

THOMAS S. EVANS

DESIGN PORTFOLIO: SUMMARY



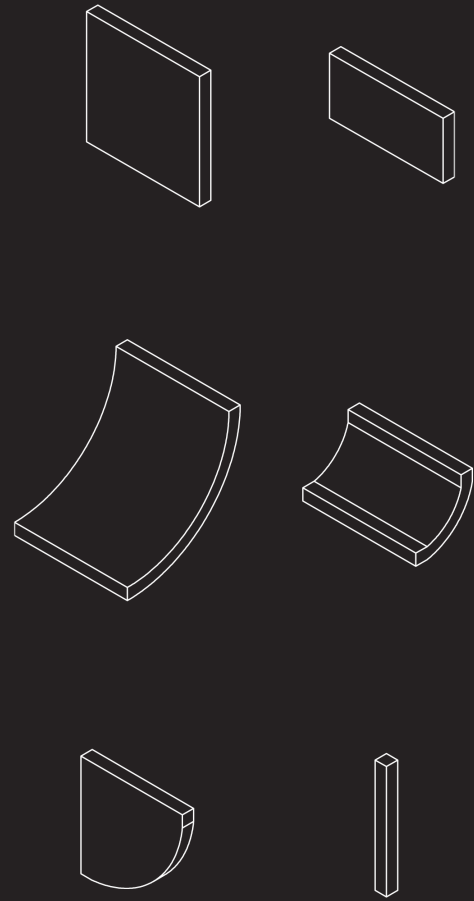
multiwall

mycetezoa-inspired modular construction

multiwall emerged from an open-ended biomimicry design process that began with studying a biological phenomenon of interest and exploring some potential design applications inspired by the results of that research.

I was interested in slime molds in part because despite some brief attention, they remain a very mysterious group of organisms to scientists, let alone designers. I had no prior design solutions in mind when selecting them as my object of focus, but the process that followed yielded what may be my favorite project in this collection.

multiwall

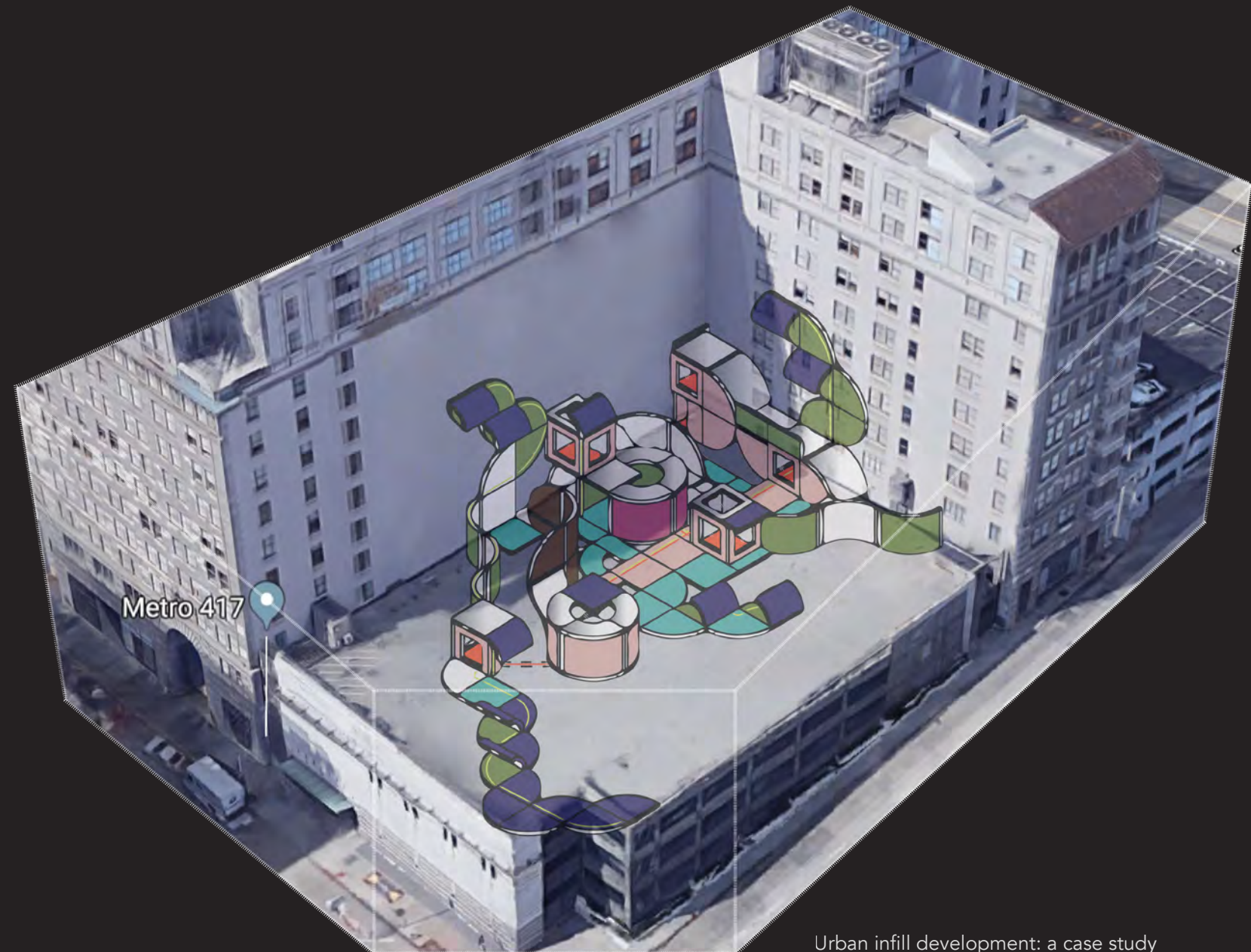


The six **multiwall** panels

MULTIWALL is an approach to modular construction informed and inspired by the Mycetoza, aka "slime molds."

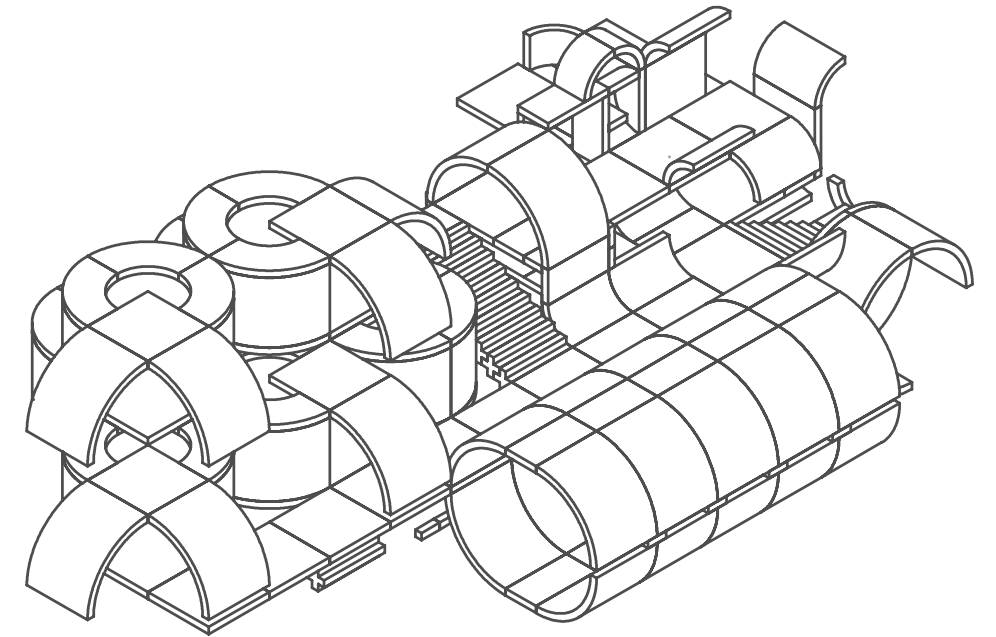
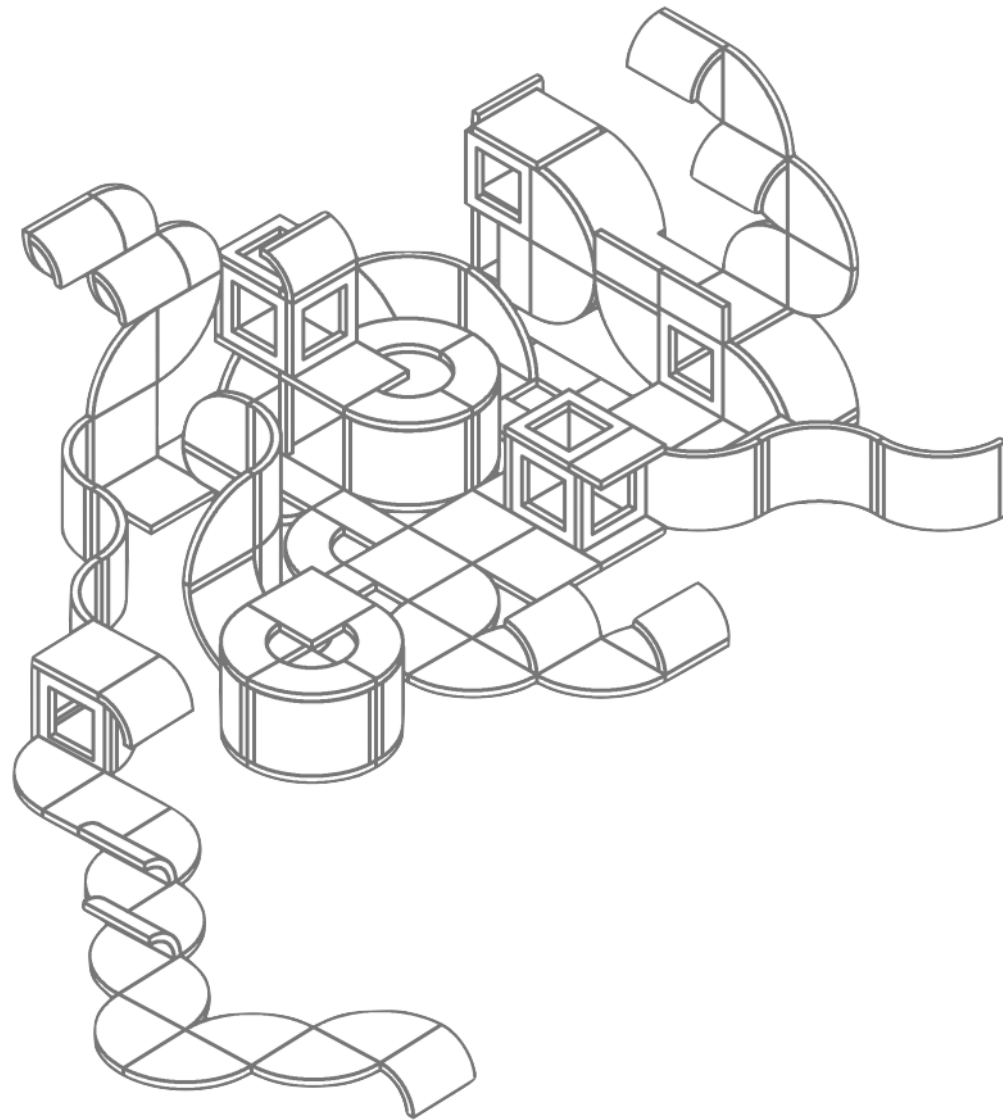
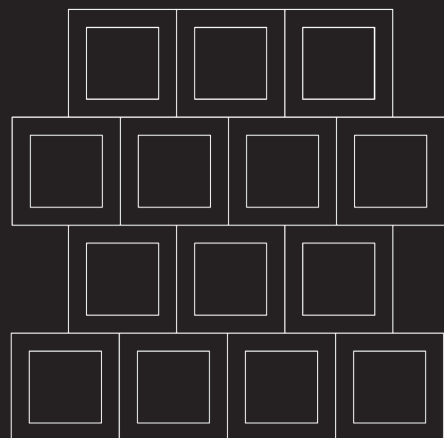
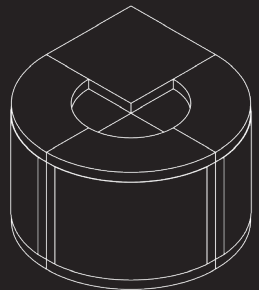
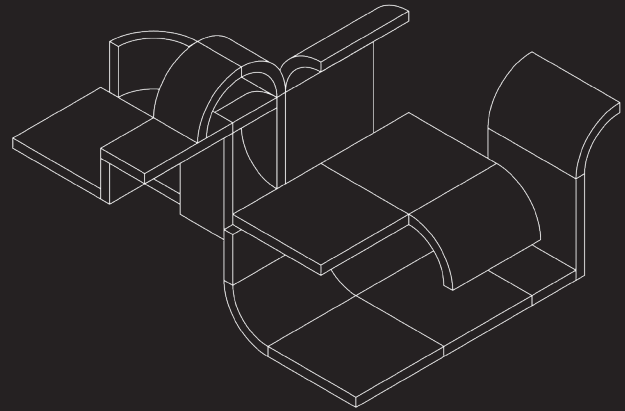
Like these molds, the panels can be combined into ambulating shapes that morph between private and public spaces, between interiors and exteriors.

