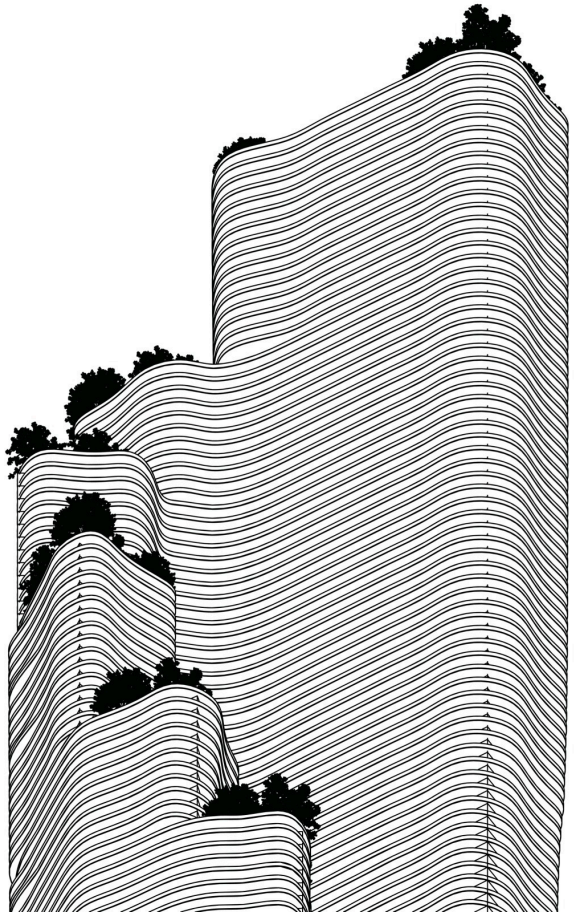
ISABELLE STRATTON

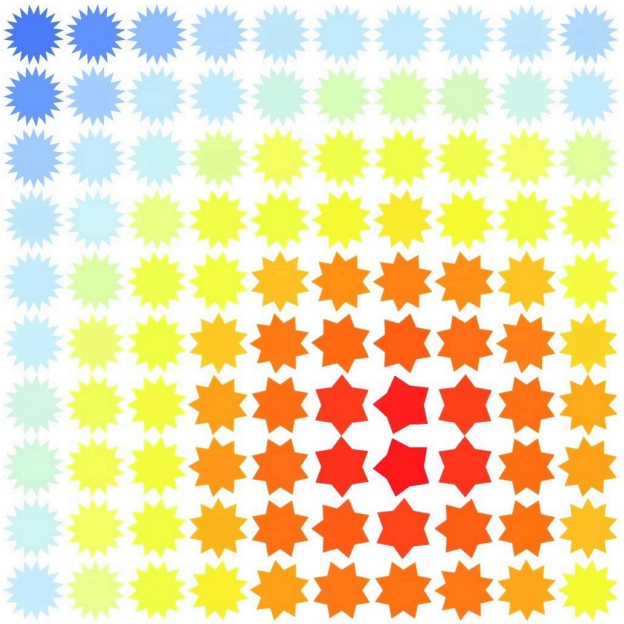


SELECTED WORKS 2025 / 26

Design research between architecture and environmental data.

CONTENTS

01	HILLSBOROUGH ECOVALUATION TOOL	GIS / DECISION SUPPORT
02	AGENTS OF BIODIVERSITY	GREEN INFRASTRUCTURE
03	REIMAGINING AQUA TOWER	CLIMATE DESIGN / TOWER
04	RESIDENTIAL RETROFIT AND REDESIGN	ENERGY / RETROFIT
05	HELIOTROPE	COMPUTATIONAL DESIGN / CANOPY
06	MULTI-DENSITY MYCO-BLOCKS	MATERIAL RESEARCH / FABRICATION
07	PARAMETRIC DRAWINGS	COMPUTATIONAL DESIGN



01

HILLSBOROUGH ECOVALUATION TOOL

YEAR
2025–2026

TYPE
GIS DECISION-SUPPORT TOOL

LOCATION
HILLSBOROUGH COUNTY, FLORIDA

SECOND AUTHOR
DR. KOTRYNA KLIZENTYTE, UNIVERSITY OF FLORIDA

PRESENTING
TAMPA BAY INNOVATION SUMMIT

ROLE
GIS ANALYSIS, TOOLBOX AND WEB APP DEVELOPMENT, DOCUMENTATION

TOOLS
ARCGIS PRO, ARCPY, ARCADE, ARCGIS EXPERIENCE BUILDER

A parcel-scale tool that puts a dollar value on what natural land does for a community, such as holding floodwater and storing carbon.

Land managers weighing conservation acquisitions rarely see the economic value of ecosystem services at the moment of decision. The tool adapts the U.S. EPA H2O / EnviroAtlas methodology to Hillsborough County and estimates four services for every parcel: flood water retention, usable air, usable water and carbon sequestration.

Land cover, soils, tree canopy and other environmental layers are intersected with parcel boundaries, so each parcel resolves into ecosystem types with acreages and per-service values. Each is compared across current and alternative land-cover scenarios, one fully developed and one restored.

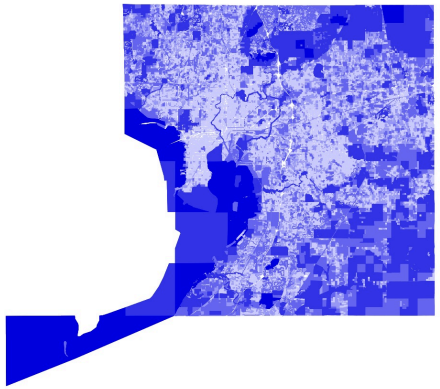
The analysis runs as a scripted ArcGIS Pro toolbox in Python. A configuration table drives data sources and publishing, so annual refreshes need no code changes, and a dry-run mode previews every publish. Results are delivered through a web application where selecting a parcel updates its land-use makeup and a chart of service values by scenario. Cached vector tiles keep a map of more than 500,000 parcels responsive.

Authorship: I am first author, with Dr. Kotryna Klizentyte (University of Florida) as second author. I will present the work at the Tampa Bay Innovation Summit.

My contribution: I built the analysis pipeline and ArcGIS Pro toolbox and delivered the results through the web application. I also wrote the operations guide and parcel report templates that let County staff refresh the data and produce reports on their own.



