

frolicking egg is a 3D puzzle developed under the following criteria:

- Fits within a volume of 10 cubic inches
- Composed of 4 interlocking pieces
- Contains a hidden volume for storage

What made this challenge especially interesting was the search for a theme or implicit narrative that “justifies” the geometry of the product.

There are plenty of puzzles of this kind that present themselves solely on the merits of the spatial challenge they offer - this attempt seeks to offer something new.





CASE STUDIES I: OBJECTS

RETICULATED SPHERE | COLLAPSIBLE LANTERN | GLASS ARMONICA



RETICULATED SPHERE

ORIGIN: CHINA
DESIGNER: TRADITIONAL ARTISANS
MATERIAL: IVORY (sometimes jade)
DATE: 14th CENTURY ONWARDS (or earlier)

These puzzles involve rotating the inner spheres in order to make all apertures align. They were usually ornamental, as attempting to solve them can easily damage them.

I admire the simplicity of the puzzle, the fact that it need not rely on trial and error, and its integration of form with function.



COLLAPSIBLE LANTERN, "SOUL CELL"

ORIGIN: SWEDEN
DESIGNER: JESPER JONSSON
MATERIAL: CANVAS, PLASTIC
DATE: 2011

This lantern design embraces the material traits of the fabric that acts as the shading element via its collapsible design, leading to added functionality.

The Soul Cell's contribution to the ideation process is general: I wanted to find a way to design function into the puzzle.



GLASS ARMONICA

ORIGIN: USA
DESIGNER: BENJAMIN FRANKLIN
MATERIAL: GLASS, CORK, WROUGHT IRON
DATE: 1761

The glass armonica was invented by Benjamin Franklin to "instrumentalize" singing wine glasses. By rotating the central shaft and wetting the bowls, it can be played similarly to a piano.

I took a look at these after deciding I wanted to incorporate sound. I am drawn to its tone, and admire the elegance of the solution.

CASE STUDIES III: PROCESSES

IMPLICATE/EXPLICATE ORDER | HOLOGRAMS AND ANALOG SOUND

IMPLICATE | EXPLICATE ORDER

Implicate/explicate order is a concept developed by physicist David Bohm to resolve strange observations in quantum mechanics. As I was thinking about ancient tools, I was reminded of the idea.

While the mathematical justifications are not accessible to me, the concept is that phenomena in the universe may be modeled as abstractions of a unified phenomenal ontology at a "deeper level" of reality: the "implicate" or "enfolded" order.

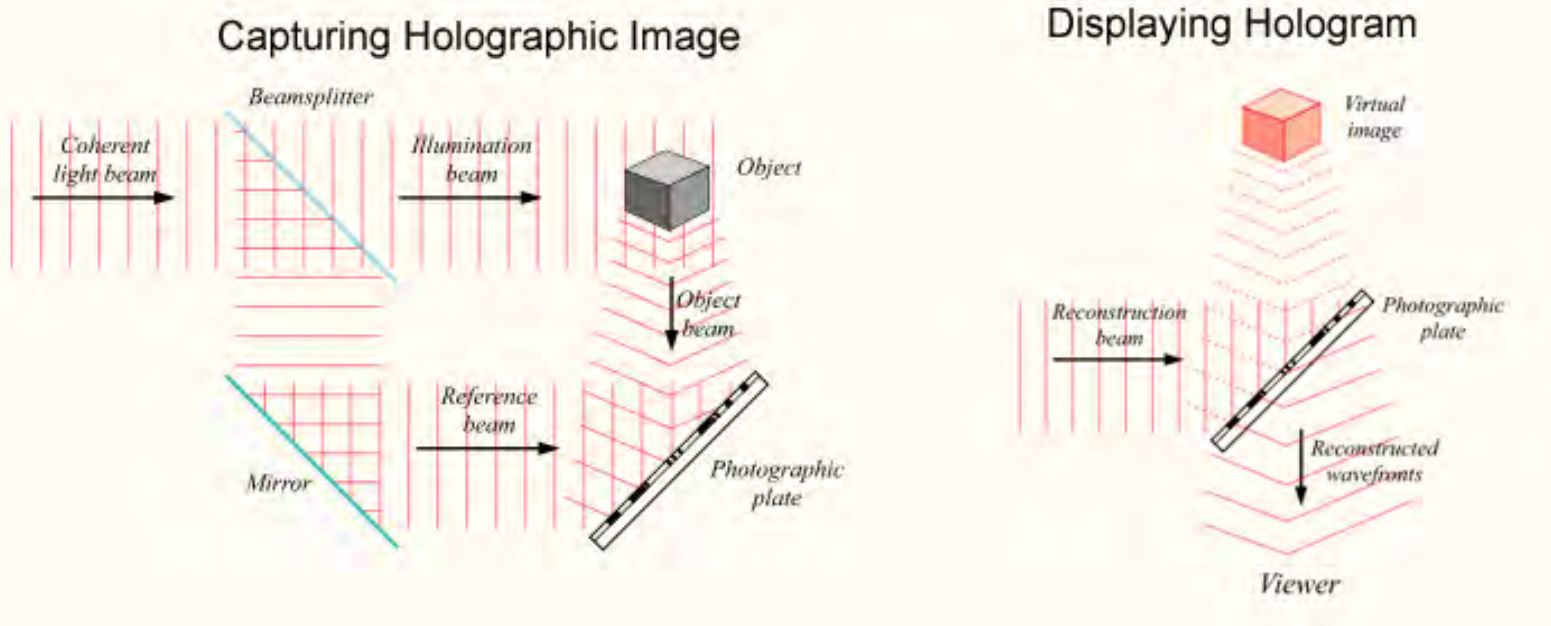
This relationship between two levels of information struck me as an interesting theme for a 3D puzzle.

ANALOG SOUND AND HOLOGRAMS

Holograms are one way to think about the relationship between an implicate and explicate order. 3D image information is encoded onto a 2D substrate, which can then be activated to project the 3D image - but no matter how real the image appears, it is ephemeral in comparison to the coding on the substrate.

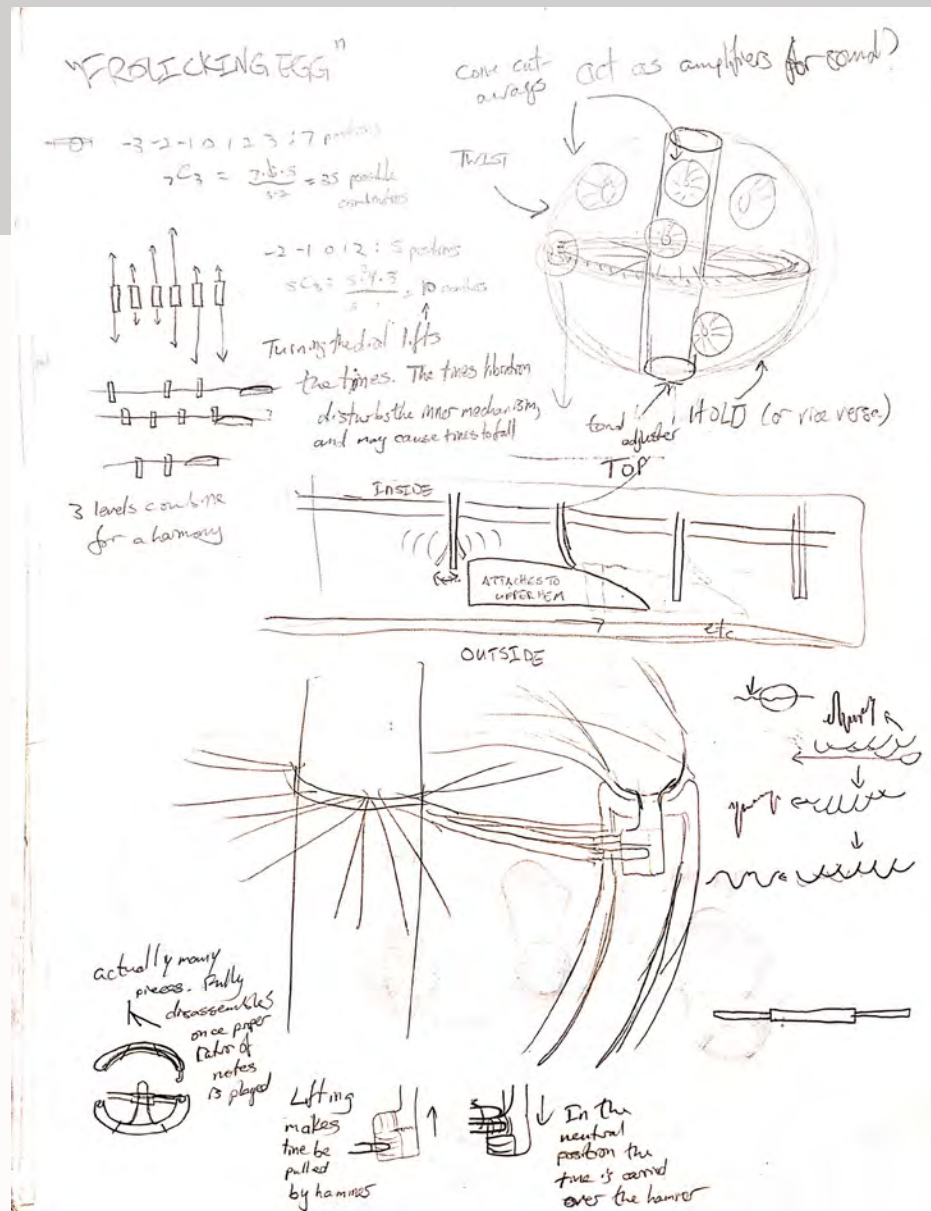
There is a similar relationship between vinyl records and sound waves. Analog sound recording is essentially the engraving of the shape of a waveform itself onto a physical medium. The recorded wave can be "induced" by using a needle to create vibrations "shaped" by the etched channel.