The panels do not differentiate between use as ceiling, wall, or floor. Once installed, they can be equipped with claddings, fittings, fixtures, and internal fillings and pipings to establish their role in the building - but they are always ready to become something new.



Urban infill development: a case study

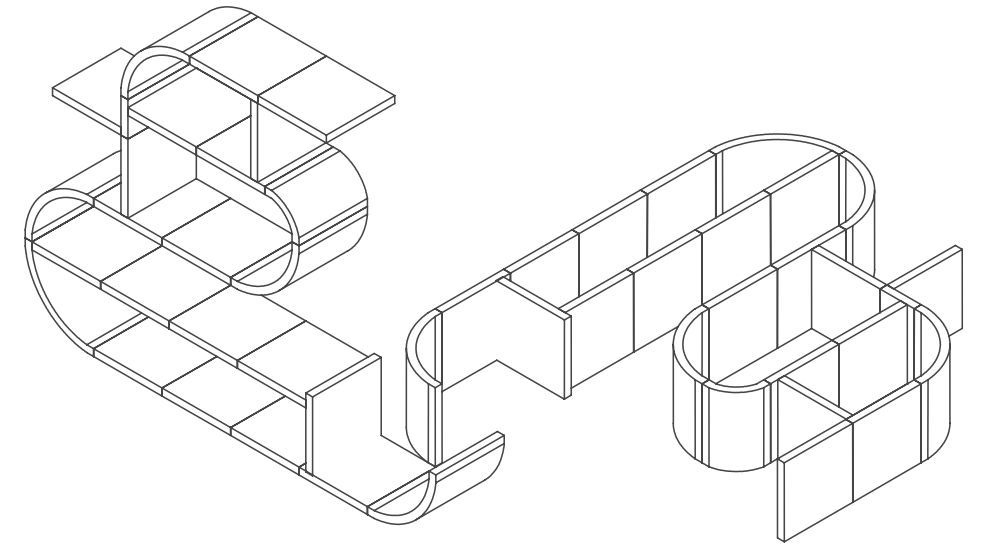
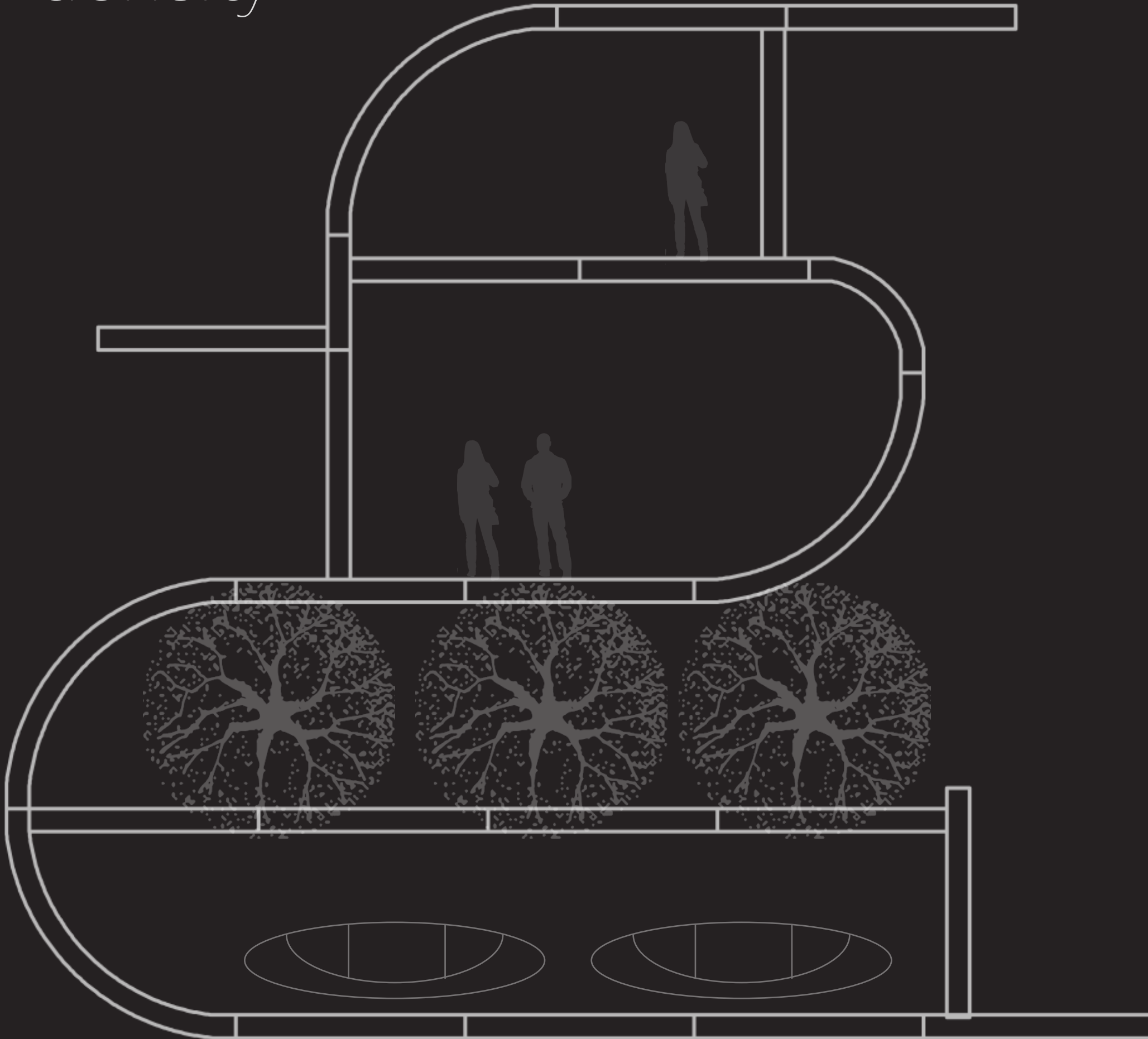
order



Depending on the community profile, site, and usage needs, the modules may take on a wide variety of forms. In general, the organization of these forms can be thought of as ranging from increasingly anarchic, decentralized, and opportunistic (chaotic/random) to increasingly planned, controlled, and monitored (ordered/designed).