USABLE WATER



Usable Water
Annual water quality benefit

- $1M to $10M
- $100k to $1M
- $10k to $100k
- $1k to $10k
- Up to $1k

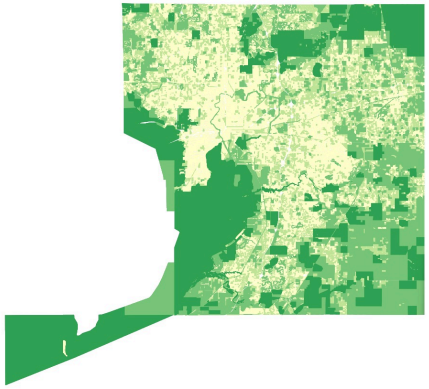
USABLE AIR



Usable Air
Annual air quality benefit

- $1M to $10M
- $100k to $1M
- $10k to $100k
- $1k to $10k
- Up to $1k

CARBON SEQUESTRATION



Carbon Sequestration
Annual carbon storage value

- $1M to $10M
- $100k to $1M
- $10k to $100k
- $1k to $10k
- Up to $1k

FLOOD RETENTION



Flood Retention
Stormwater retention value per storm

- $1M to $10M
- $100k to $1M
- $10k to $100k
- $1k to $10k
- Up to $1k

ECOSYSTEM SERVICE LAYERS IN THE WEB APPLICATION, SHOWN BY PARCEL

DEVELOPED



Developed Value
Estimated value if developed

- $1M to $10M
- $100k to $1M
- $10k to $100k
- $1k to $10k
- Up to $1k

CURRENT



Current Value
Present-day ecosystem service value

- $1M to $90M
- $100k to $1M
- $10k to $100k
- $1k to $10k
- Up to $1k

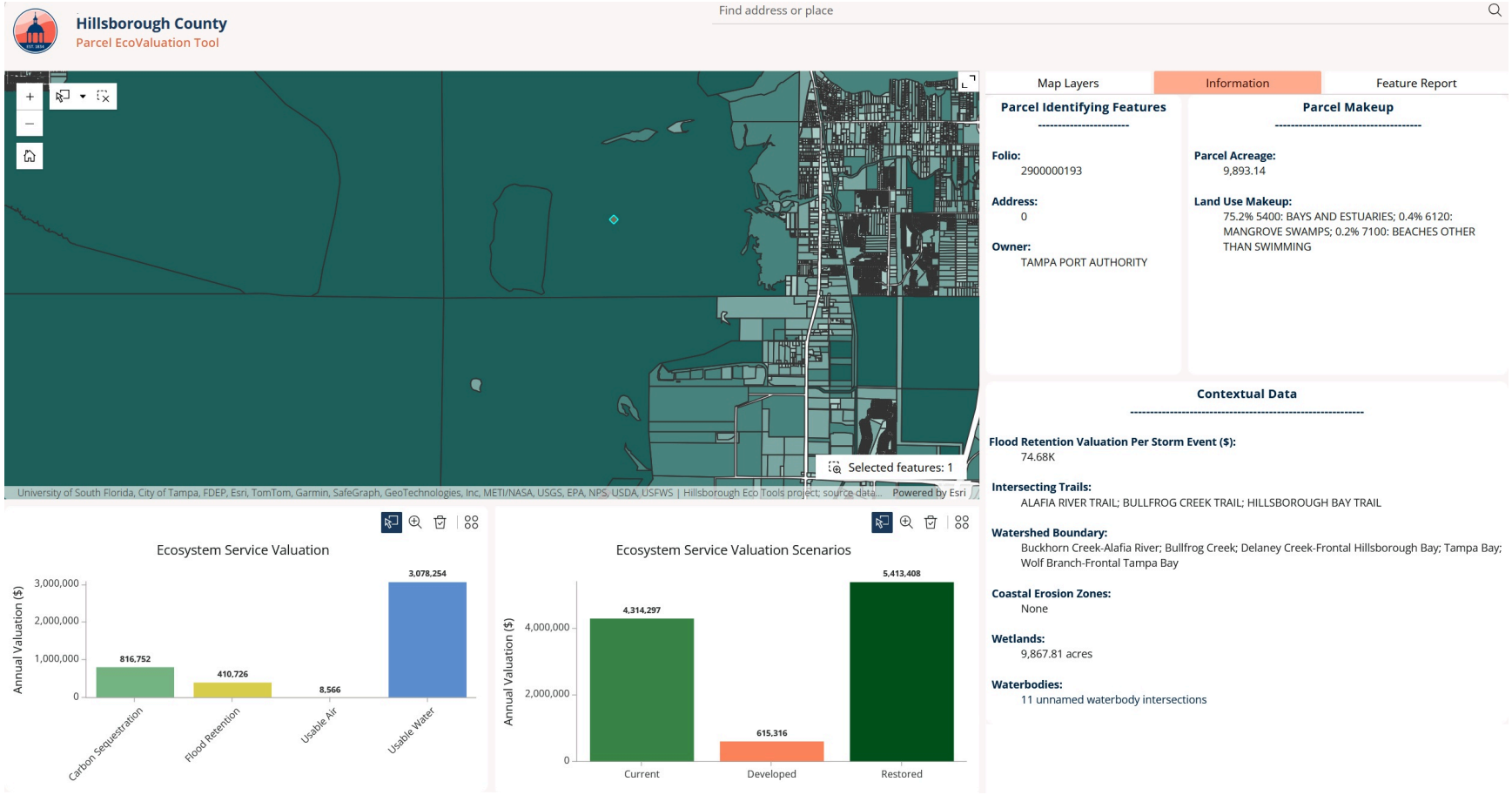
RESTORED



Restored Value
Estimated value if restored

- $1M to $90M
- $100k to $1M
- $10k to $100k
- $1k to $10k
- Up to $1k

ANNUAL ECOSYSTEM SERVICE VALUE UNDER THREE LAND-COVER SCENARIOS



THE PARCEL ECOVALUATION WEB APPLICATION: SELECTING A PARCEL UPDATES ITS MAKEUP AND VALUE CHARTS

02
AGENTS OF BIODIVERSITY

YEAR
FALL 2025

STATUS
PROPOSAL: CONCEPT AND DIAGRAM, NOT BUILT

TYPE
ADAPTIVE GREEN INFRASTRUCTURE

LOCATION
PITTSBURGH, PA

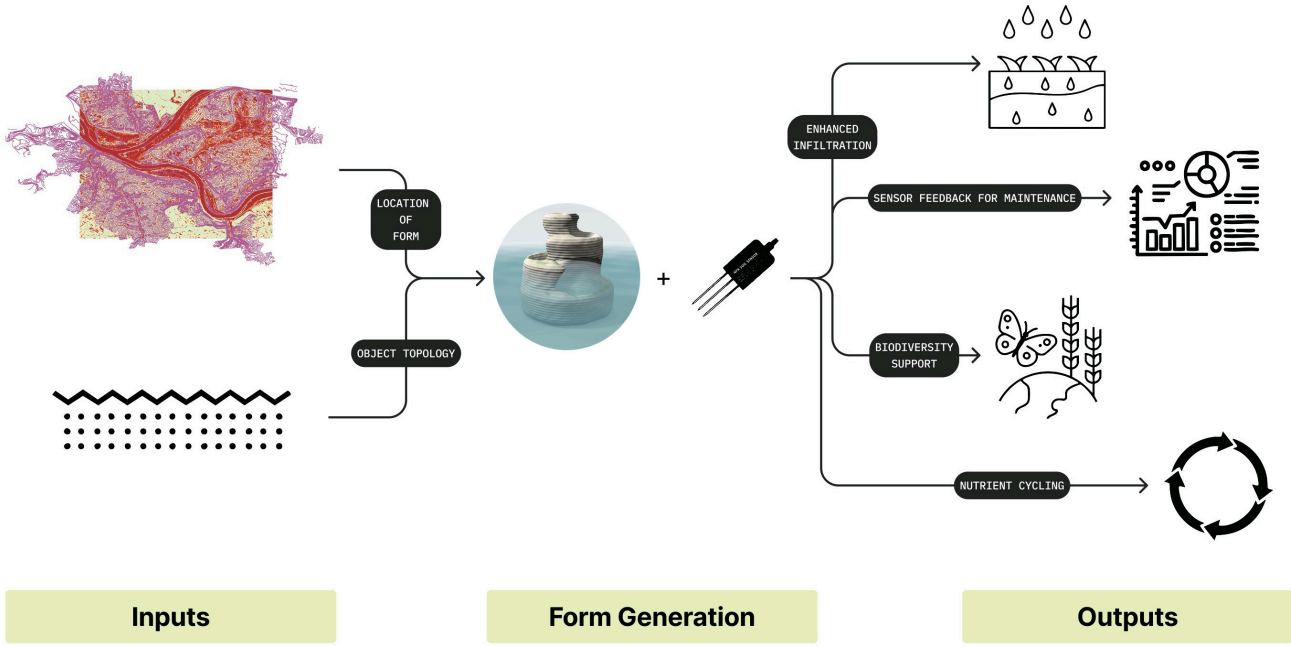
FOCUS
BIOSWALES, FLOOD RISK, SENSING

A proposal for bioswale modules that report on their own health, so maintenance follows need instead of a calendar.

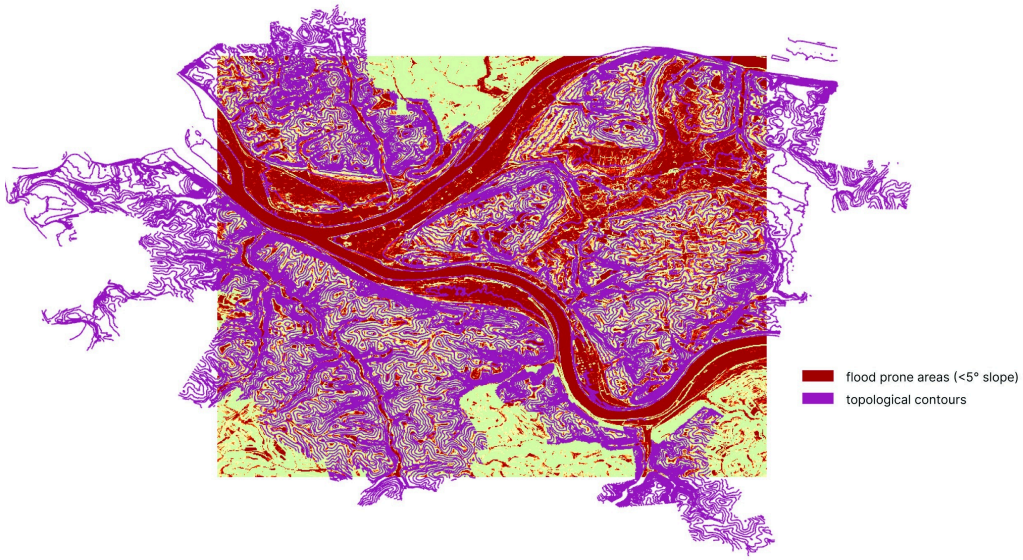
Pittsburgh's steep topography and aging infrastructure, together with intensifying storms, raise flood risk. Bioswales improve infiltration and reduce runoff, but they demand upkeep and monitoring to keep performing.