I started thinking about a puzzle design that has layers of meaning or information. The puzzle would have an "explicate" interface with an "implicate" logic that cannot be directly accessed. I liked the idea of using sound - given its transience - as the bridge between these levels.



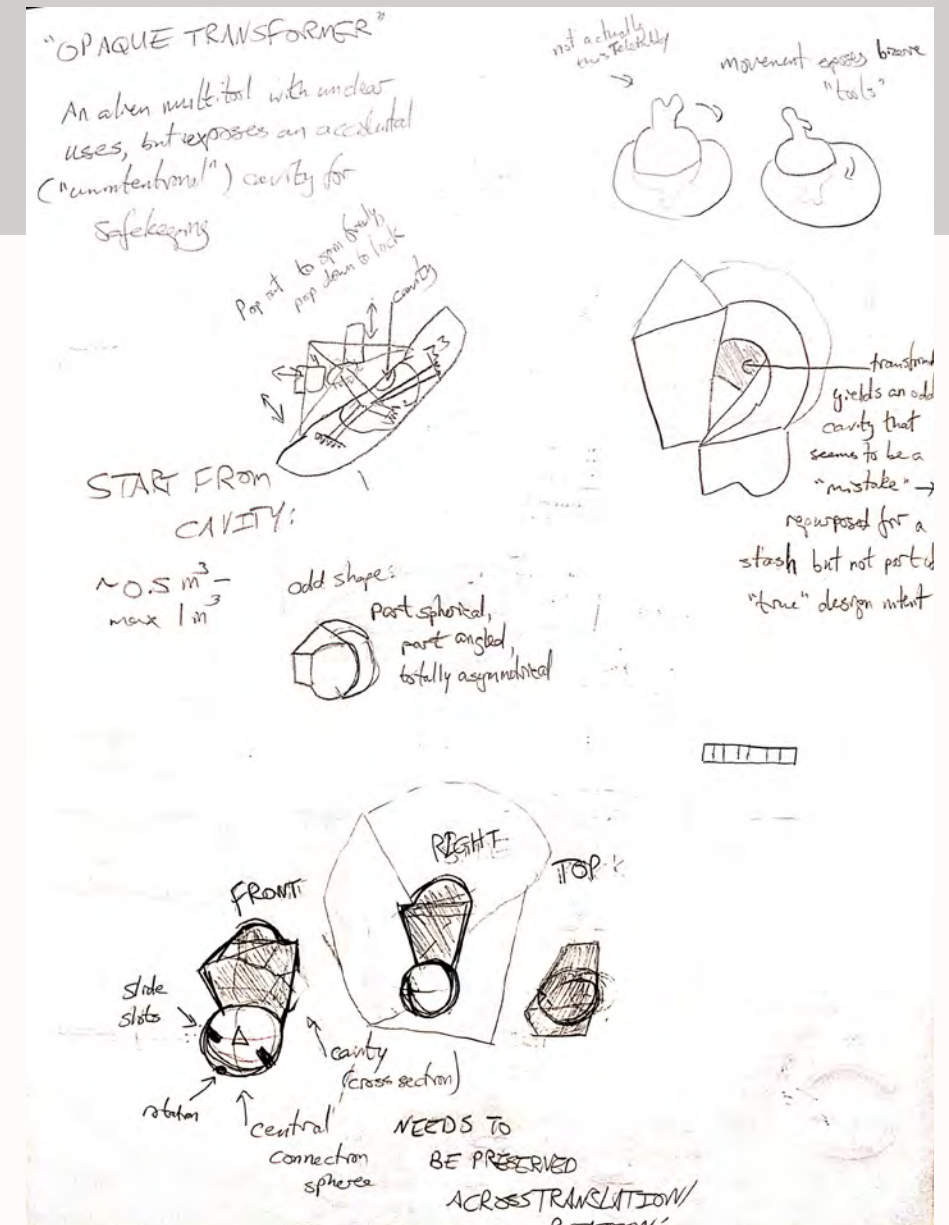
DESIGN IDEATIONS

i. frolicking egg



frolicking egg is a sound-based puzzle with two interlocking hemispheres with free rotation. When the top hemisphere is rotated, tones are produced from parts attached to the central pillar. Playing the proper sequence unlocks the hemispheres via a central mechanism.

ii. opaque transformer

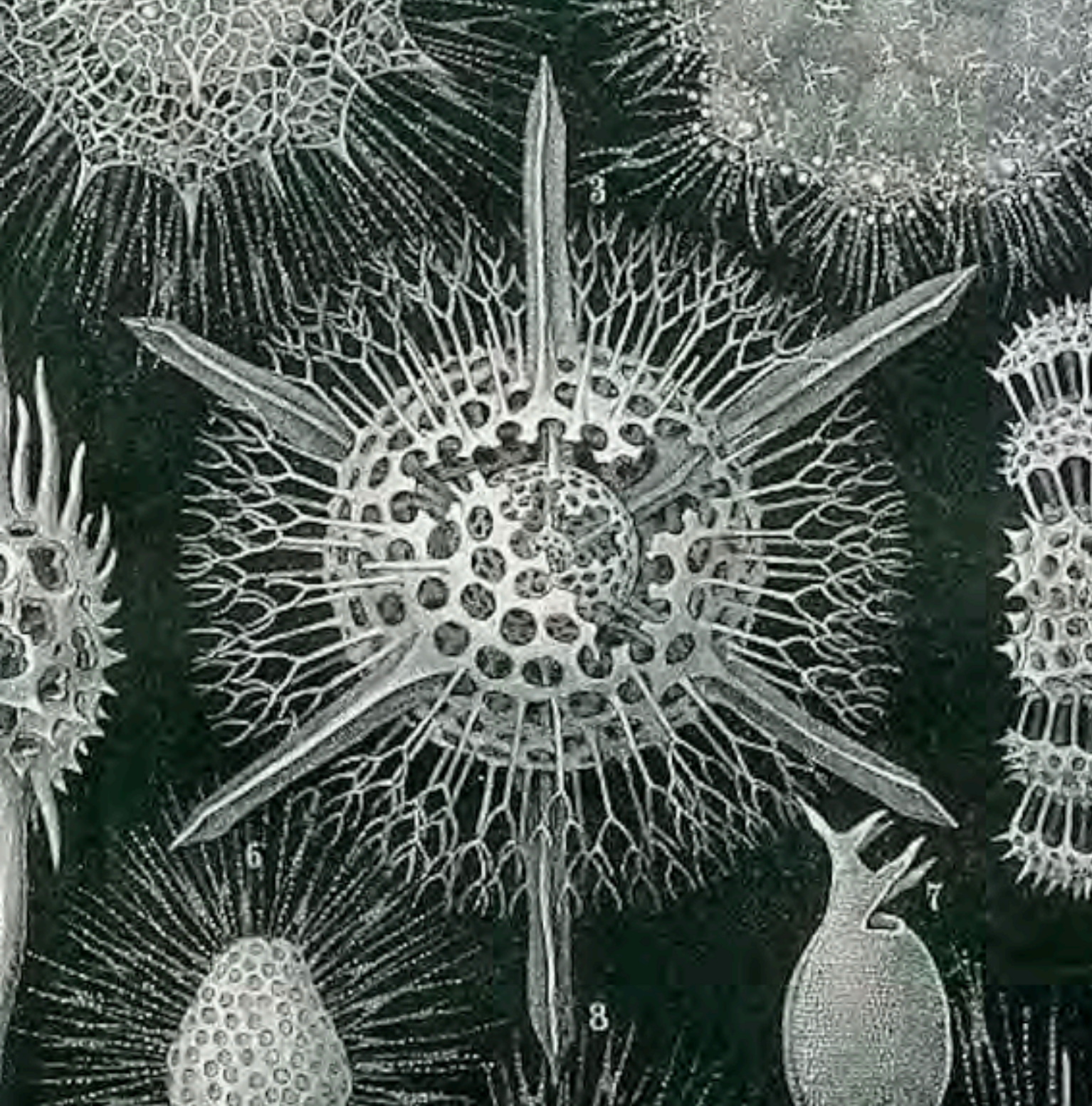


opaque transformer is a block-based puzzle with a number of obscure features that present as tools for an inscrutable purpose, to be used by some (non-human?) user. A cavity is revealed by finding the right parts to revolve and position, but its ugly asymmetry suggests it was never part of the original intent.