Different formal languages that define certain usage zones may flow and transform into each other abruptly or with imperceptible gradation, but in both cases the essential rhythmic continuity of the panel geometry persists.

density

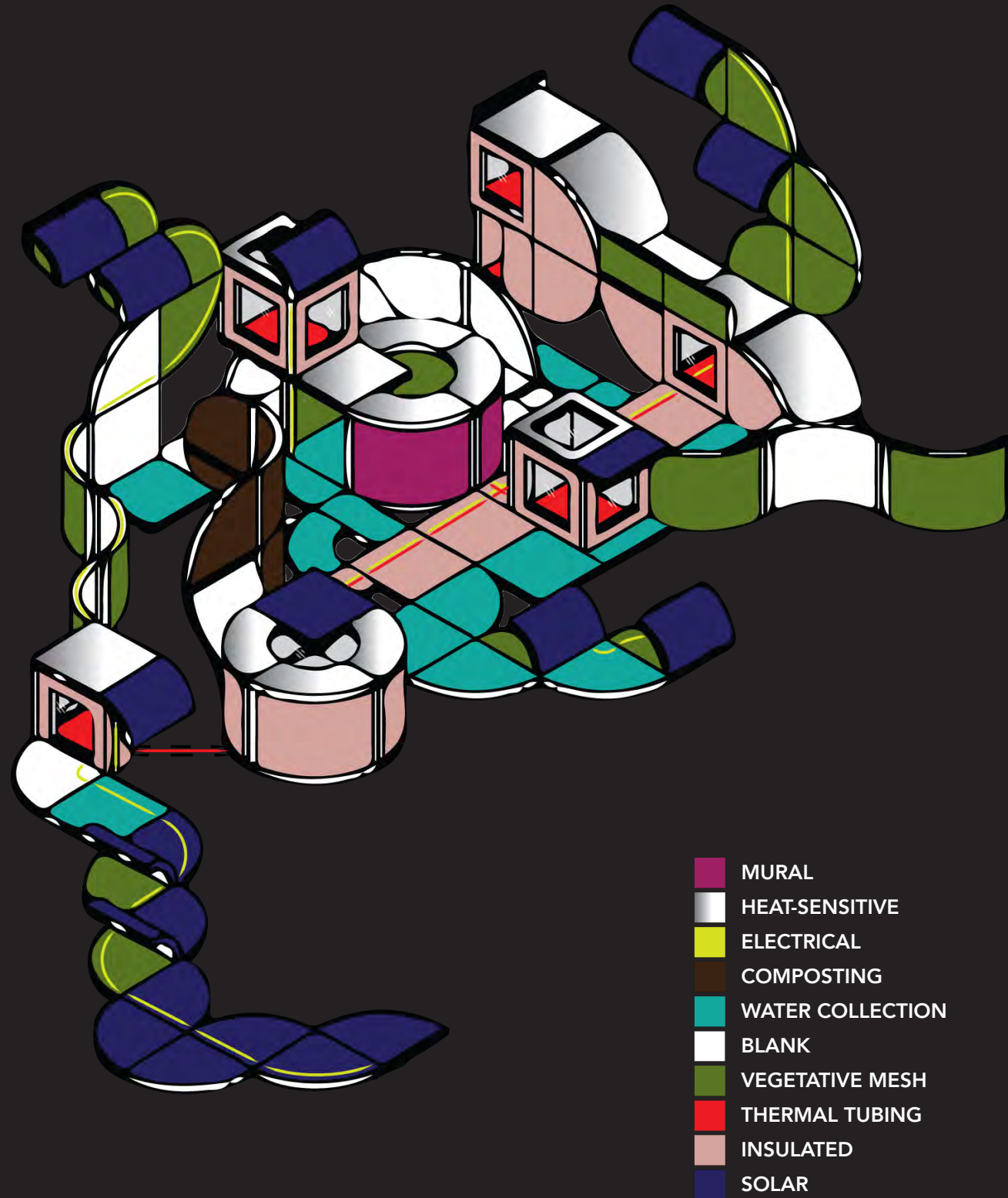


The figure to the left might be interpreted as either elevation or plan. The panels can weave back on themselves to partition off space in a visually interesting manner that may proceed along multiple axes.

For example, consider a start-up that begins with a modest arrangement of panels. As they grow, their workspace grows organically with them.

Live structural sensing might adapt with the addition of each panel, showing particularly good places to consider expansions and facilitate structurally sound vertical growth.

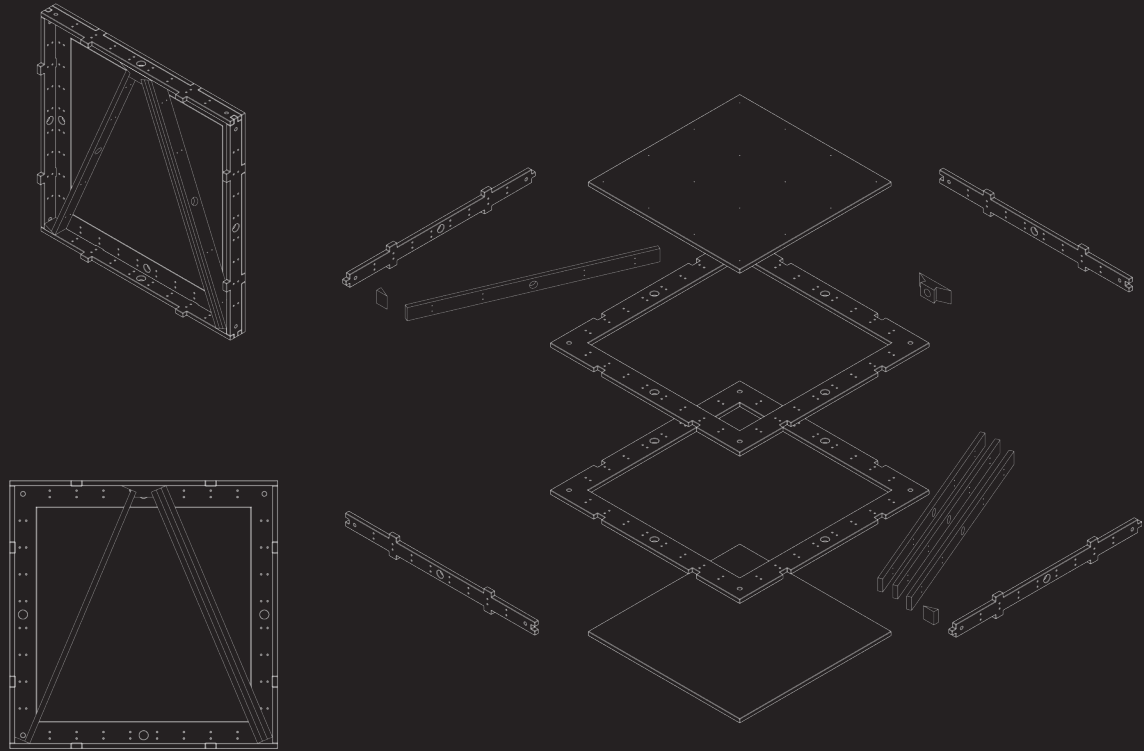
adaptability



The panels can be modified with a variety of types of cladding or internal pipings and fillings. Attaching heat and pressure etc. sensors to the panels might enable real-time analysis of how efficiently certain rooms are heated, where air tends to accumulate etc.

This information could help guide adjustments to the infrastructure of the system, redirecting resources as necessary and identifying the most resource-efficient areas for expansion.

evolution



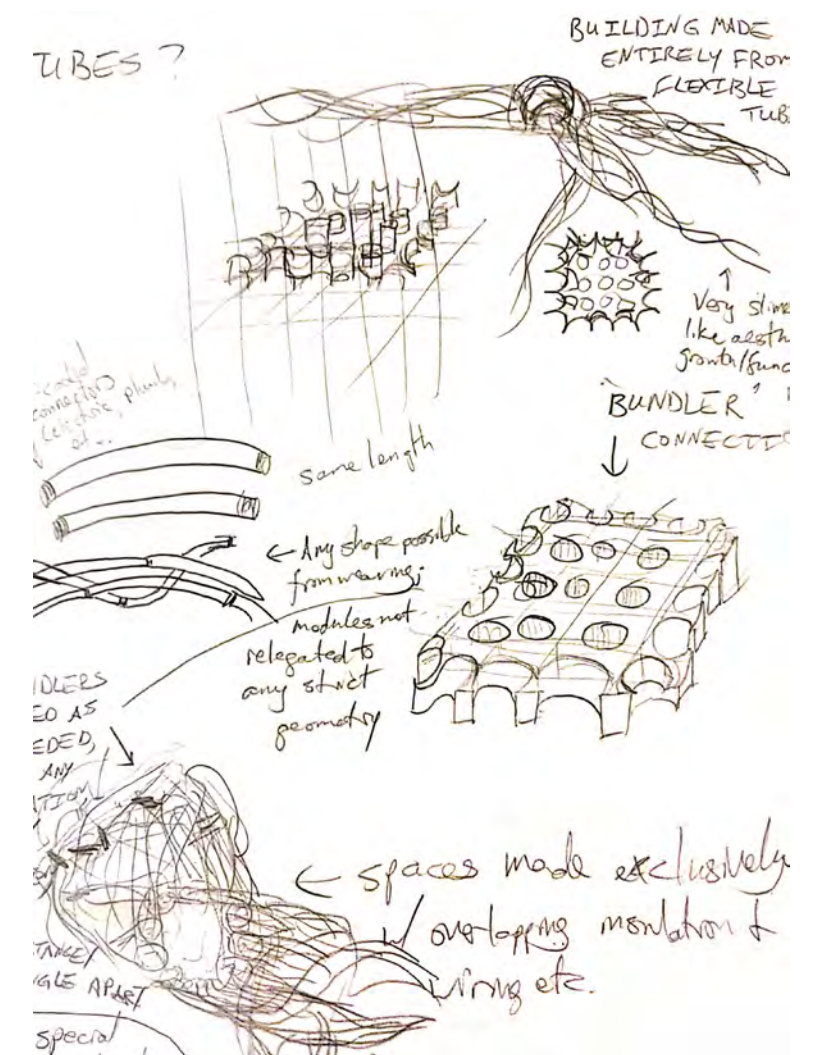
STANDARD FLAT PANEL

GROSS DIMENSIONS: 250cm x 250cm x 25cm

PROPOSED MATERIAL: Cross-laminated timber (prototype phase)

TOTAL PIECE COUNT: 8-17 (depending on trussing elements)

CONNECTION: Friction fit for pieces, standard hardware (bolt/nut) between panels



While this initial iteration proposes a conventional wooden frame, the system as a whole may "evolve" into increasingly organic and fluid construction methods using biological materials that "grow" into position.

As an intermediate step, perhaps the panels could be connected with a sort of structural tubing, breaking the orthogonal imperative of the current geometric logic. These tubes might then be the lattice for a growth-based construction.

frollicking egg was developed in an effort to create a 3D puzzle that fits within a volume of 3 cubic inches, is composed of 4 interlocking pieces, and contains a hidden volume for storage of small objects.