This proposal suggests Adaptive Bioswale Modules in ceramic or bio-based composites that support biodiversity and nutrient cycling. A sensor interface tracks NPK and soil moisture, and site factors such as soil compaction and hill slope tune maintenance schedules, cutting unnecessary spending and extending the life of the urban waterscape.

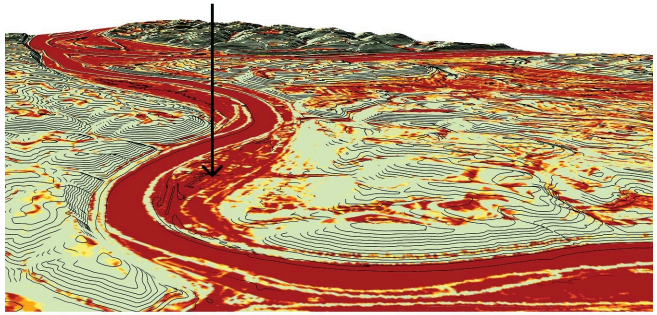
The diagram reads left to right. Two inputs, the location of the form on Pittsburgh's slope and flood data and the topology of the object, feed the form generation, and the module is paired with a soil sensor. The outcomes are better infiltration and sensor feedback for maintenance, plus support for biodiversity and nutrient cycling. The printed form and sensor node continue in my thesis work.



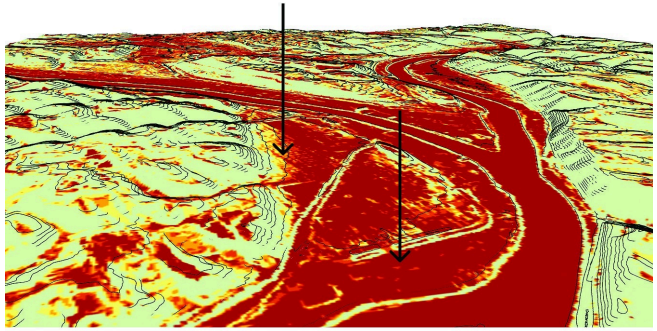
INPUTS, FORM GENERATION, OUTPUTS



FLOOD-PRONE AREAS (<5° SLOPE) AND TOPOGRAPHIC CONTOURS



FLOOD-PRONE TERRAIN



FLOOD-PRONE TERRAIN, RIVER BEND

03
REIMAGINING AQUA TOWER

YEAR
FALL 2025

TYPE
CLIMATE REDESIGN, HIGH-RISE

LOCATION
SAN DIEGO, CA (ZONE 3B)

COLLABORATORS
KRUTI MAKWANA, AASHRITHA JALADI, JULIA TWARDZISZ

MY ROLE
ENVIRONMENTAL SIMULATION; REMAPPED FLOOR PLATES TO SOLAR RADIATION

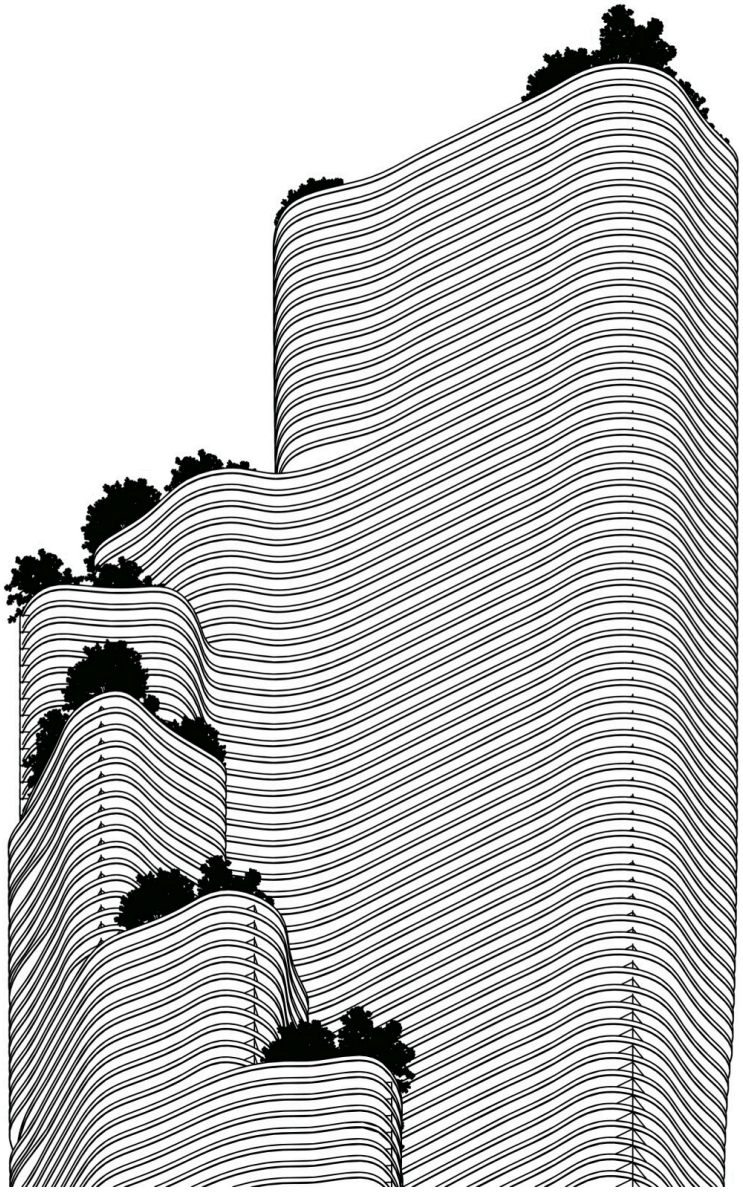
A Chicago icon translated to a Pacific presence: a cascading tower shaped by wind, sun and view.

The project moves Chicago's Aqua Tower into San Diego's warm marine climate, in the Central Building District along the bay. Natural ventilation and cooling take priority to reduce thermal stress.

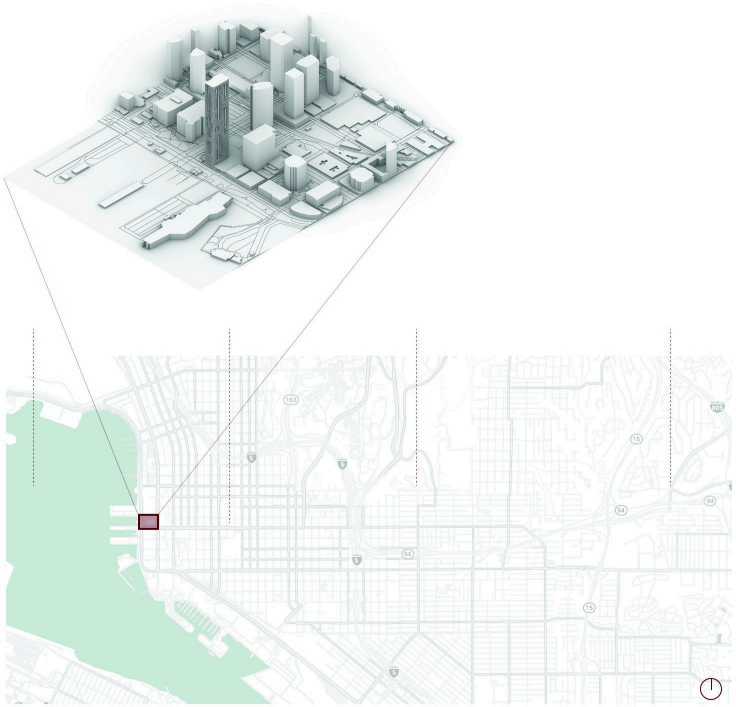
A staggered form, modeled after waves and terrestrial contours, carries green terraces and roof gardens that support community connection. Units use parallel windows to draw cross ventilation from prevailing western winds while capturing views of the Pacific and Balboa Park.

Irregular balconies act as shading devices for the floors below, with depths optimized through radiation simulation to reduce cooling demand and Energy Use Intensity. Daylight and thermal comfort studies test the result: 72% sDA, and an ASE of about 37.9% driven by the west-facing glass that frames the bay.