INTERESTS | AIMS | DESIGN INTENT

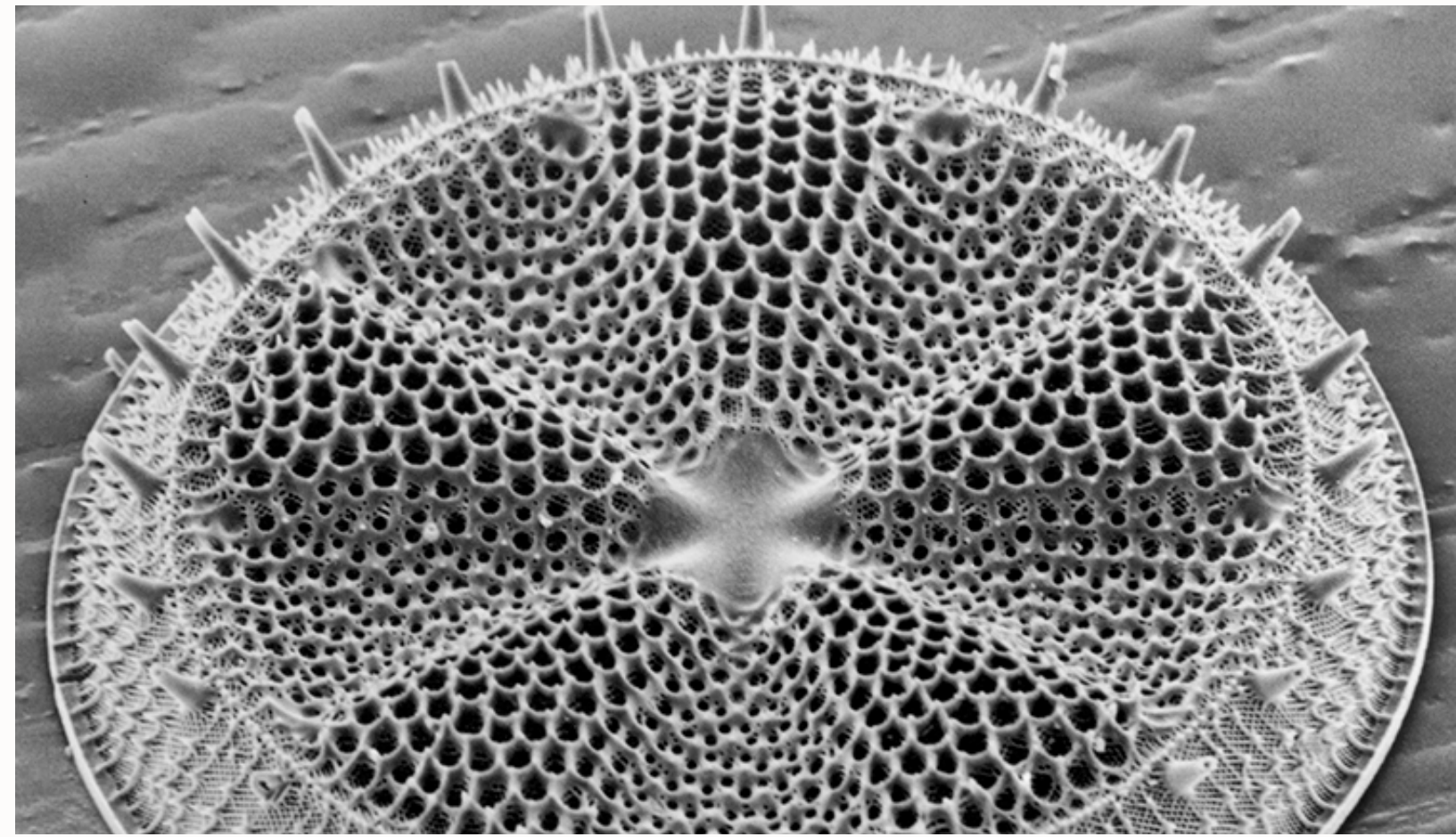
- +ALTERNATIVE FUNCTION OR IMPLIED FUNCTION
- +SOLUTION HAS NO GUESSWORK OR IS A DISCOVERY PROCESS
- +SENSE OF MYSTERY OR OF THE UNKNOWN

- +PARSIMONY OF FEATURES (FORM/FUNCTION UNITY)
- +VISUALLY INTRIGUING
- +PROPERLY SATISFIES ALL CONSTRAINTS



frollicking egg

Formally, frolicking egg draws heavily from the Chinese reticulated sphere puzzle. The strange organic appearance of the spheres is reminiscent of diatoms, radiolaria, and other unicellular organisms with patterned "skeletons." Not only might these patterns be used as geometric inspiration, but the holes might potentially be engineered as "speakers" to amplify the sound by forming them into cones from the interior to the exterior.



USER PROFILE

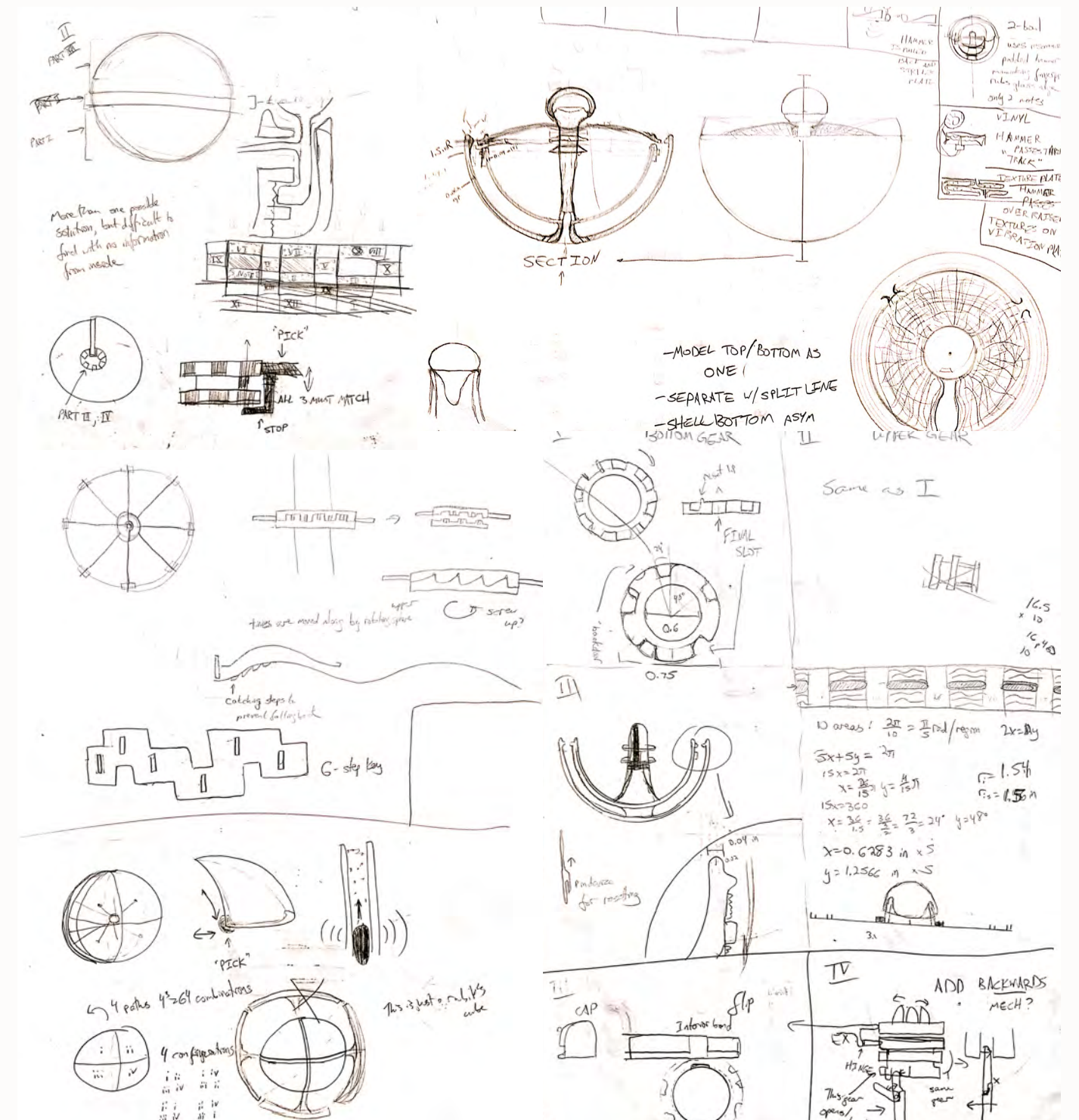
My process, rather than selecting a target user, has instead been to ask myself what I would like more of, what I would like to see, what I think would be interesting etc. The aim is something of a conceptual or experimental one: I would love to stumble across an inscrutable object like this, and want to know if it can produce a similar feeling of interest in others.

I envision the final product as closer to "art piece" than "main-stream consumable." If sold, I think it might fit in museum gift shops or design boutique stores. Preferably, this would be without a package or explanation - almost like an antique or curio.

In keeping with that, at risk of pretension, I think the design would be most successful if made with high quality or obscure materials and attention to detail, aiming to appeal to people who like collecting strange objects, unique design pieces and the like. Its musical qualities may make it appealing to musicians as well.