What made this challenge interesting was finding a theme or implicit narrative to the product that “justifies” the geometry. There are plenty of puzzles of this kind that present themselves solely on the merits of the spatial challenge they offer - hopefully this attempt offers something somewhat new.



frollicking egg

May 2019

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 acting as the shading element, leading to added functionality.

I became interested in creating a puzzle that is not purely ornamental, but has some kind of practical function embedded into its design.



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.

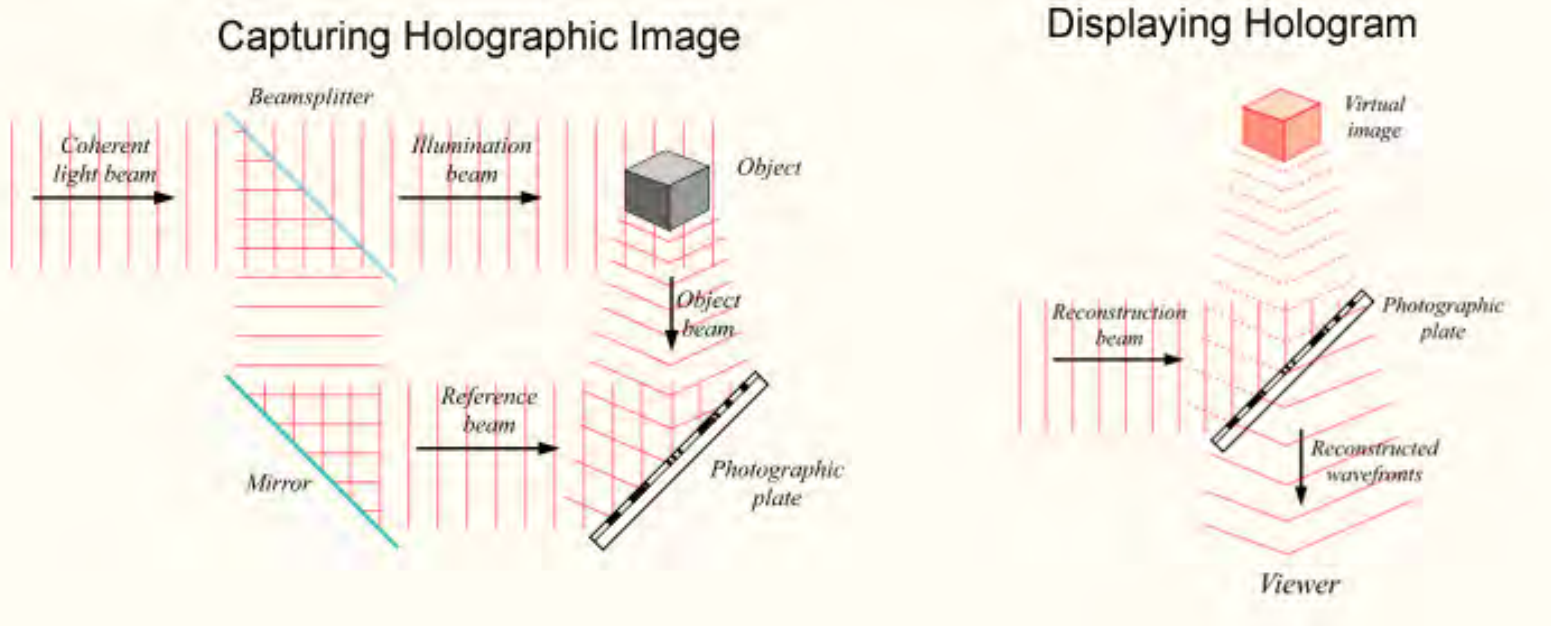
This relationship between two levels of information struck me as an interesting theme for a 3D puzzle.

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.





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.

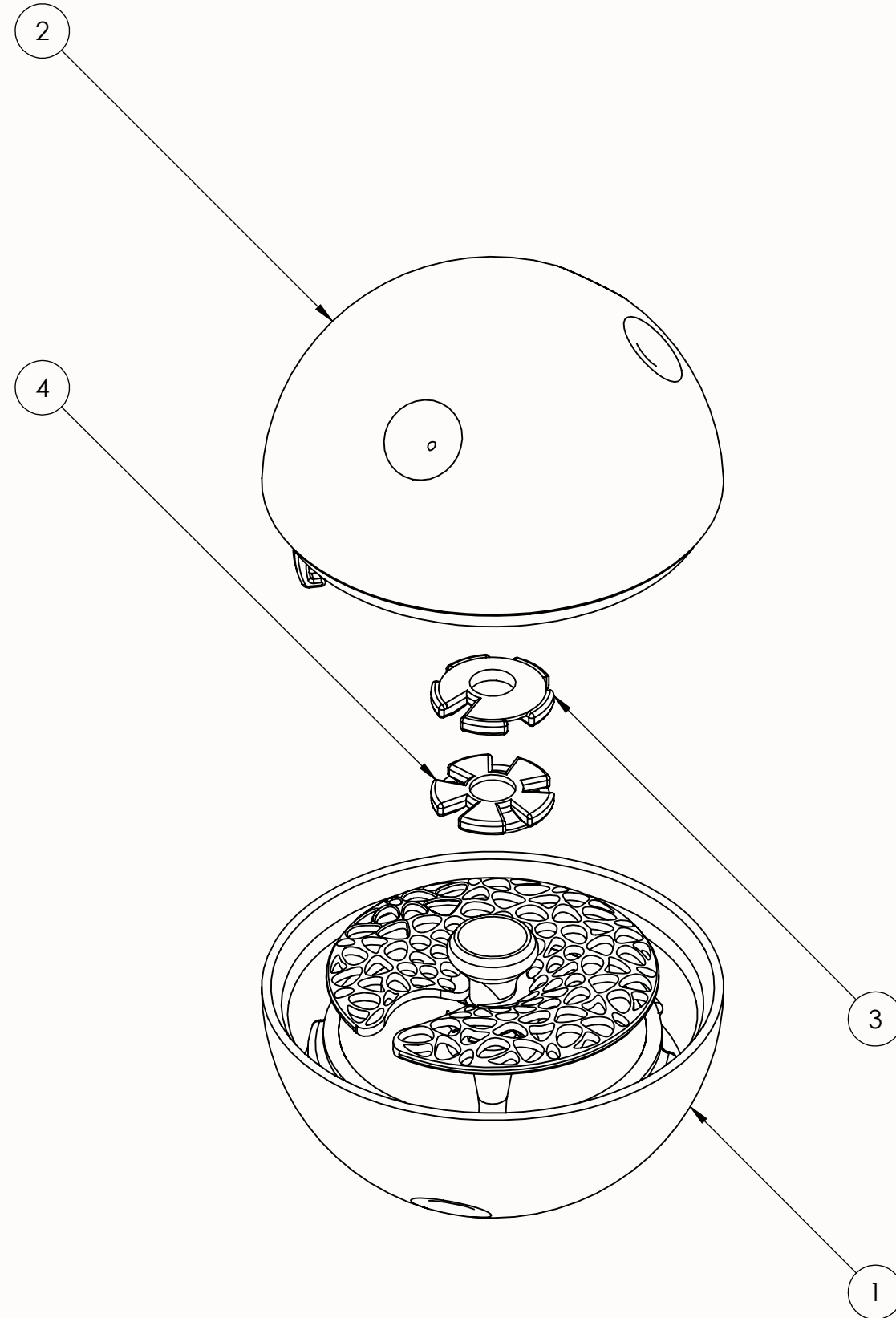
4

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
FEATURE		STATUS	
BASIC FORM		COMPLETE	
INTERLOCKING MECHANISMS		COMPLETE, POSSIBLE IMPROVEMENTS	
FORMAL ASPECTS		MOSTLY COMPLETE, NEEDS IMPROVEMENT	
SOUND PRODUCTION		BOWL, INTERFACE, SPEAKER HORNS ONLY	
EXTERNAL PATTERNING/CODING		INCOMPLETE	
RESET		DESIGNED BUT INCOMPLETE	
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

ikikaza

Package-as-product decoration platform

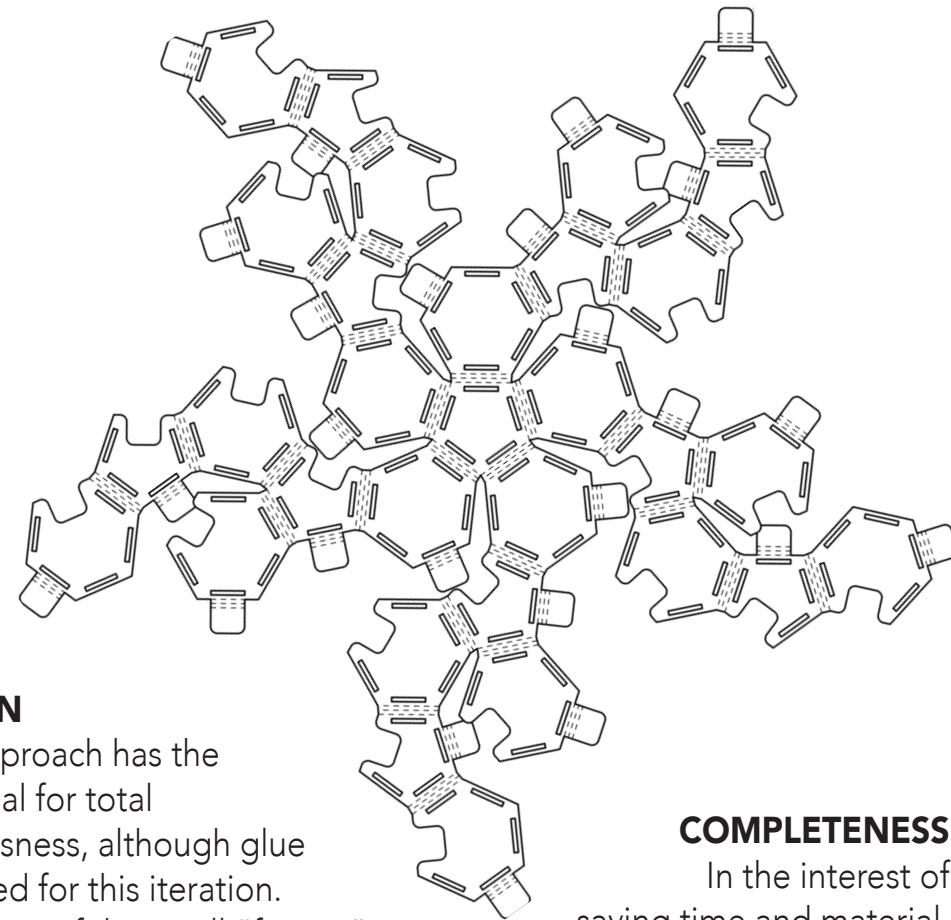
January 2019

DESIGN PROCESS DOCUMENTATION

The aim of this project was to develop a flat-packageable envelope for an arbitrary product. Consideration of how to approach the challenge led to an interest in flattening the distinction between the package and the product itself - an increasingly common theme in maximally dematerialized flat package designs.