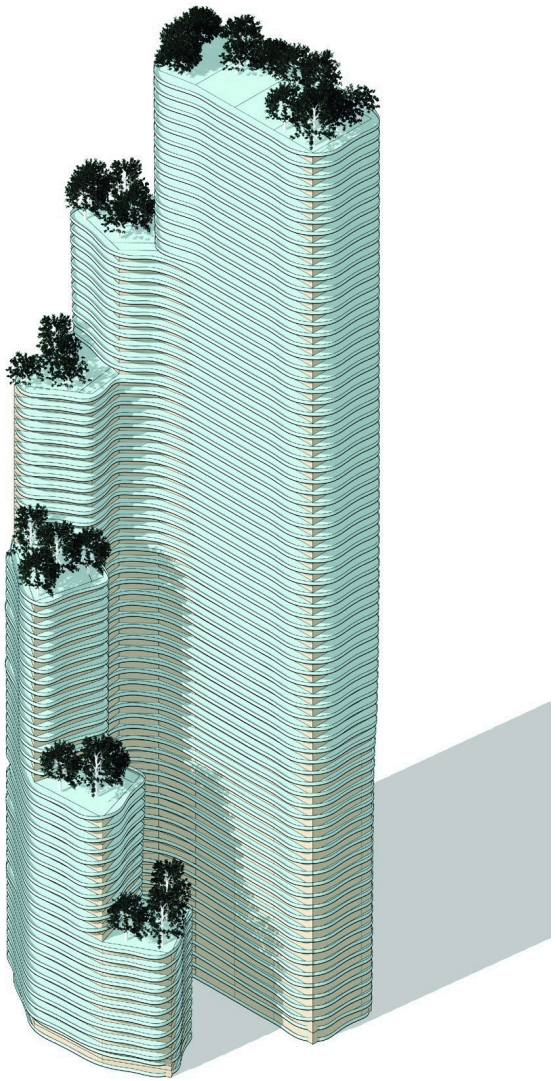
My contribution: I worked on the environmental simulations throughout the project, and I built the parametric radiation-to-form logic: each floor plate's solar radiation is remapped to an overhang depth, so balcony depth increases where radiation is highest and updates whenever the simulation does.