While a cheap "toy" version of it could be made, I think seeing rows of them on a shelf in gaudy packaging and an instruction manual would destroy the sense of mystery and discovery I would like it to produce. Then again, children may not be that picky about it.

frollicking egg



Further ideation sketches



frollicking egg



The puzzle consists of turning a hemisphere to produce sounds in a sequence that will enable the hemisphere to disengage. Rather than the tine approach considered in early ideations, this approach focuses on the possibilities of a “resonant bowl” for sound production.

An unofficial thematic goal emerged in the design process to seamlessly blend biological and technological cues - to make the object hover as much as possible between organic object and human artifice - in an attempt to create an otherworldly effect that is simultaneously accessible and pleasant, yet alien.

The biological formal influence can be seen in the stem plate (radiolaria/diatoms) and in the ribs of the upper part (mushroom gills). To push this a step further, the puzzle could potentially be made out of a type of chitin - the cellulose-like polysaccharide found in arthropod carapaces and mushroom stalks. Sustainable bioplastics made from this material are already under investigation.

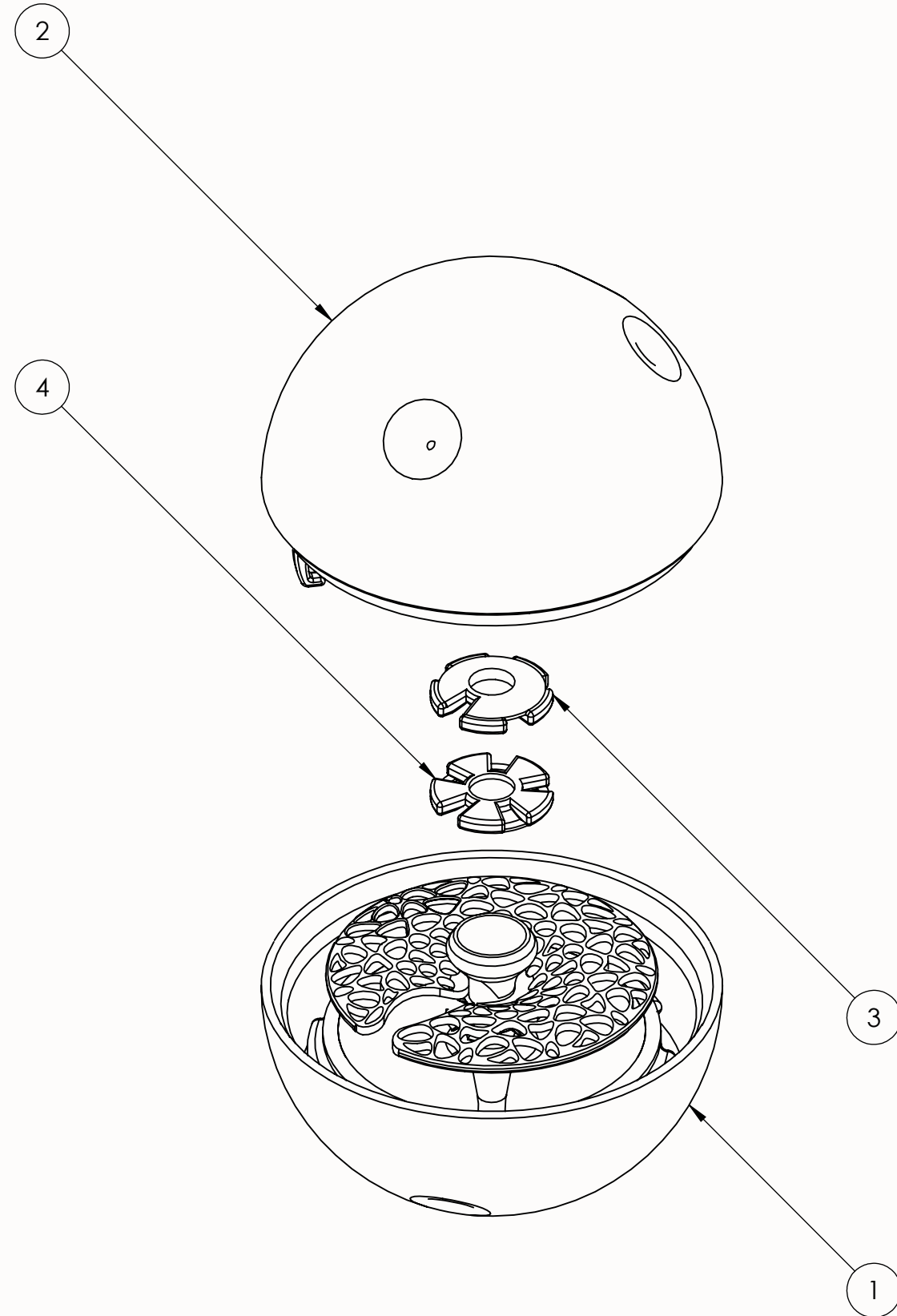
4

3

2

1

PART NO.	PART NAME	DESCRIPTION	QTY.
1	LOWER HEMISPHERE	CHITIN	1
2	UPPER HEMISPHERE	CHITIN	1
3	UPPER GEAR	CHITIN	1
4	LOWER GEAR	CHITIN	1
DETAILS			
MASS		0.244 lbs (as plastic analog)	
VOLUME		6.77 cubic inches	
CAVITY VOLUME		.065 cubic inches	
PIECE COUNT		4	



(SCALE: 1:2)

THOMAS S. EVANS

TITLE:

FROCKLING EGG
ASSEMBLY

SIZE	DWG. NO.	REV
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B		
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SCALE: 1:1	WEIGHT:	SHEET 1 OF 1
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4

3

2

1

B

B

A

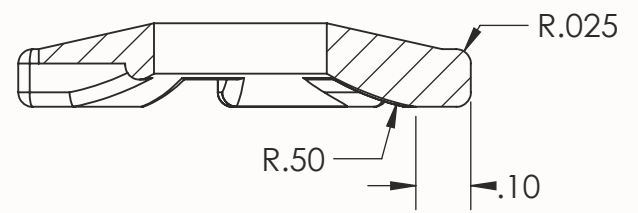
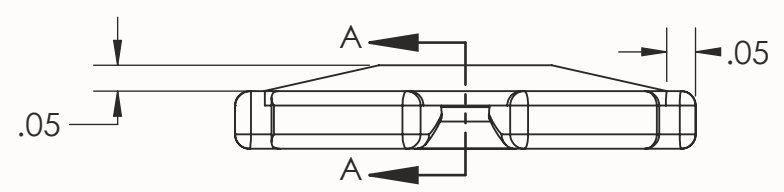
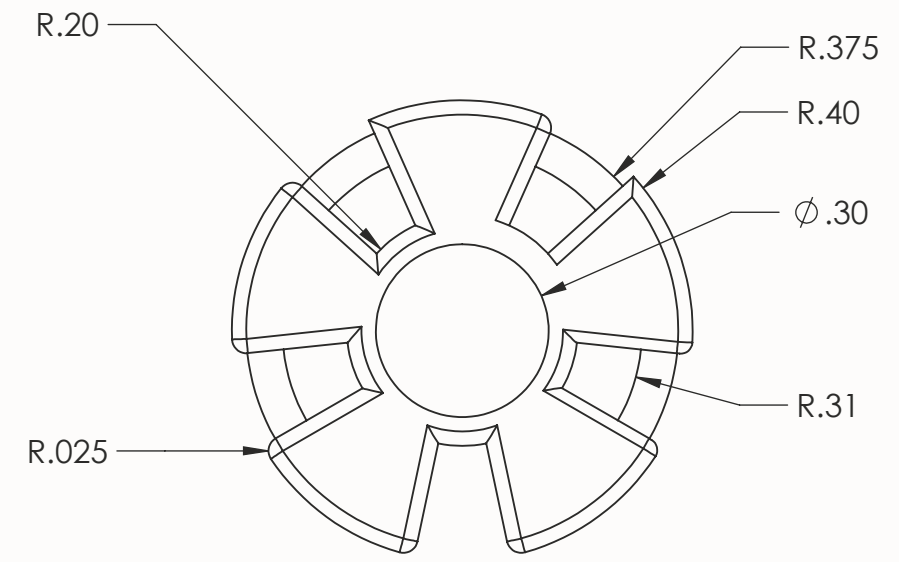
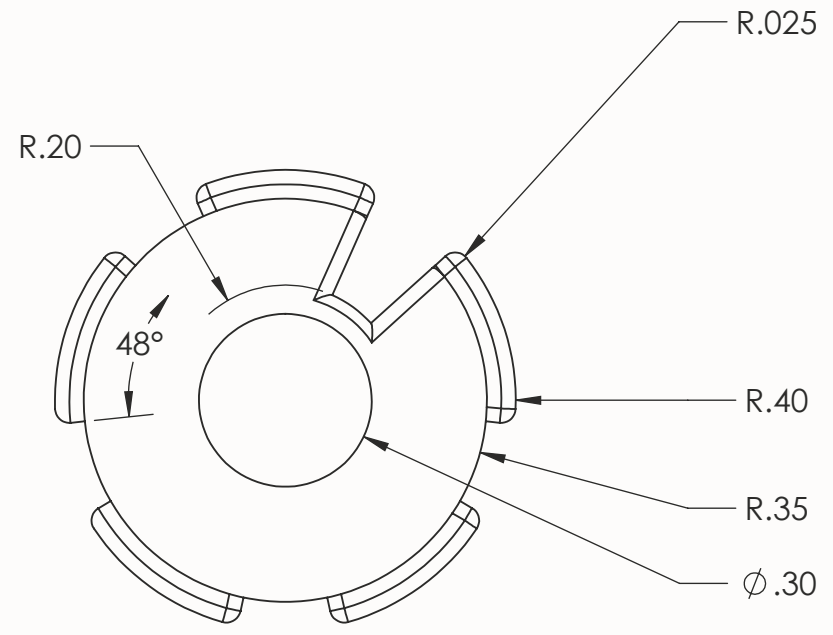
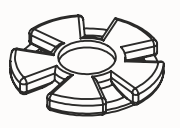
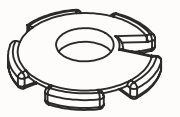
A