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PROTOTYPE 1



BUILD ANALYSIS

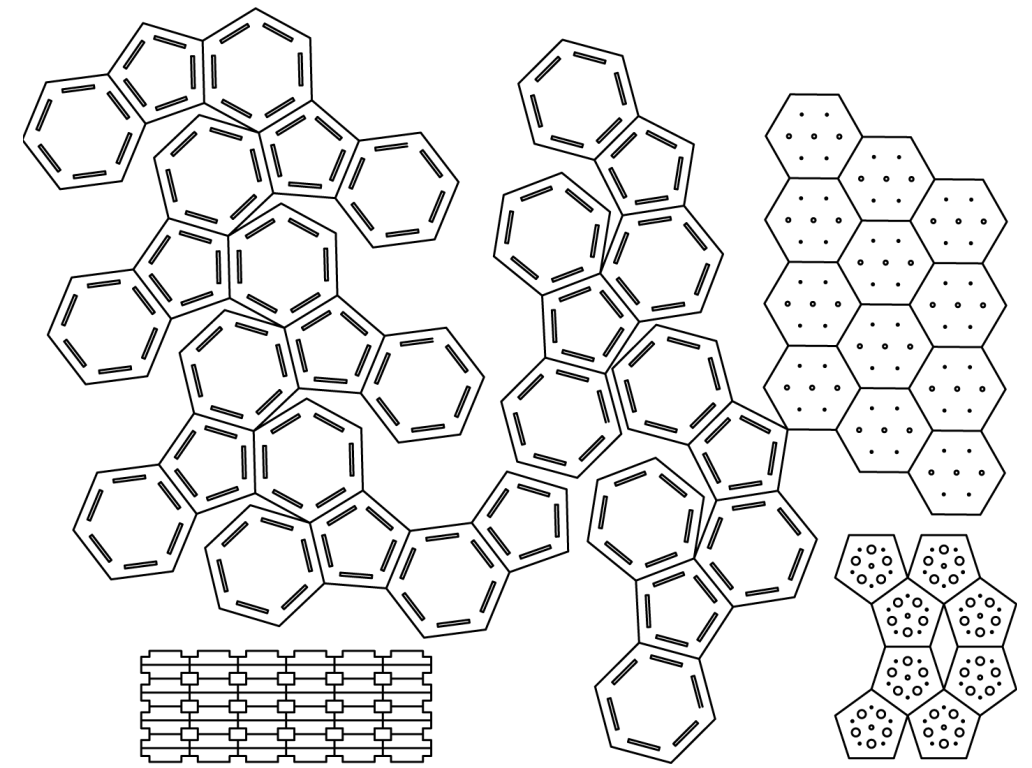
This version is closer to a working prototype than a final design, as much improvement remains possible.

DESIGN

This approach has the potential for total gluelessness, although glue was used for this iteration. Perfection of the small "fences" will allow them to be used like nails. The result should be stronger than glue, as well as more elegant.

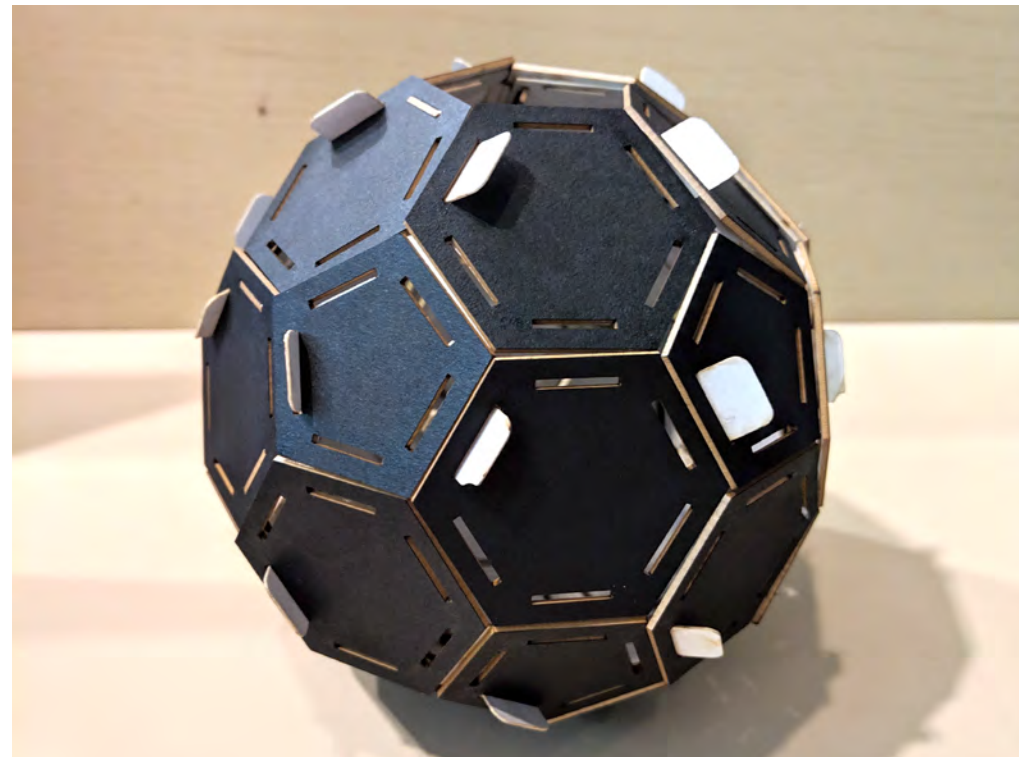
COMPLETENESS

In the interest of saving time and material, not all tiles and fences were printed.



AutoCAD Nets (not to scale)

Physical Model



AESTHETICS

The design is a formal success. It is close to the original vision; the detail from technical aspects of the design provide visual interest that in some respects make it superior.

Minor errors such as bad laser settings that led to scorching make the physical model look a bit unpolished. The white is also overwhelming; more black or natural cork would be better.

INTEGRITY

The model is fragile. The design is in dire need of strengthening so that it can work as a standalone package.

The white tabs were to slide into the indents at the same layer level, but there was insufficient time to design the "latch" - so open tile slots were used as a serendipitous solution.

SUSTAINABILITY

Despite the purported reduction in waste by combining package and product, the net shape yields significant unusable material. Future iterations must address this issue.

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PROTOTYPE 2



MATERIALS

0.125" cork sheet
 0.0625" black mat board
 0.03125" poster sheet

DIMENSIONS

OUTER HEX: 1" edge
 OUTER PENT: 1" edge
 SOLID: ~3" radius

EFFECT

The cork object tiles have a more pleasant tactile sensation and are easier to place and remove than the prior layers of mat board. Additional bottom layers elevates the tiles off the surface for more of a "dais" effect.

STRUCTURE

This version – while less fragile due to the cork and more repairable thanks to the replaceability of the connection tabs – lacks the expected rigidity. It does not seem that paper tabs are sufficient to secure the shape tightly, leading to gaps. The "squishiness" may be an asset, however – the solid is less likely to experience some kind of critical tear.

PROCESS

This version uses two layers of cork to provide outer protection and additional heft. The inner cork tiles were rastered to provide a "groove" for the connection tabs, which are now individual and replaceable. Mat board "nails" connect the layers with a friction fit.

The groove on one side of the tab is larger to allow pieces to be pushed together when folding up into the solid shape. This allows the bend to be on the material – not the tab.

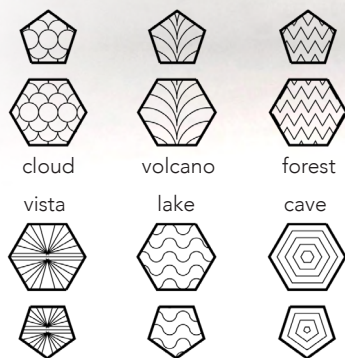
REMARKS

The presence of this iteration is much stronger than the prior one. However, the second cork layer is a bit redundant and the connections need refining. Two possibilities are living hinge mat board tabs or a mat board elastic clip mechanism, both of which could be replaceable in the same way as the current poster board tabs.

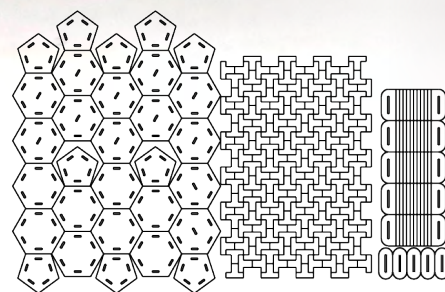
Other approaches include Gecko-skin tabs on the exterior or magnetic strips along junctions. The latter is particularly appealing for its use simplicity, but both frustrate the push to use either sustainable (cork) or easily recyclable (cardboard/paper) materials.

DESIGN

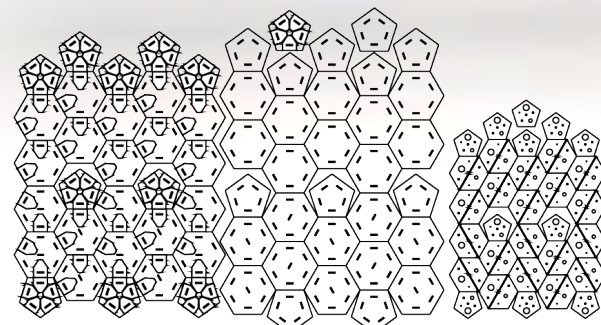
Board game rules have been made and testing is underway. The central tile-holding pillar remains for fabrication. The slot-shaped pieces in the mat board section are a connection mechanism for the outside that did not prove necessary.