STEPPED TOWER ELEVATION



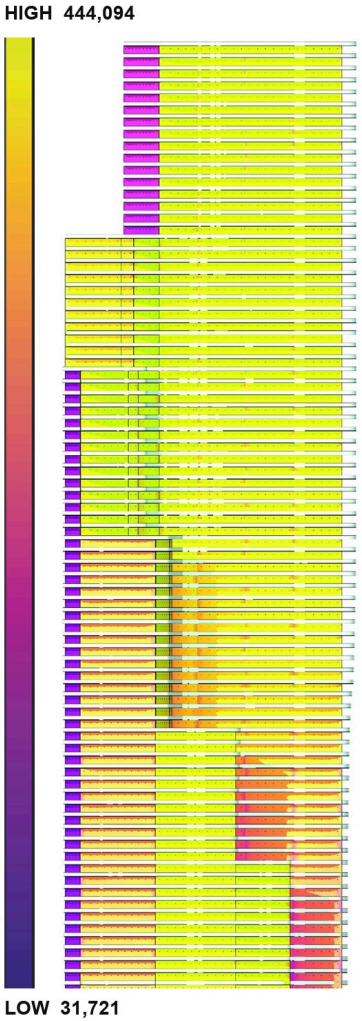
SITE CONTEXT: THE BAY AND BALBOA PARK



TOWER WITH TERRACES AND ROOF GARDENS

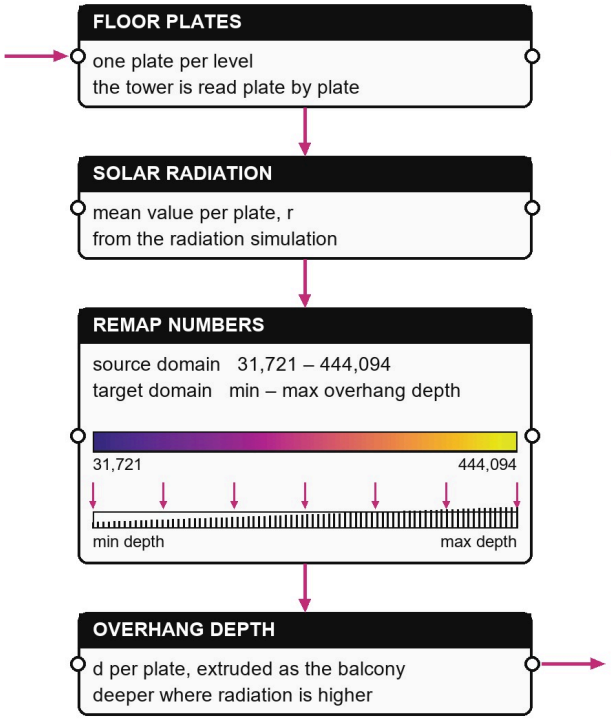
01 INPUT

Solar radiation on every floor plate



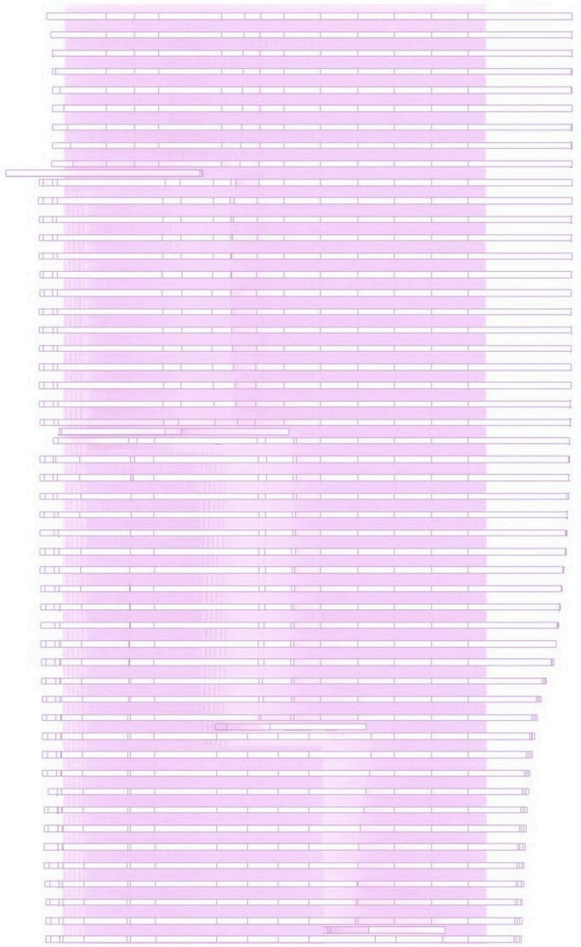
02 PARAMETRIC LOGIC

Radiation drives depth, not a hand-drawn overhang



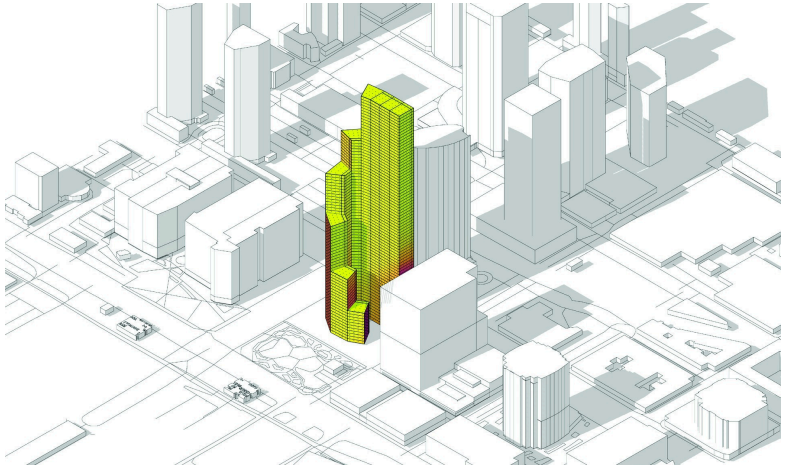
03 OUTPUT

Overhang depth per floor plate

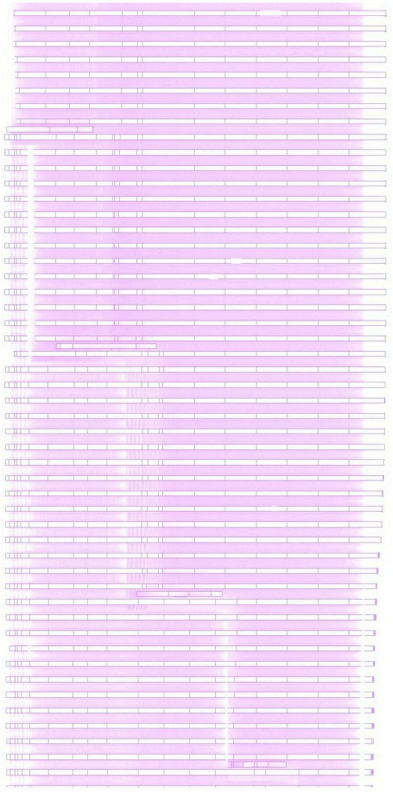


Max depth exaggerated so the change is visible

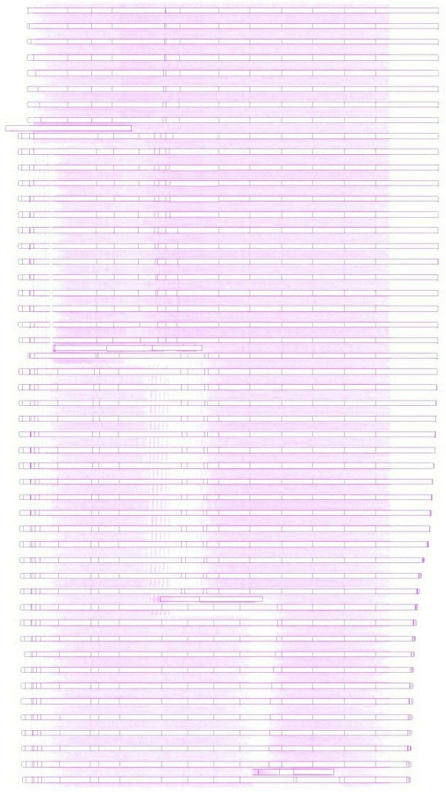
PARAMETRIC LOGIC: EACH FLOOR PLATE'S SOLAR RADIATION IS REMAPPED TO A BALCONY OVERHANG DEPTH, SO THE FORM RESPONDS TO THE SIMULATION



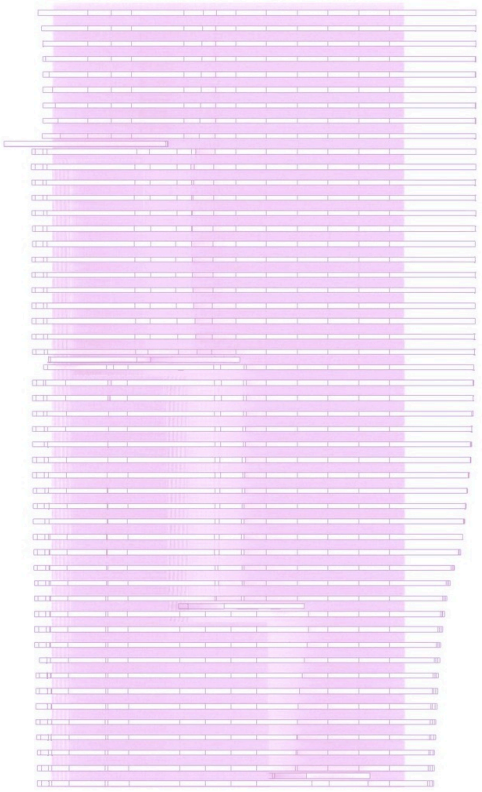
OVERHANG DEPTH STUDIES: MAX DEPTH EXAGGERATED SO THE CHANGE IS VISIBLE



ITERATION 1: DEPTH EXAGGERATED



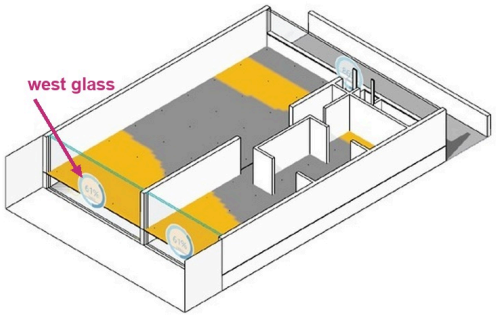
ITERATION 2: DEPTH EXAGGERATED



ITERATION 3: DEPTH EXAGGERATED

DAYLIGHT Iteration 1

ASE

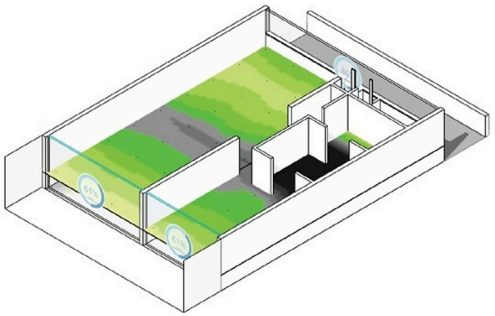


37.9%

0 250 hrs >

West-facing glass, sized to keep the bay view, drives high annual sunlight exposure.

sDA

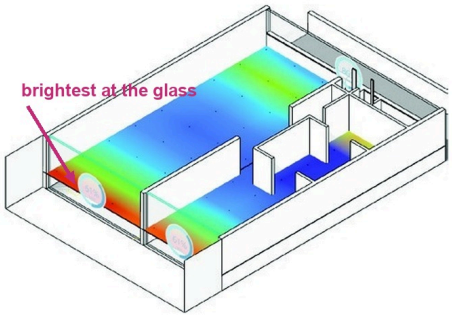


72%

0 50% 100%

East and west windows for views and cross ventilation still give good daylight autonomy.

MEAN ILLUMINANCE



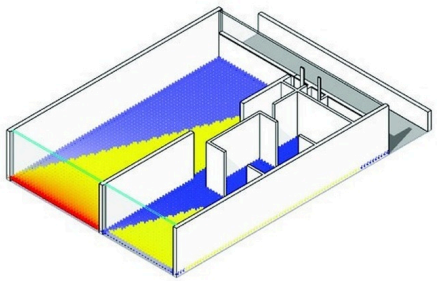
0–3,000 lux

0 3000 lux

Peaks between 9 am and noon, and again near sunset around 5:30 pm.

SPATIAL THERMAL COMFORT June 21st, 6 pm

MEAN RADIANT TEMPERATURE

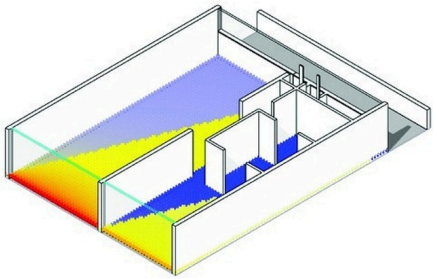


22.99–28.41 °C

cold hot

The low sun heats the wall dividing the living and bedroom zones.

PREDICTED MEAN VOTE

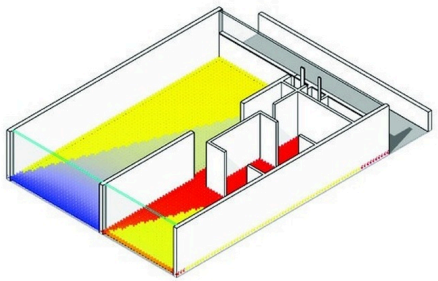


−1.76 to −0.63

cold hot

Slightly cool as the sun sets, close to neutral in places.

PREDICTED % DISSATISFIED



13% – 65%

fewer dissatisfied more dissatisfied

Predicted dissatisfaction across the unit at sunset ranges from 13% to 65%, the share of occupants expected to feel uncomfortable.