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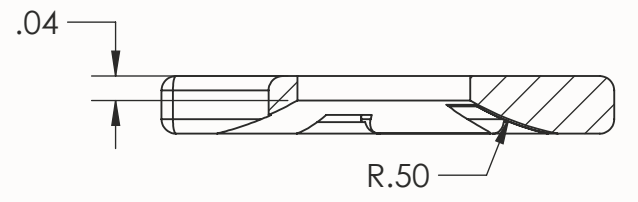
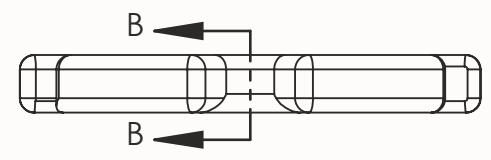
3

2

1



SECTION A-A
SCALE 3 : 1



SECTION B-B
SCALE 3 : 1

UPPER GEAR

LOWER GEAR

THOMAS S. EVANS

TITLE:
UPPER GEAR
LOWER GEAR

SIZE	DWG. NO.	REV
B		

SCALE: 2:1		
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4

3

2

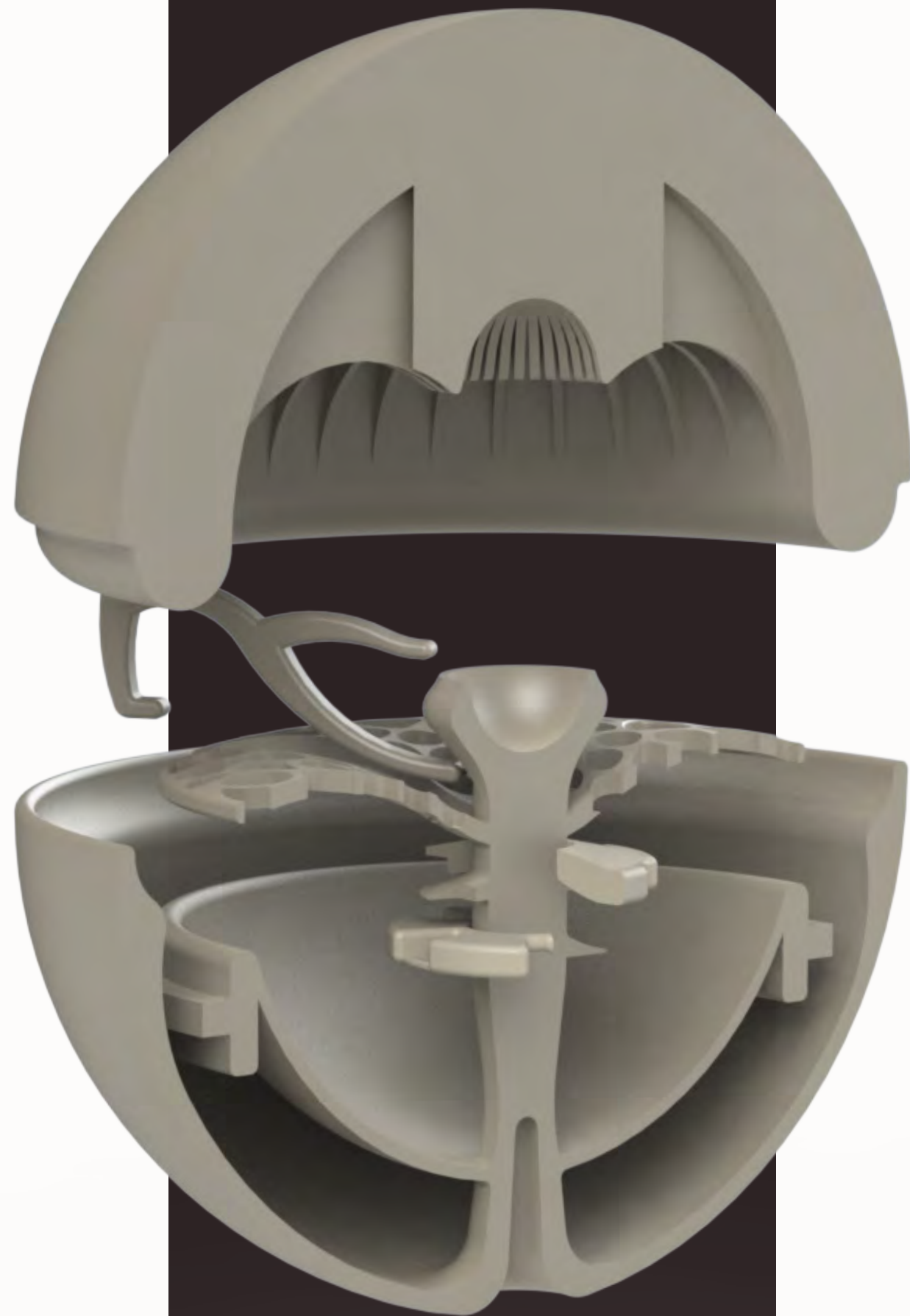
1

B

B

A

A



CENTRAL MECHANISM

The Egg locks with hooded gears that are associated with the sound producing regions. Rotating the Egg leads to the prong becoming entangled in the gears. These gears have one location each with no hood; alignment of these locations with the entry site unlocks the Egg.

The position of the gears cannot be seen directly from the outside. Rather, on the exterior, solutions for each position would be encoded to guide alignment. The solutions refer to sounds, and the sounds have to be identified by rotating the Egg. These solutions would not necessarily be the most straightforward approach, but may have aesthetic value in the melody they produce.