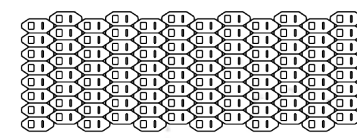
GAME TILE DESIGNS



MAT BOARD



CORK



SHEET



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PROTOTYPE 3: STRUCTURE



PROCESS

This version uses two layers of mat board separated by spacers to create a .125" cavity between the inner and outer shell. This cavity provides a space through which mat board latches cut with a living hinge can pass.

Once reaching the aperture on the outer tiles, the latches spring back to catch on the edge of the tile. From the outside, they can be pressed to enable them to slide back out under the outer tile perimeter.



DESIGN

Much of the design remains the same. The latches are of a similar shape to the previous connections; "permanent" connections between always-connected tiles have been simplified and made smaller. However, like the last version, all connecting elements are re-placeable.

EFFECT

The open space and layers create a sense of discrete "islands" between each tile. The black on the inside might be better replaced with an off-white board or the tile on the outside with natural cardboard to break up the black, as it currently has too much of a "technical" feel.

REMARKS

The two goals for this variant were to make the entire product 100% recyclable with no processing necessary on the part of the end user and to devise a more secure tabbing mechanism for constructing the sphere.

Due to the amount of dye used to make the black mat board, it may not be the most eco-friendly approach. Natural .0625" cardboard is a viable alternative.

The hinging latch mechanism works well to keep the sphere se-secure, but it can be a bit confusing to unlock it once assembled. An advantage of the prior iteration was that the sphere could essentially be pulled apart.

The space between the two layers and the flexibility of the hinges create a flimsy feeling. The nails have a tendency to slide out when assembled. Cardboard scraps from production could be used to make a simple glue to hold certain nails.

While this option is not fully recyclable, the cork tiles from the previous iteration are compatible with this version, so this de-sign could be "upgraded" with the cork for a deluxe edition.

MATERIALS

0.0625" black mat board

DIMENSIONS

OUTER HEX: 1" edge
OUTER PENT: 1" edge
SOLID: ~2.5" radius

STRUCTURE

Some adjustments need to be made in order to fully realize this design. The interior tiles are a bit too large and the latches are a bit too long. Both of these issues prevent flush connections between the outside tiles - an easy fix.

Assembly is even more time-consuming than the previous version. Short of creating a novel production process, the design would likely need an overhaul for mass manufacture.



ikikaza

PROTOTYPE 3: USE



Unfolded net

VERSATILITY

Like prior iterations, the open **ikikaza** net can be used for decoration by placing tiles with various shapes into the spaces provided. It can also be hung up flat on the wall as a decoration in itself.

Different versions might be suited to different uses.

One version might have an empty space on both layers, so that when the net is folded into a sphere, it can be attached to a lightbulb to act as a lamp.

Another version might make use of the cavity between the two layers, to allow for planting small plants.

ASSEMBLY

This is the first design to actually produce and incorporate the central pillar. This pillar acts as an internal support for the sphere as well as acting as storage. It is hexagonal in shape with enough space to hold all of the cork tiles (if used) or game tiles within.

Extra cartridges (the smaller pillar pictured) might contain preferred objects or be used as additional space for holding accessories and tile packages. Up to 6 can fit onto the central pillar within the sphere.

These cartridges could be sold separately and mix-and-matched at initial purchase so users can decide what functionality they want for their **ikikaza**.

All kits would come with spare connector pieces and nails for user repair.



Half dome configuration with center pillar

MATERIALS

0.0625" mat board,
various colors

DIMENSIONS

OUTER HEX: .75" edge
OUTER PENT: .7" edge
PIECE HEIGHT: .75"

STRATUM

player reference

TURN SEQUENCE

LAND: Use the land ability of the tile you are on.

MOVE: Place one of your land tiles on a space.

DRAW: Take a tile from the main stock.



VICTORY: Collect all five rings and reach the center space.

LAND TILES

- abyss**
Ends Move phase (no ability).
- cave**
Use the ability of any land tile.
- hill**
Move in any number of tiles.
- vista**
Draw a land tile of any type.
- cloud**
Move one space.
- volcano**
Place or remove a tile.
- forest**
Place a tile from your stock.
- gate**
Move to space with gate of same shape (if present).

AFFINITY (OPTIONAL)

- form**
If on an Abyss, place a land tile of any type on any Abyss. This can be from your stock or the main stock.

GAME

Stratum is a reference to the strata in rock formations used in biology and geology to piece together the history of Earth and the evolution of life.

Players seek to acquire one each of five rings located at the far end of each of the 5 arms of the **ikikaza** net. As they do so, they place tiles that represent different types of land that each have their own powers that players can draw upon.

Because the game board is blank, players can create their own tiles and invent their own games that take advantage of the uncommon board structure that the **ikikaza** net provides.



Stratum land tiles and player pieces

*The following are excerpts from a presentation that covered development up through the most recent exposition to an audience.

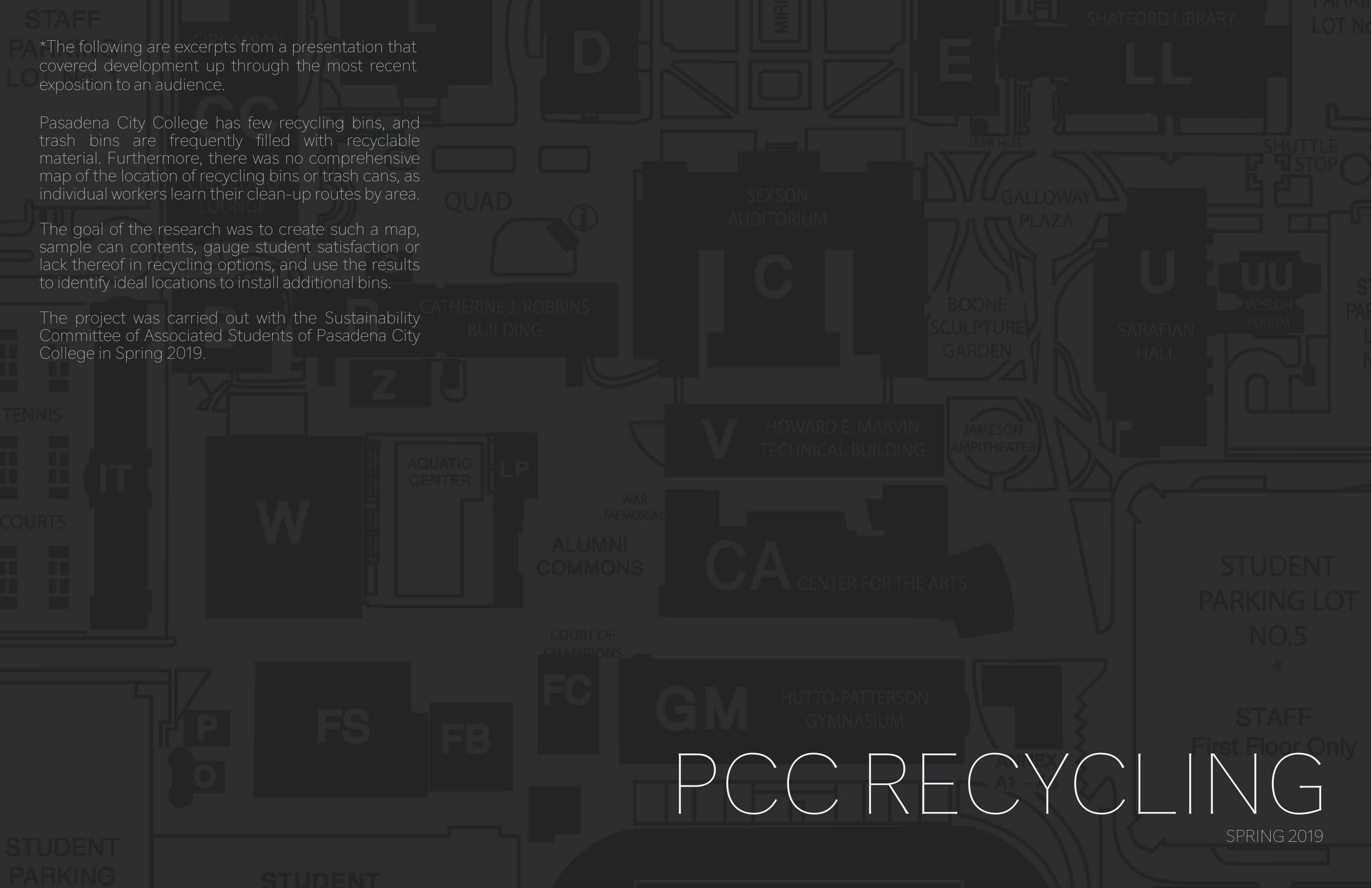
Pasadena City College has few recycling bins, and trash bins are frequently filled with recyclable material. Furthermore, there was no comprehensive map of the location of recycling bins or trash cans, as individual workers learn their clean-up routes by area.

The goal of the research was to create such a map, sample can contents, gauge student satisfaction or lack thereof in recycling options, and use the results to identify ideal locations to install additional bins.

The project was carried out with the Sustainability Committee of Associated Students of Pasadena City College in Spring 2019.

PCC RECYCLING

SPRING 2019



BACKGROUND

OVERVIEW

While Pasadena City College has made overtures towards sustainability in the past - with some notable successes - there may be problems with follow-through on some matters. The current vision is somewhat unclear.

The Measure P bond awarded to PCC roughly 20 years ago led to a dramatic overhaul of the campus - and funded the LEED-recognized Center for the Arts building - but going by recent budget reports, sustainability is not a major thematic pillar of its allocation.

While once there appears to have been more variety to the recycling system, the current system seems to lack support for some materials regularly discarded on campus.