Energy zones

Zone 1: Living room, dining and kitchen

Zone 2: Wash, bathroom, closet, bedroom

Zoning

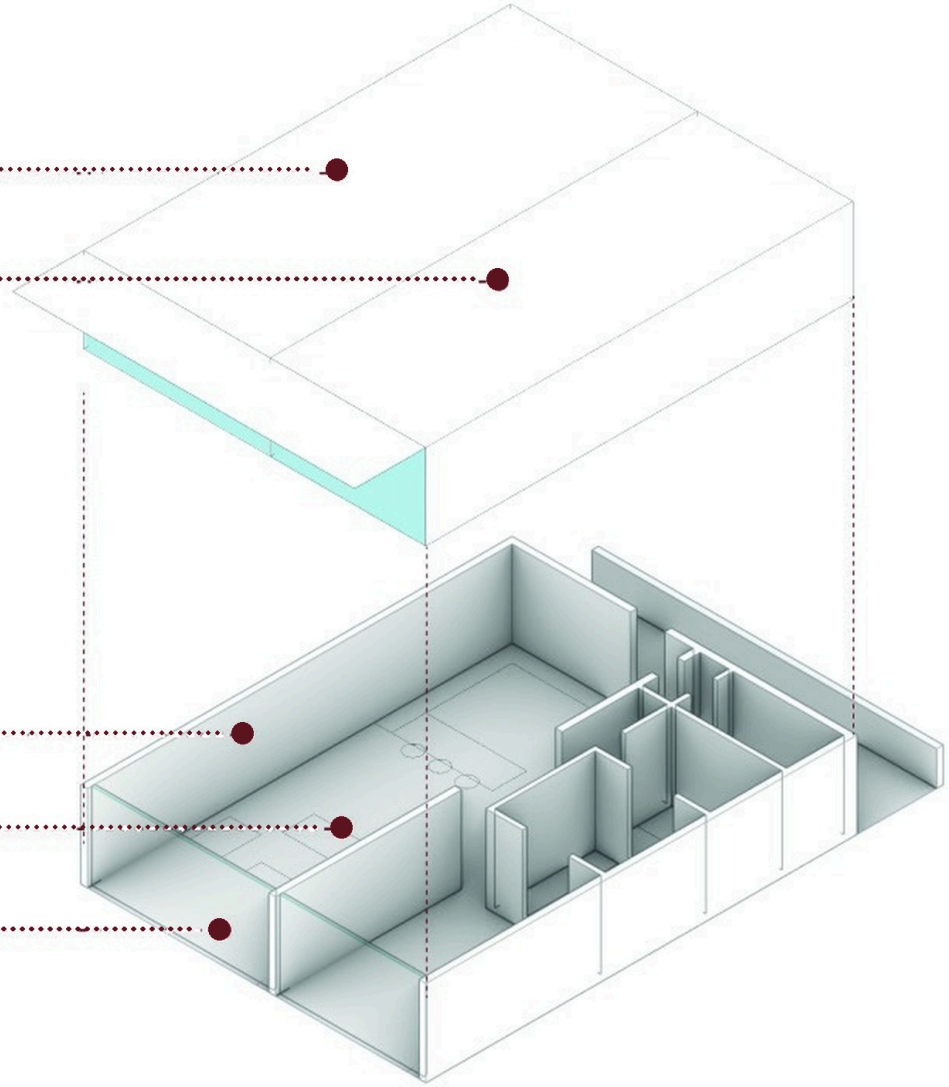
The zone is divided into 2: one is a more active zone of living room, kitchen and dining, while the other is a zone of rest: bedroom, closet, washroom and the wash area of the kitchen.

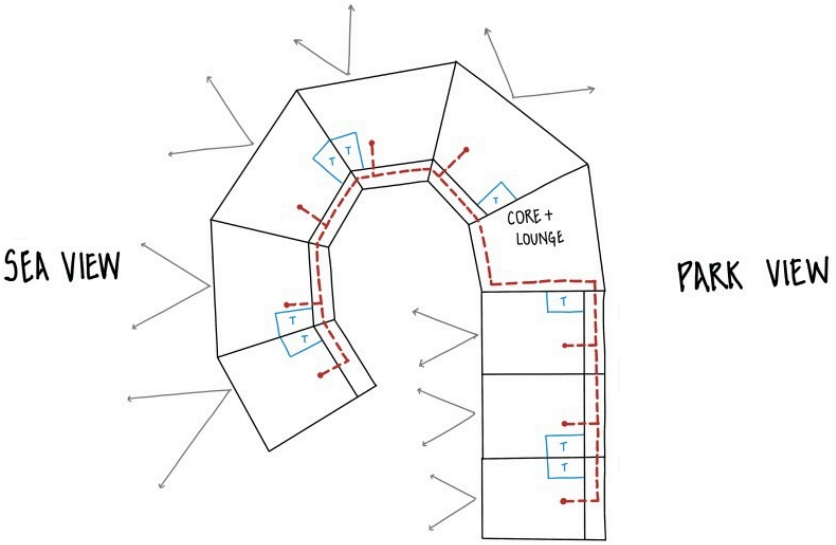
Materials

Masonry wall: CMU

Concrete slab: reinforced cement concrete

Glazing: double glazed unit, VLT ↑ SHGC ↓





TOWER PLAN: SEA VIEW AND PARK VIEW

Tower plan. The floor plan bends around a central core and lounge, so the units fan out along two arms. The western arm looks toward the sea and the eastern arm toward the park, and the grey arrows show the view direction from each unit. A single circulation line (red, dashed) runs along the core and branches into every unit, so each one is reached from the same spine while keeping its own view and cross ventilation.

04

RESIDENTIAL RETROFIT AND REDESIGN

YEAR
FALL 2025

TYPE
ENERGY ASSESSMENT, RETROFIT

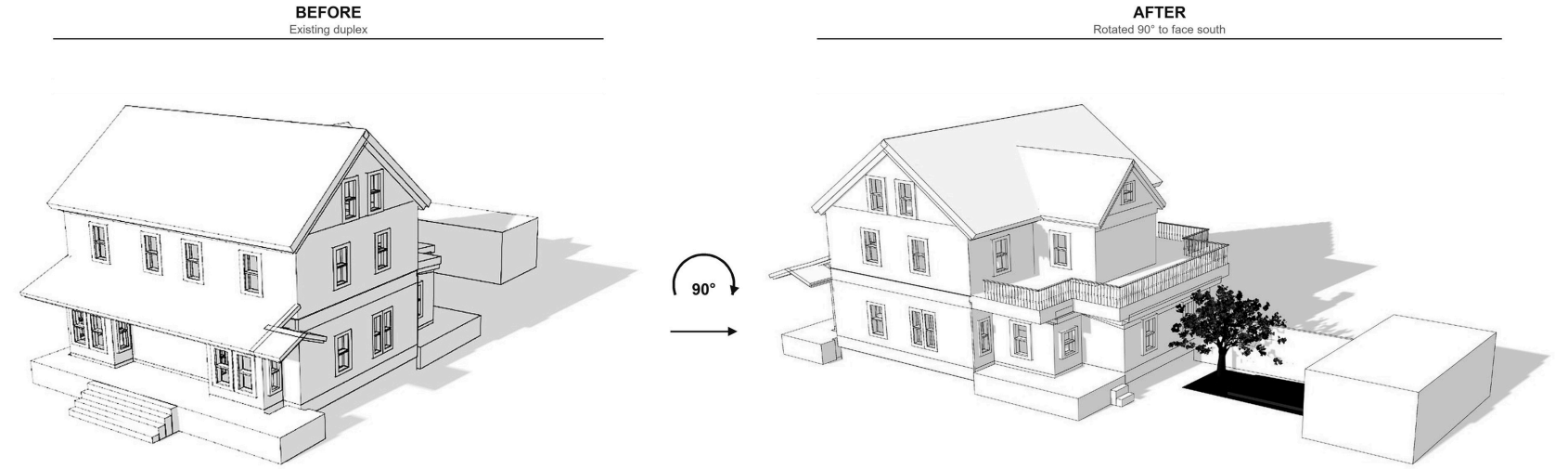
LOCATION
GLOUCESTER, MA

FOCUS
PASSIVE SOLAR HEATING

Two paths to efficiency for a duplex in a cold coastal climate: one ideal, one buildable.

Unit 39 gets some morning sun but limited afternoon solar gain because of the wall it shares with its neighbor. The theoretical redesign rotates the building 90 degrees to face south and maximize winter gain. It is the ideal configuration, and not feasible for the existing structure.

The recommended retrofit is a sunspace built on the existing south porch: a glass enclosure with operable windows and skylights that reopens as a porch in summer. It warms interior surfaces and air passively, reducing space heating, the home's main energy load, with night insulation shades and the common wall helping distribute heat.