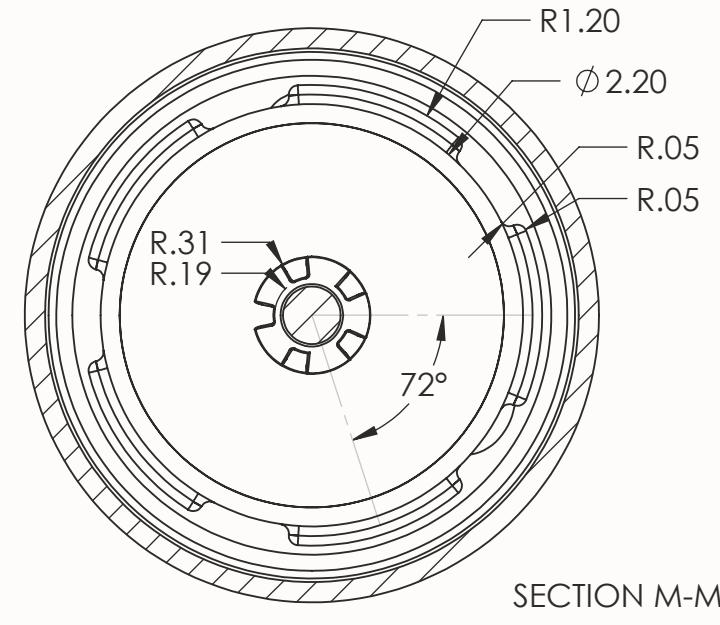
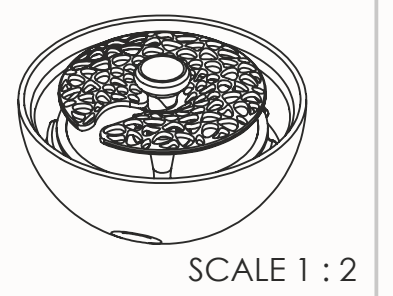
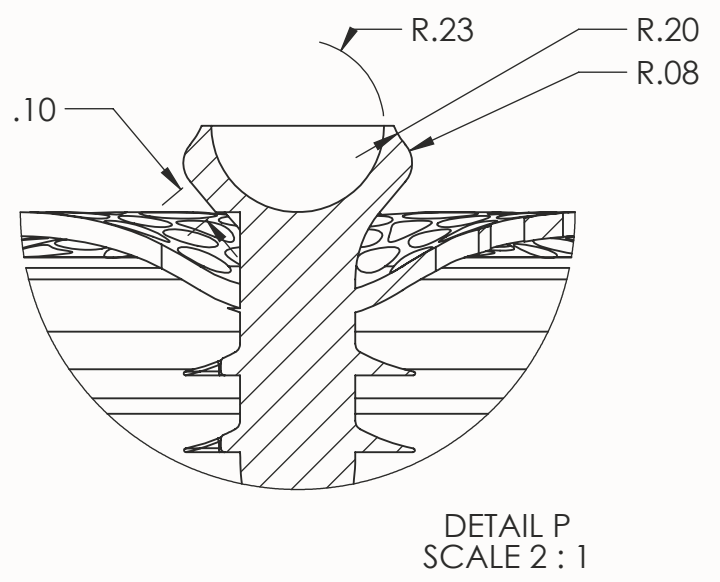
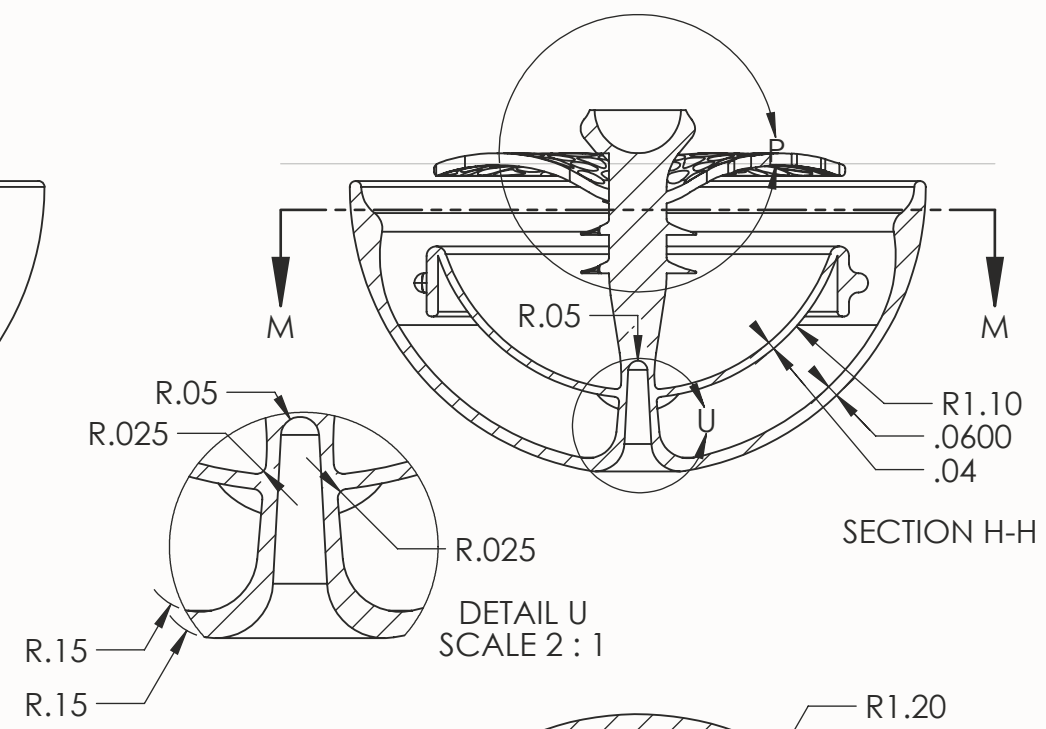
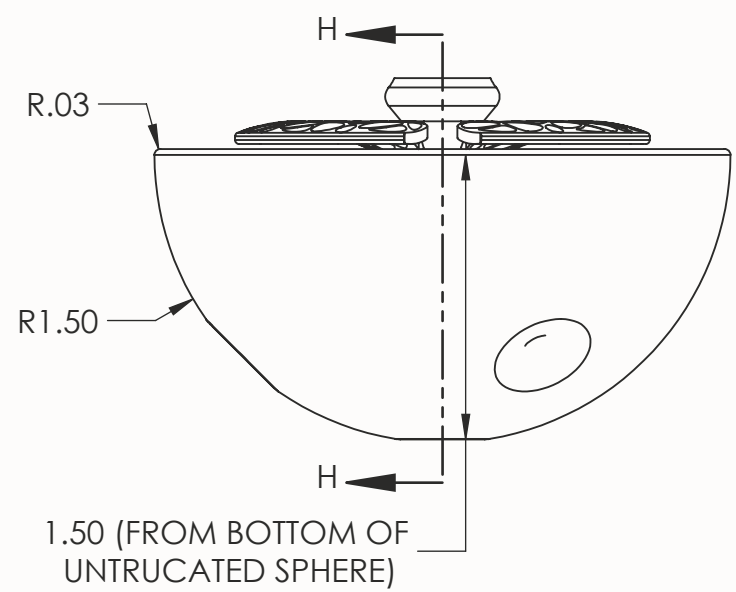
Originally, I thought there would be 25 (5×5) unique positions for the gears, but because the prong cannot disengage, they are locked in a modulo 5 pattern that keeps the gears and prong in the same relative position. There are thus only 5 unique positions, despite 2 5-toothed gears. Future iterations might explore ways of making this more complex.

4

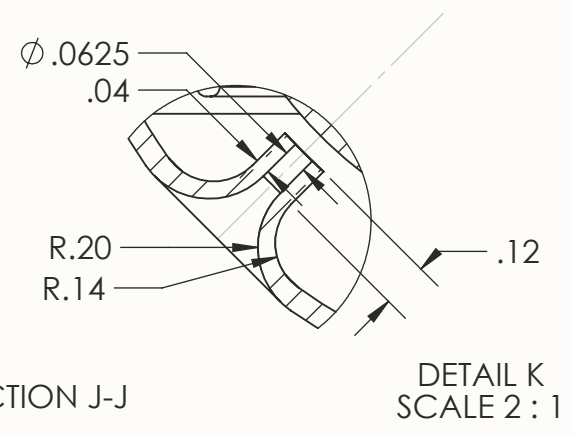
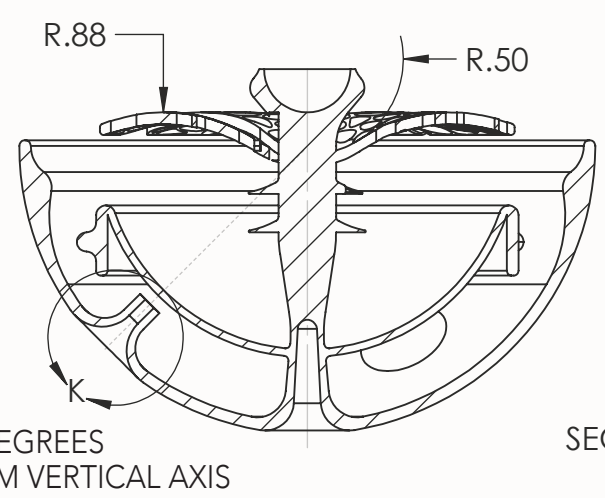
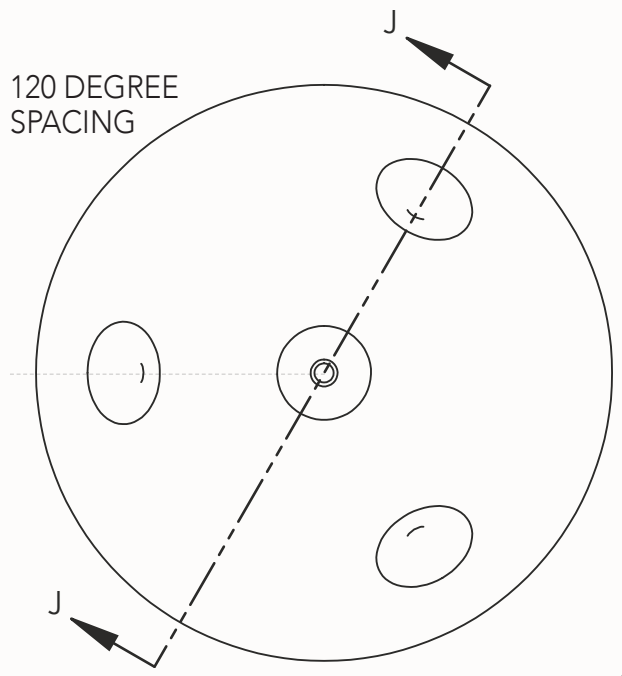
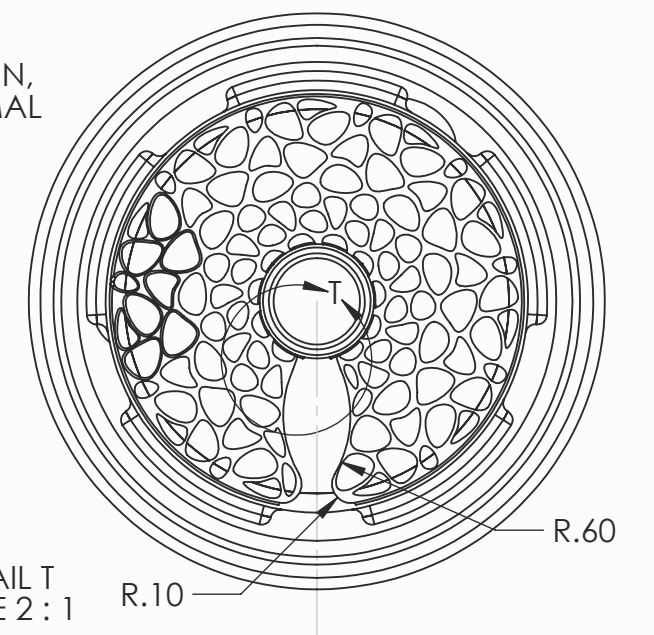
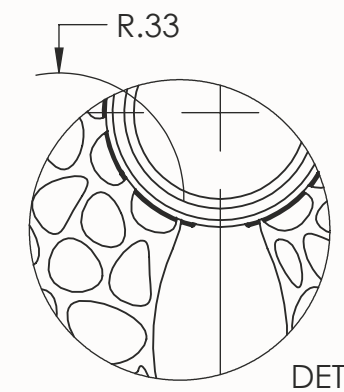
3