PCC had at least some outdoors paper bins as recently as 2017



The LEED-recognized Center for the Arts building

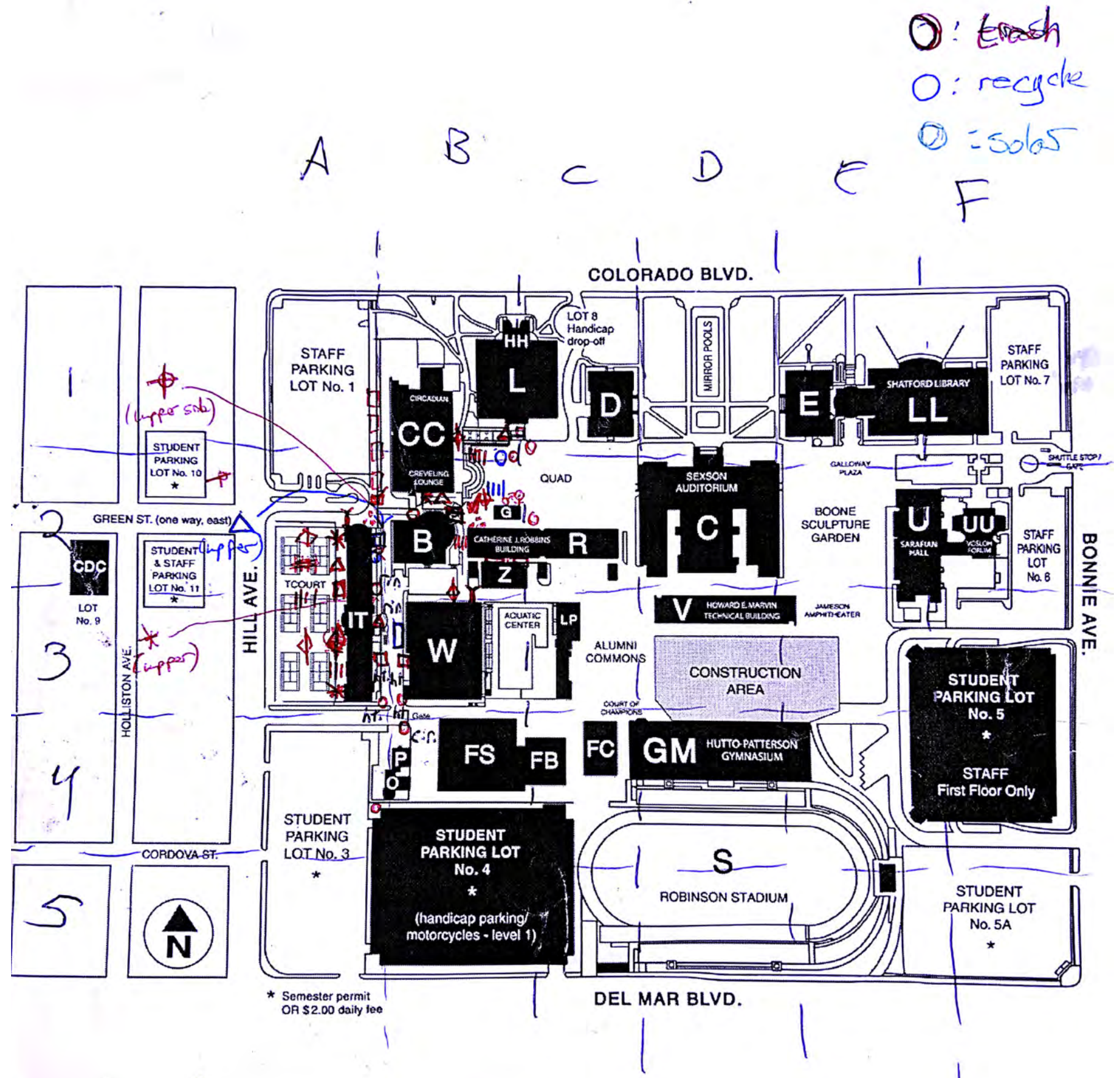
ASSESS

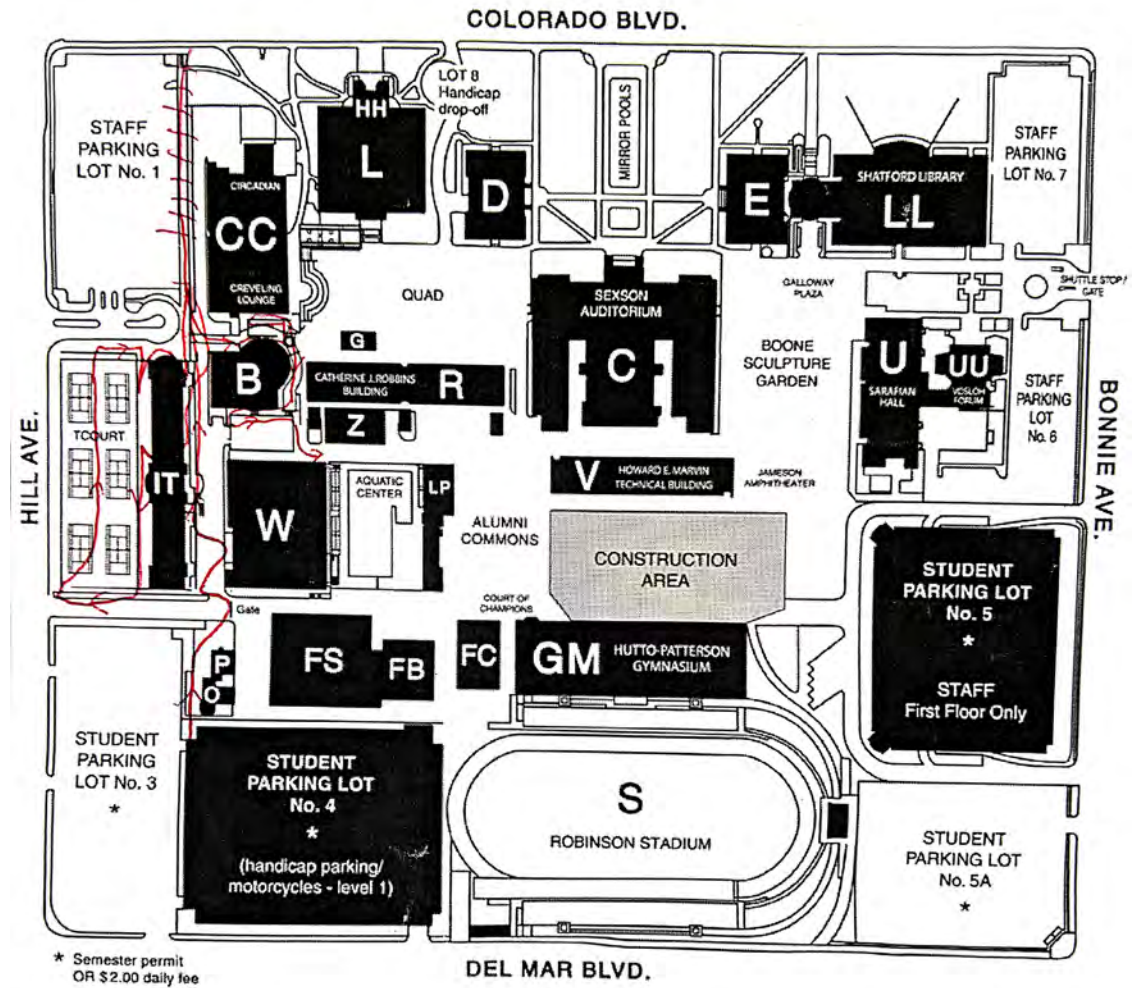
SURVEY DATE: APRIL 1st, 2019

This preliminary sampling of PCC bins provided a firsthand look into the state of trash and recycling on campus.

An improvisational approach informed the cataloguing scheme, under the assumption that distilling a formalized categorization method from the data collected and symbols used would result in superior comprehension.

First survey map with ad hoc notation. The map used was outdated, preceding completion of the Center for the Arts building.





* Semester permit OR \$2.00 daily fee

TYPE

: dumpster
 : covered trash
 : skate-top
 : open-top
 : bin
 : fitted (bottle/can)

