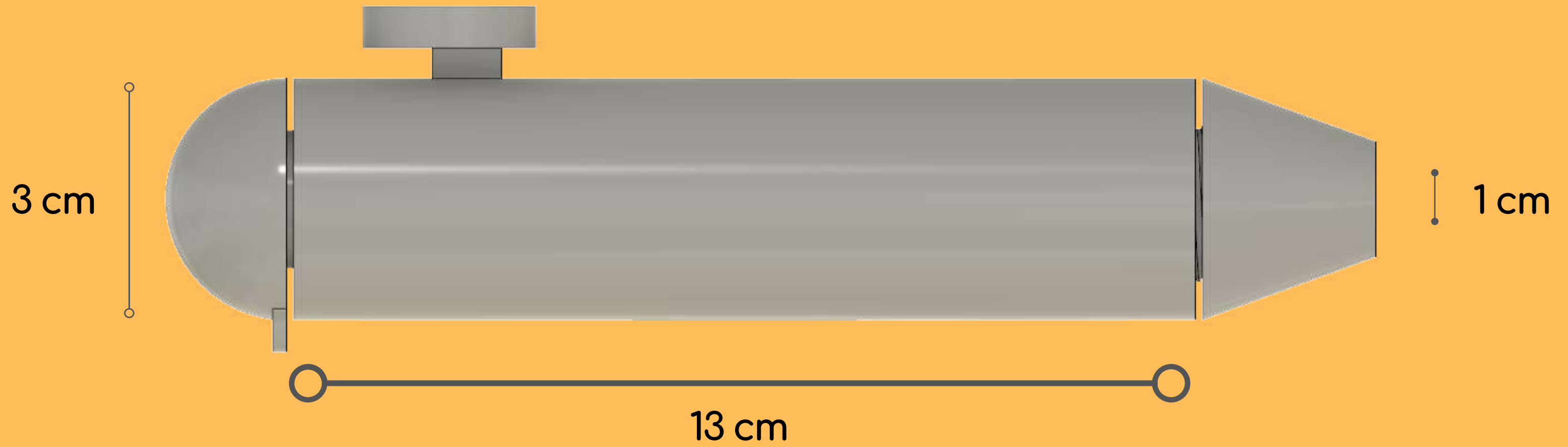
3D Model







Dimensions









Material

Comparison

LDPE (Low-density poly-ethylene)

- Less dense, soft and flexible
- Less tensile, but more ductile
- Plastic bottles, caps, bags
- Inexpensive
- Non-biodegradable

HDPE (Low-density poly-ethylene)

- High density, hard and brittle
- More durable
- Plastic bottles, buckets
- Slightly expensive
- Non-biodegradable



Comparison

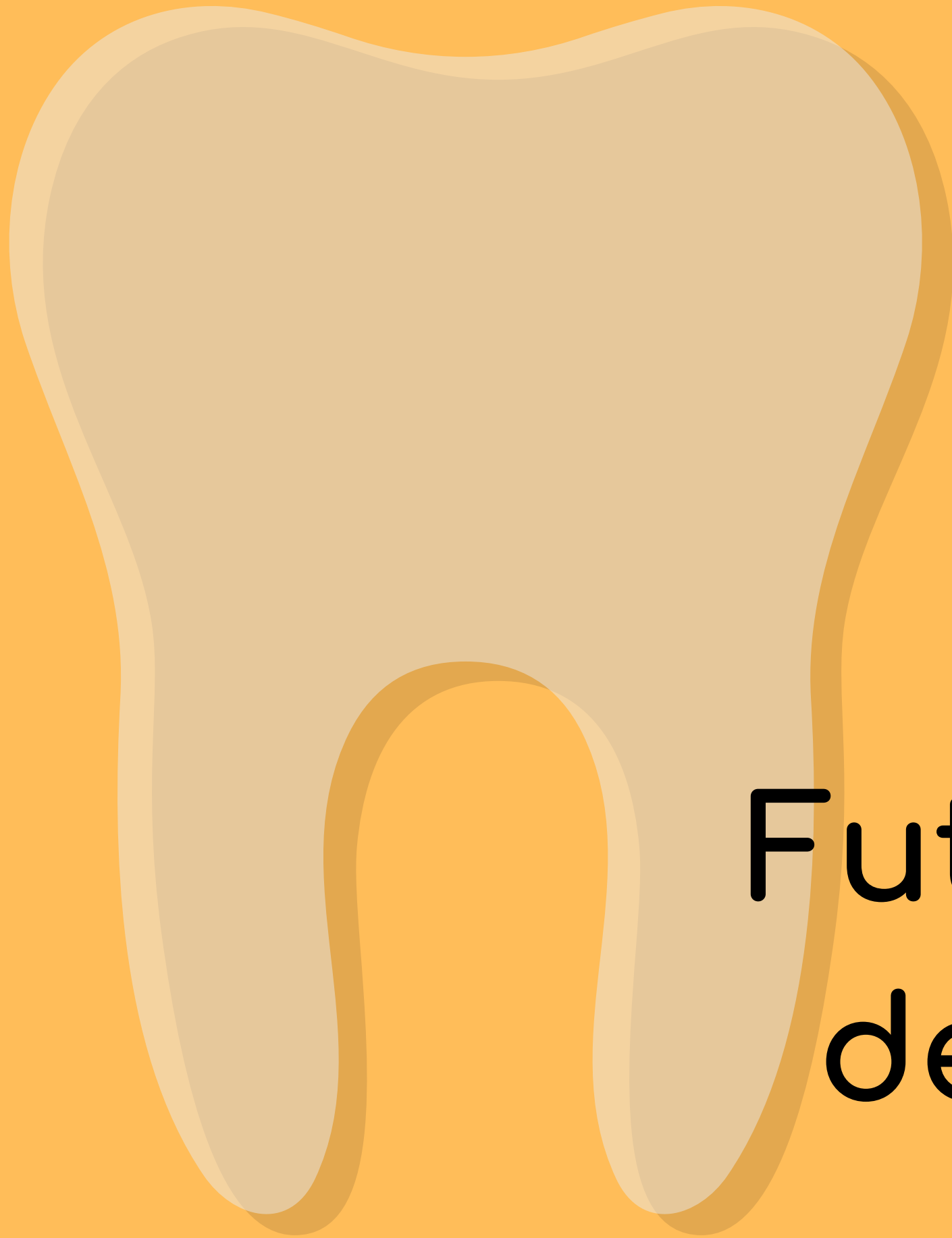
Bamboo

- Natural
- Bio degradable
- Inexpensive
- Hard to mass manufacture

Poly-lactic Acid (PLA)

- "Bioplastic"
- Made of corn starch and sugarcane
- Bio-degradable
- Looks and feels just like plastic





Future trends in
dental hygiene

- Liquid adhesive material which can wash out particles and plaque
- Gel pods which dissolve in the mouth and release a cleansing solution
- Ultrasonic vibration pulses can loosen foreign particles accumulated in the mouth

<https://www.planetdds.com/blog/the-future-of-toothpaste>

<https://www.scienceworld.ca/blog/how-do-ultrasonic-teeth-cleaners-work>

Thank you