2

1



SHAPE SPLINES AT DISCRETION,
PATTERNED RADIALLY NORMAL
TO LATERAL DIAMETRIC AXIS



THOMAS S. EVANS		
TITLE:		
EGG LOWER HEMISPHERE		
SIZE	DWG. NO.	REV
B		
SCALE: 1:1		

4

3

2

1

B

B

A

A

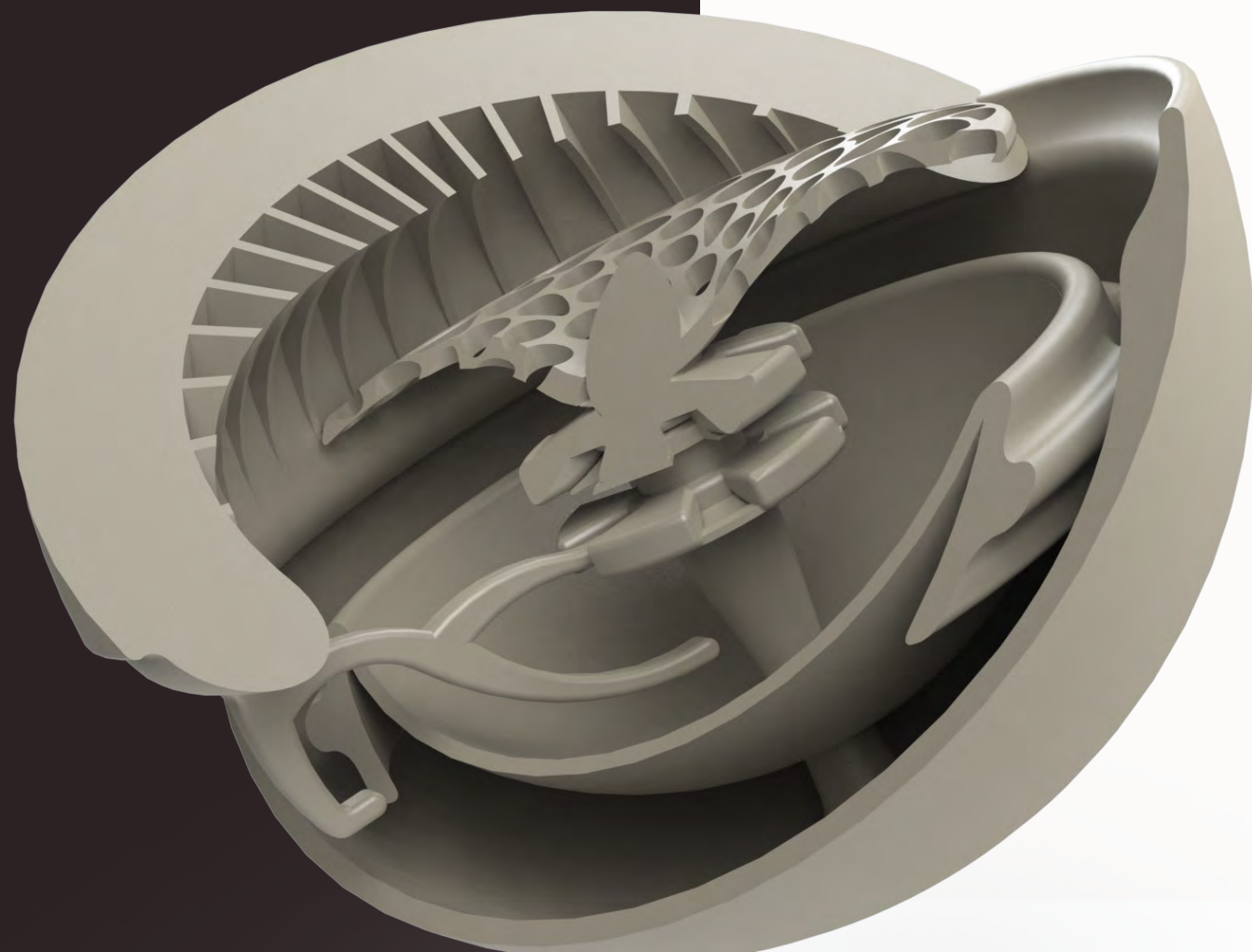
LOWER HEMISPHERE

The lower hemisphere is the central part of the puzzle. It consists of two bowls - an outer shell and the resonance bowl inside - a central stem with frills that houses the gears, the cavity cup, and an upper plate.

The resonance bowl (inner bowl) houses the sound production interface. In the analog waveform iteration to the left, the foldover region of the inner resonance bowl would be inscribed with a waveform like a vinyl record at each of the sound production sites. When a needle (attached to the prong visible to the left) passes across these channels, the bowl itself would vibrate, producing sound. This is a hypothetical approach that may not work.

The volume of the cavity cup is quite small. Future iterations could position it asymmetrically opposed to the prong entrance channel; this approach may make it easier to modify the gears to be involved in forming the cavity to properly satisfy the cavity constraints.

The stem plate currently needs more finessing to look properly like its inspiration. Two additional small insertion points placed along the edge of the stemplate (with corresponding hooks for the upper part) would offer additional rigidity.

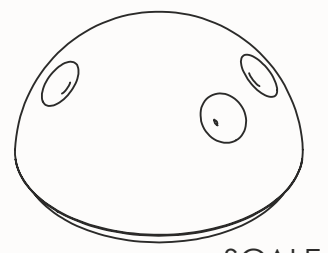
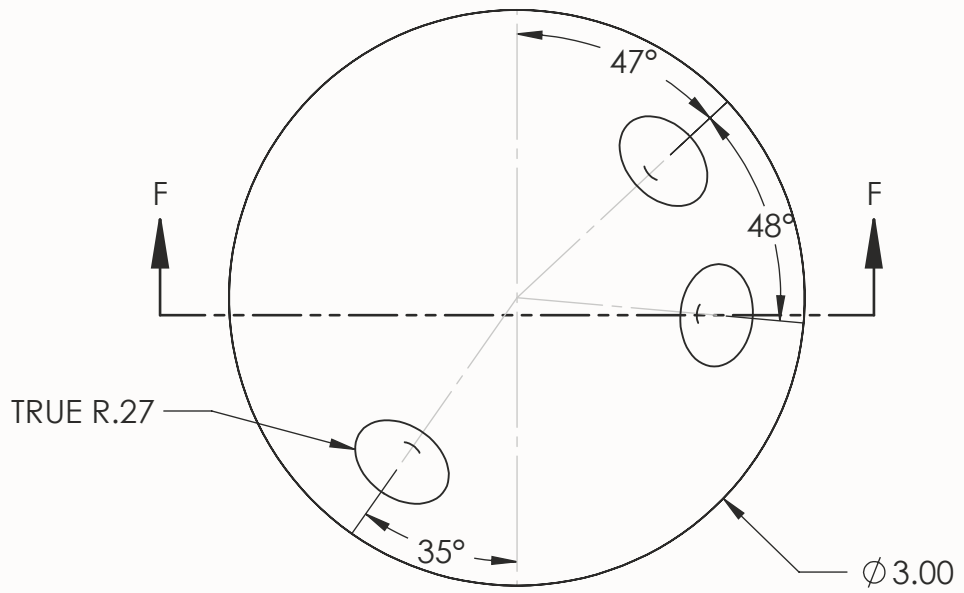
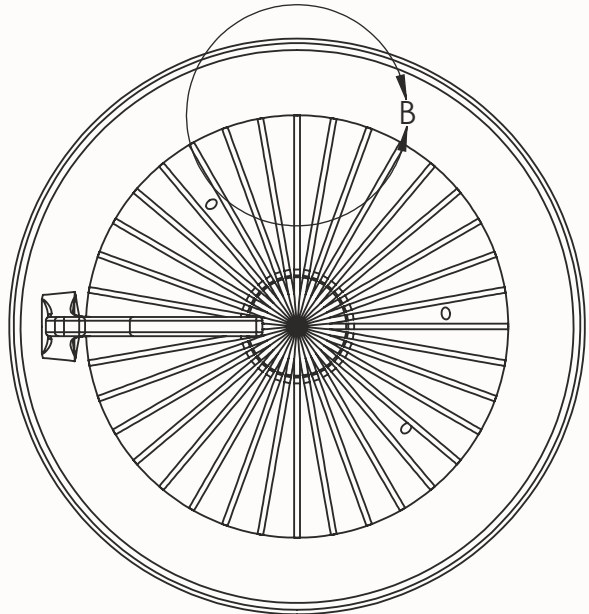