LEGEND

: trash
 : recycle
 : solar

INSTANCE OF TYPE

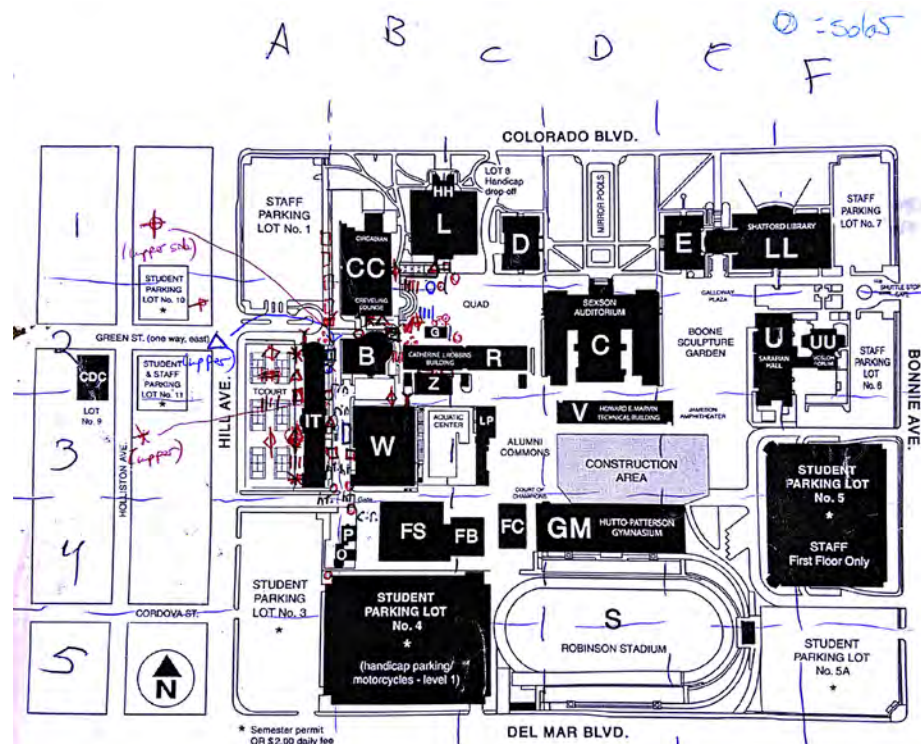
1st
 2nd
 3rd
 4th
 5th
 6th

Map recording route taken on initial sampling

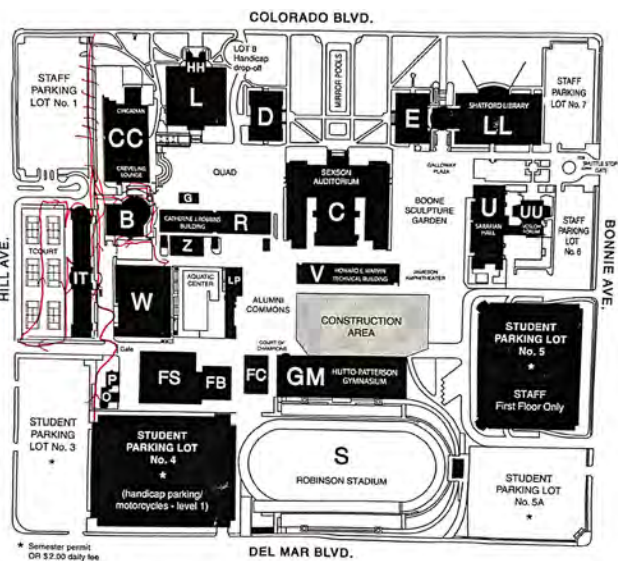


Photos of sampled bin contents

FORMALIZE



The original grid was split according to major planning lines



TYPE	LEGEND	INSTANCE OF TYPE
☐	☐ : trash	☐ 1st
☐	☐ : recycle	☐ 2nd
○	○ : solar	* 4th
☐	☐ : filled (bottle/can)	5th
☐	☐ : covered trash	☐ 6th
☐	☐ : chute-top	
○	○ : open-top	
∨	∨ : bin	

A2: ☐/☐ too recycling bins not obviously being used for recycling. In a "dump zone" of trees, bulk waste etc. contain mainly paper waste & plastics & glass. FC: food container. Bx: Box.

F: full
MB: mostly empty

A3: * mostly empty (ME), PIB & PaC w/L (ca 1)

A2: ☐ ↑ PaBx, G/B, PB, PFC

A3: ☐ ||| ME | PIB

A3: * ↑ PaFC w/PIL, PIB, MC, PIC w/PIL, Pa^S

A3: ☐ P/B (29), PaFC, PaC

A2: ||| ☐ ME | PB, PIC w/PIL, MC

A2: ☐ P/B (26)

A2: * ↑ P/FC (23), PaC w/PIL, PaFC (23) w/PIL (1)
note proximity to food strip to North

A2: Δ ↑ PaFC (22), PIC (22)

A2: ∨ ↑ MC, PIB, P/FC, PaBx

A2: ☐ ↑ G/B, PaC w/PIL (22), PIC (22)

A2: Δ ☐ FULL

A2: ☐ ME | PaC

Pos: paper goods

↑ covered
∨ chute
○ open

☐ = green fence
∨ = blue bin



Bin form code examples

PI

PLASTIC

Pa

PAPER

M

METAL

O

OTHER

C

CUP

L

LID

Bo

BOTTLE

Bx

BOX

Material and product type code examples

Development of the legend in an ad-hoc fashion based on what was found in real-time

SURVEY

SURVEY DATE: APRIL 22nd, 2019

On April 22nd, 2019, the PCC Associated Students Sustainability Committee held an Earth Day event near the reflecting pool (block D1).

The student body at PCC is roughly 25,000 students. In order to conduct a statistical analysis with a 95% confidence interval and a +/-10% margin of error, the survey required a minimum sample size of n = 96 responses.

PCC RECYCLING SURVEY



We are collecting student opinions on the PCC trash and recycling system!

On a scale from ① for VERY POOR to ⑤ for VERY GOOD, please rank the following:

AVAILABILITY OF TRASH CANS

① ② ③ ④ ⑤
VERY POOR VERY GOOD NO OPINION



AVAILABILITY OF RECYCLING BINS (BOTTLES | CANS)

① ② ③ ④ ⑤
VERY POOR VERY GOOD NO OPINION



AVAILABILITY OF RECYCLING BINS (OTHER PLASTICS)

① ② ③ ④ ⑤
VERY POOR VERY GOOD NO OPINION



AVAILABILITY OF RECYCLING BINS (PAPER | CARDBOARD)

① ② ③ ④ ⑤
VERY POOR VERY GOOD NO OPINION



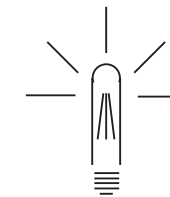
AVAILABILITY OF COMPOST BINS

① ② ③ ④ ⑤
VERY POOR VERY GOOD NO OPINION



WHICH BEST MATCHES YOUR VIEW?

- PCC is a leader in sustainability.
- PCC is above average with regards to sustainability.
- PCC is average with regards to sustainability.
- PCC is below average with regards to sustainability.
- PCC is far behind with regards to sustainability.
- Don't know/unsure



PLEASE CHOOSE ONE:

- Sustainability is of great importance to me.
- Sustainability is of some importance to me.
- I have no opinion/am unsure about sustainability.
- Sustainability is of little importance to me.
- I don't think sustainability is important at all.

FREE RESPONSE

Do you have any additional thoughts?
Have any particular concerns?
Please use the back side
of this paper to tell us!

THANK YOU for participating in our survey.

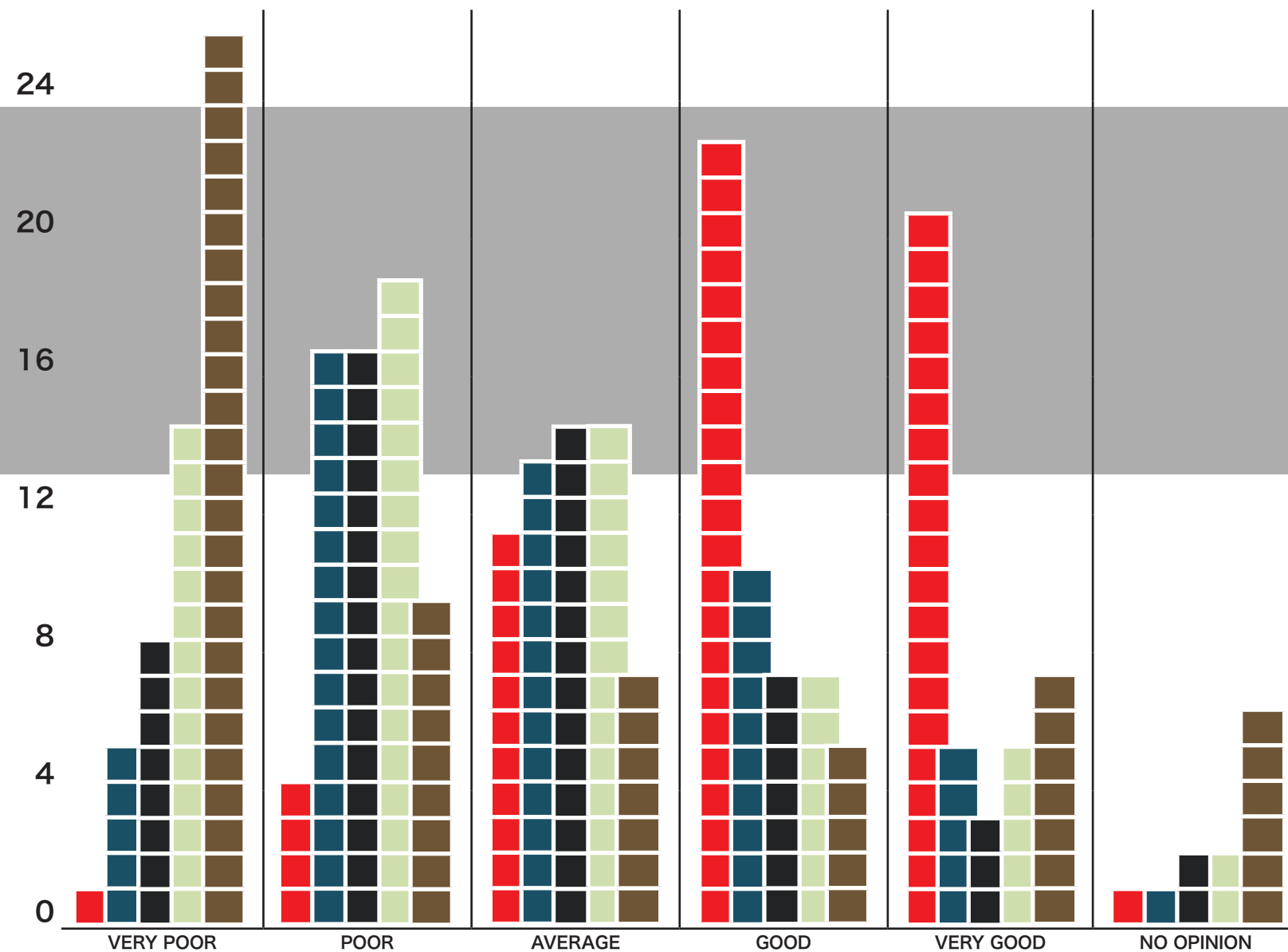
The survey used.

RESULTS

responses

ONLINE | 36
PAPER | 21

p | 25000
n | 57
CI | 95%
MoE | 12.9%



CAMPUS BIN AVAILABILITY

highest satisfaction
trash can availability
42 positive

lowest satisfaction
compost bin availability
34 negative

PCC SUSTAINABILITY

leader | 8
good | 17
average | 20
poor | 6
behind | 2
don't know | 4

IMPORTANCE TO YOU

very important | 36
somewhat important | 16
unsure | 5
not very important | 0
not at all important | 0

Additional surveys to be conducted on Thursday, 4.25.2019. Because the event is an environmental documentary screening, there may be a self-selection bias to those results.

THANK YOU