BEFORE AND AFTER: THE EXISTING DUPLEX (LEFT) AND THE THEORETICAL REDESIGN, ROTATED 90° TO FACE SOUTH (RIGHT)



RECOMMENDED SUNSPACE



WINTER DAY: LOW SUN ENTERS THE GLAZING AND WARMS THE HOUSE



WINTER NIGHT: SHADES CLOSED, COLD BOUNCES OFF THE GLAZING



SUMMER DAY: HOT AIR EXITS HIGH WHILE COOL AIR IS DRAWN IN LOW



SUMMER NIGHT: COOL AIR FLUSHES THE SUNSPACE AND RISES OUT THROUGH THE UPPER WINDOWS

PASSIVE SOLAR HEATING — GLASS AREA CALCULATION

Isolated Sunspace (SSE2) – Massachusetts Climate

1. System Type & Specifications

System Type:
SSE2 — Semi-enclosed 90/30 sunspace with insulated common wall and night insulation

Location:
Boston, MA (cold climate)
Retrofit of existing south porch

Glazing:
- Vertical south: 5 windows (3'×5') = 75 ft²
- Roof skylights: 4 units (4'×3') = 48 ft²

Total: 123 ft²

- Double-pane low-E, argon (U=0.22, SHGC=0.45)

Thermal Controls:
- Common wall: R-13 to R-19
- Floor: R-19 insulated wood
- Night insulation shades
- Operable windows/skylights for summer ventilation

2. Heat Loss Calculation

```
Measured UA = 969.88 Btu/hr·°F
24UA = 24 × 969.88 = 23,277 Btu/day·°F
```

3. SSF/LCR Analysis

LCR	100	70	50	40	30	25	20	15
SSE2 SSF (%)	16	22	29	34	41	46	52	61

4. Target Performance (30% SSF)

```
Target SSF = 30% → LCR ≈ 50

Required glass area:
A = 24UA / LCR
A = 23,277 / 50
A ≈ 466 ft²
```

5. Actual Performance

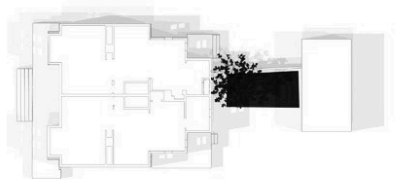
```
Actual glass area = 123 ft²

Actual LCR:
LCR = 23,277 / 123
LCR ≈ 189
```

EXPECTED SOLAR SAVINGS FRACTION: 8-10%

6. Design Commentary

- **Glass Area:** 123 ft² limited by existing porch structure and budget. Provides useful daytime gains without overheating risk.
- **Thermal Mass:** Insulated porch floor and interior finishes moderate temperature swings; additional masonry not required at this LCR.



PLAN, SUMMER SHADOWS



PLAN, WINTER SHADOWS

05
HELIOTROPE

YEAR
FALL 2026

TYPE
PARAMETRIC SHADING CANOPY

COURSE
48-724 SCRIPTING AND PARAMETRIC DESIGN, FALL 2026

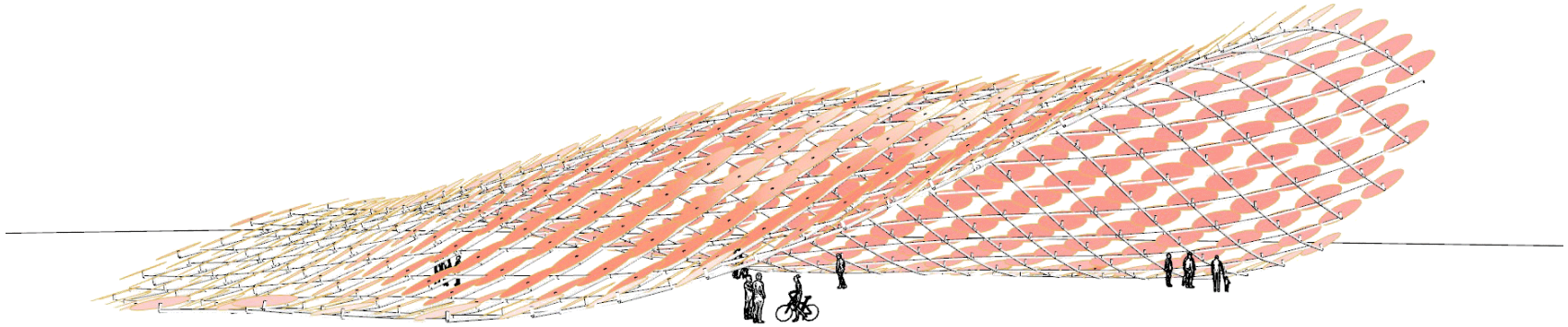
PRECEDENT
FEDERATION SQUARE FACADE, RECONSTRUCTED PARAMETRICALLY

TOOLS
RHINO, GRASSHOPPER, PYTHON

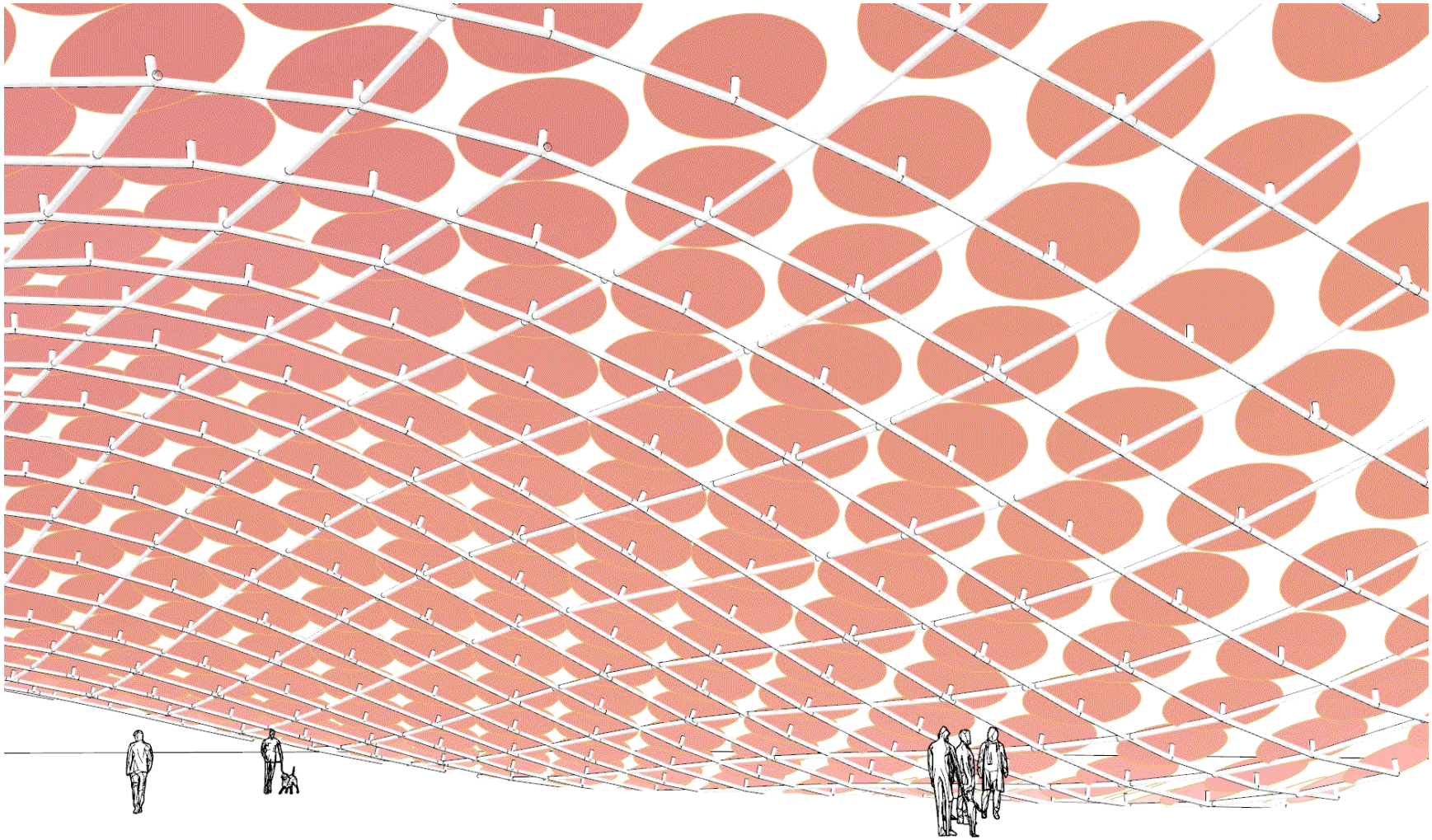
A canopy that turns its face to the sun, disc by disc, derived from the Federation Square facade.

Heliotrope is a generative shading canopy built in Rhino Python and Grasshopper. Circular discs are packed on a hexagonal grid: row spacing is derived from column spacing with a 30-60-90 triangle, so every disc keeps an even gap to its neighbors in all directions.