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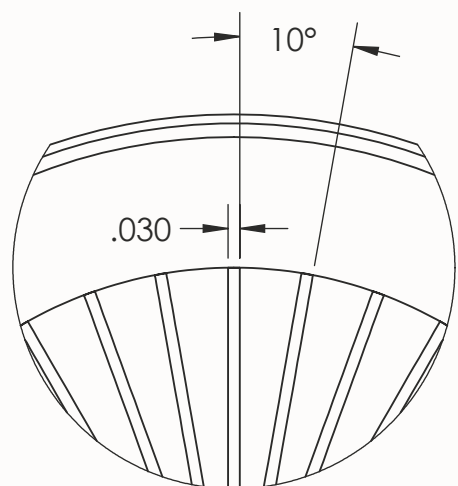
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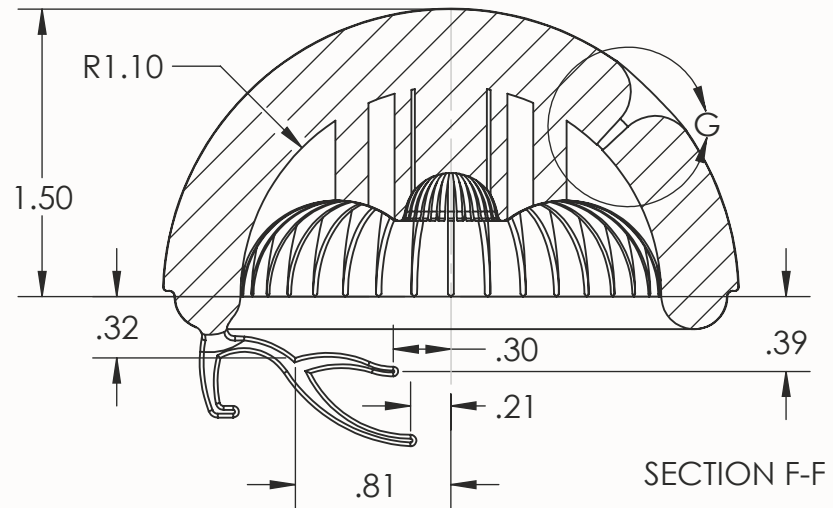
SCALE 1 : 2

B

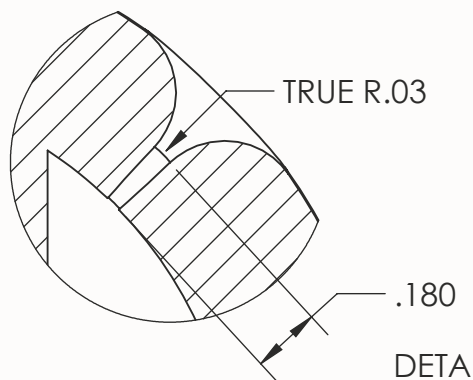
B



DETAIL B
SCALE 2 : 1



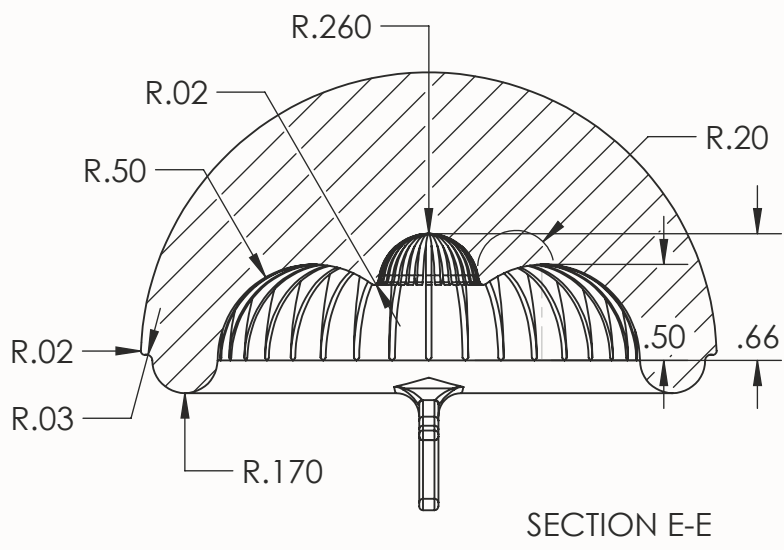
SECTION F-F



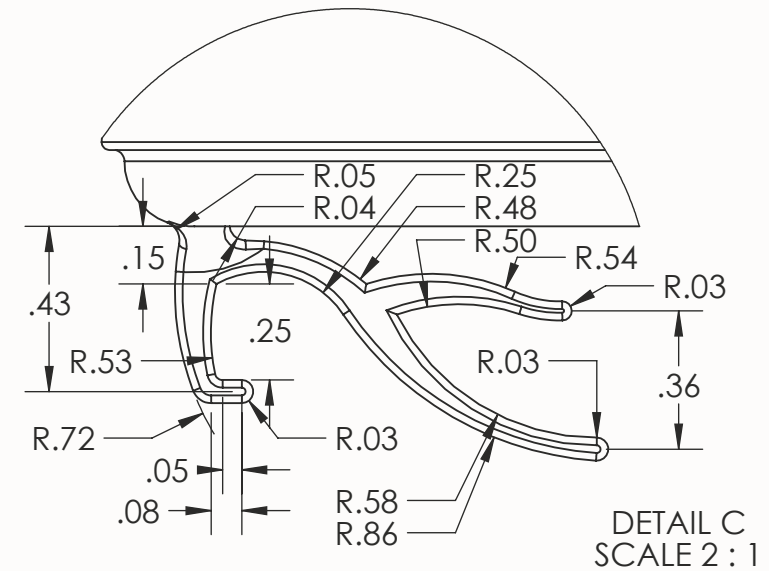
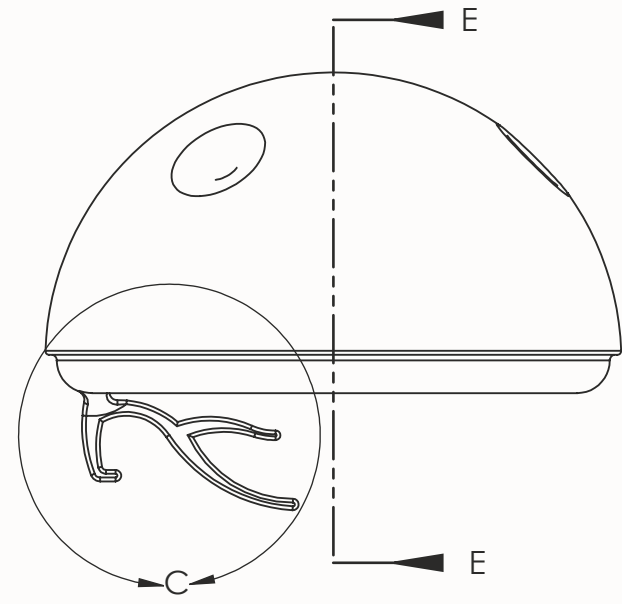
DETAIL G
SCALE 2 : 1

A

A



SECTION E-E



DETAIL C
SCALE 2 : 1

THOMAS S. EVANS		
TITLE:		
EGG UPPER HEMISPHERE		
SIZE	DWG. NO.	REV
B		
SCALE: 1:1		

4

3

2

1

UPPER HEMISPHERE

The sound horns of the upper hemisphere may not contribute much to actual sound output, but they could potentially be used to see into the Egg to locate the current gear positions. Given that there are only 4 non-solution gear positions in this iteration, this may not be as necessary, but for a more complex version this feature would be critical.

After some thought into how to use light in a way that would maintain the "mystery" or "darkness" of the interior, I thought of the effect of illuminating eggs or one's hand from behind. The semi-opaque glow it gives off seems to convey the proper mood.

By thinning the material at the proper locations, glowing dots might be visible through the upper hemisphere speaker horns, but these quasi-apertures would not be apparent when the hemisphere is removed.

When raising the hemisphere, too much of the interior is visible. Addition of a "perimeter shield" around the circumference tangent to the prong may rectify this.





FINAL ANALYSIS

Experimenting with sound production is the next major phase for development. The first step would involve casting the lower hemisphere and testing its resonance as an initial proof-of-concept.

The inclusion of the light-based reset, the perimeter shield, the extra locks, etc. are all minor updates. The exterior patterning may be a phase of its own; while a provisional graphic code could be quickly wrapped onto the surface, satisfactory thematic/formal integration will take more thought.

Because of the somewhat ad hoc approach to this stage of the design process, some of the modeling strategies were a bit messy, which ended up impacting the schematics as well. Once a final design is settled on, a complete rebuild would allow for a more integrated design plan that would allow for swapping out different sound production configurations and the like.

Finally, a better presentation would aid in dynamic communication of the product. This particular rendition is too utilitarian.