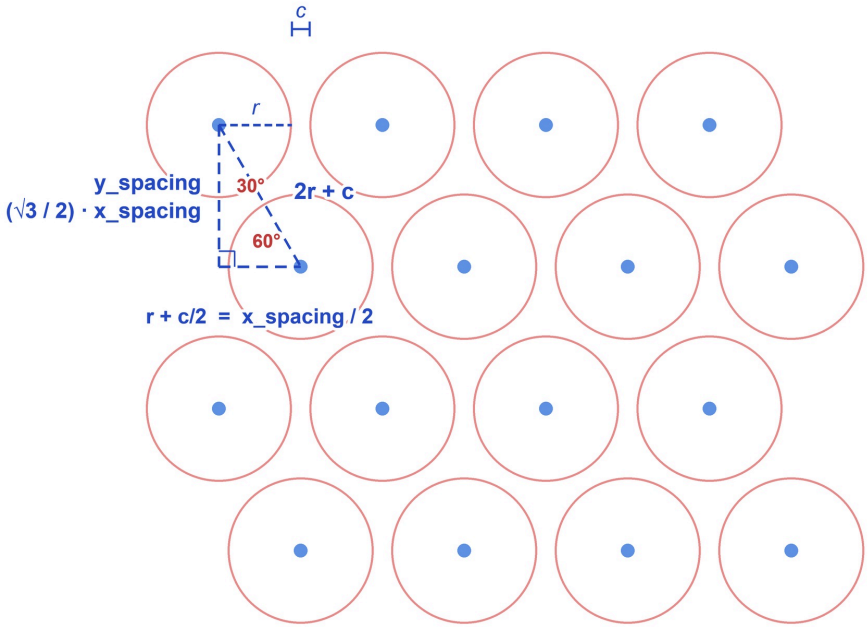
A sun-path arc acts as the attractor. As the sun moves from morning to evening it drives the tilt of each disc, and the views across the day show the field opening and closing.



DISC TILT FOLLOWING THE SUN PATH THROUGH THE DAY (ANIMATION)



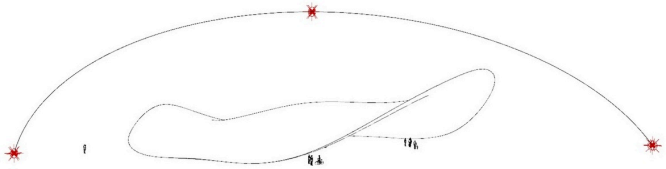
CLOSE VIEW FROM BELOW: DISCS OPEN AND CLOSE THROUGH THE DAY (ANIMATION)



x_spacing = 2r + c

Even rows are shifted by half a column, so every disc keeps an even gap to its neighbours.

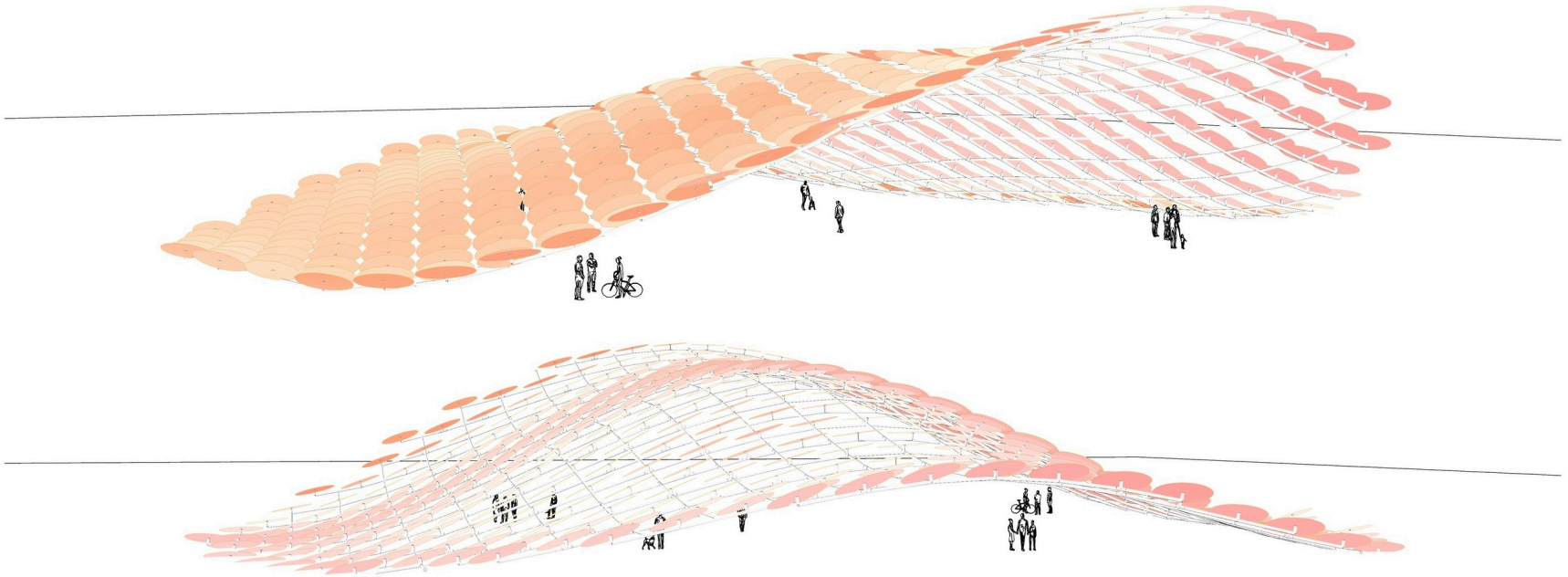
GENERATIVE LOGIC: HEXAGONAL DISC PACKING AND THE 30-60-90 TRIANGLE THAT SETS ROW SPACING



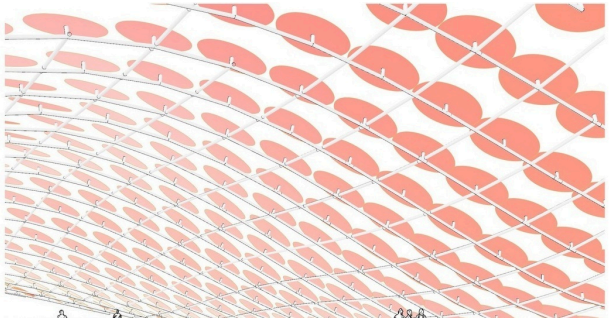
SUN PATH (ATTRACTOR ARC) DRIVING DISC TILT THROUGH THE DAY

Precedent: the disc field is derived from an analysis of the Federation Square facade.

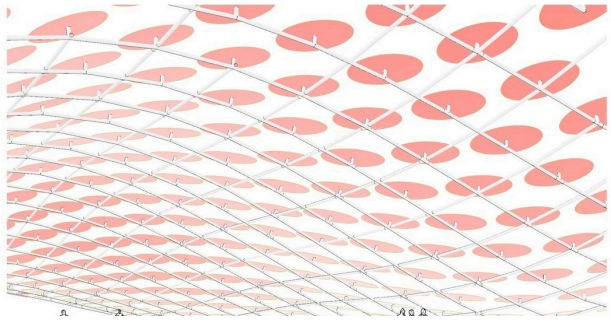
Row spacing is derived from column spacing using a 30-60-90 triangle. Since the hypotenuse (2r + c) is twice the adjacent side (r + c/2), rows must be spaced √3/2 times the column spacing, so every disc keeps an even gap to its neighbors in every direction.



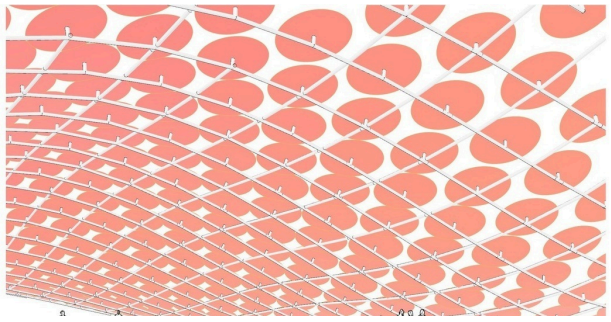
KEY VIEWS: THE CANOPY FROM TWO ANGLES



MORNING



MIDDAY



EVENING

06

MULTI-DENSITY MYCO-BLOCKS

YEAR
SPRING 2026

TYPE
MULTI-DENSITY MYCELIUM WALL SYSTEM

METHOD
CNC MOLDS, VACUUM FORMING, HYDRAULIC COMPRESSION, 3D-PRINTED JIGS

MATERIAL
MYCELIUM, CARNAUBA AND BEESWAX FINISH

Mycelium as both material and form generator, now built up into multi-density blocks.

Each block is a sandwich: two compressed mycelium panels around a core of mycelium foam, coated in carnauba and beeswax. The dense skin carries load and sheds moisture, while the foam core keeps air pockets for insulation. Hexagonal modules tessellate into a wall, with a mycelium corner joint in development. The intent is a product that is entirely biodegradable.

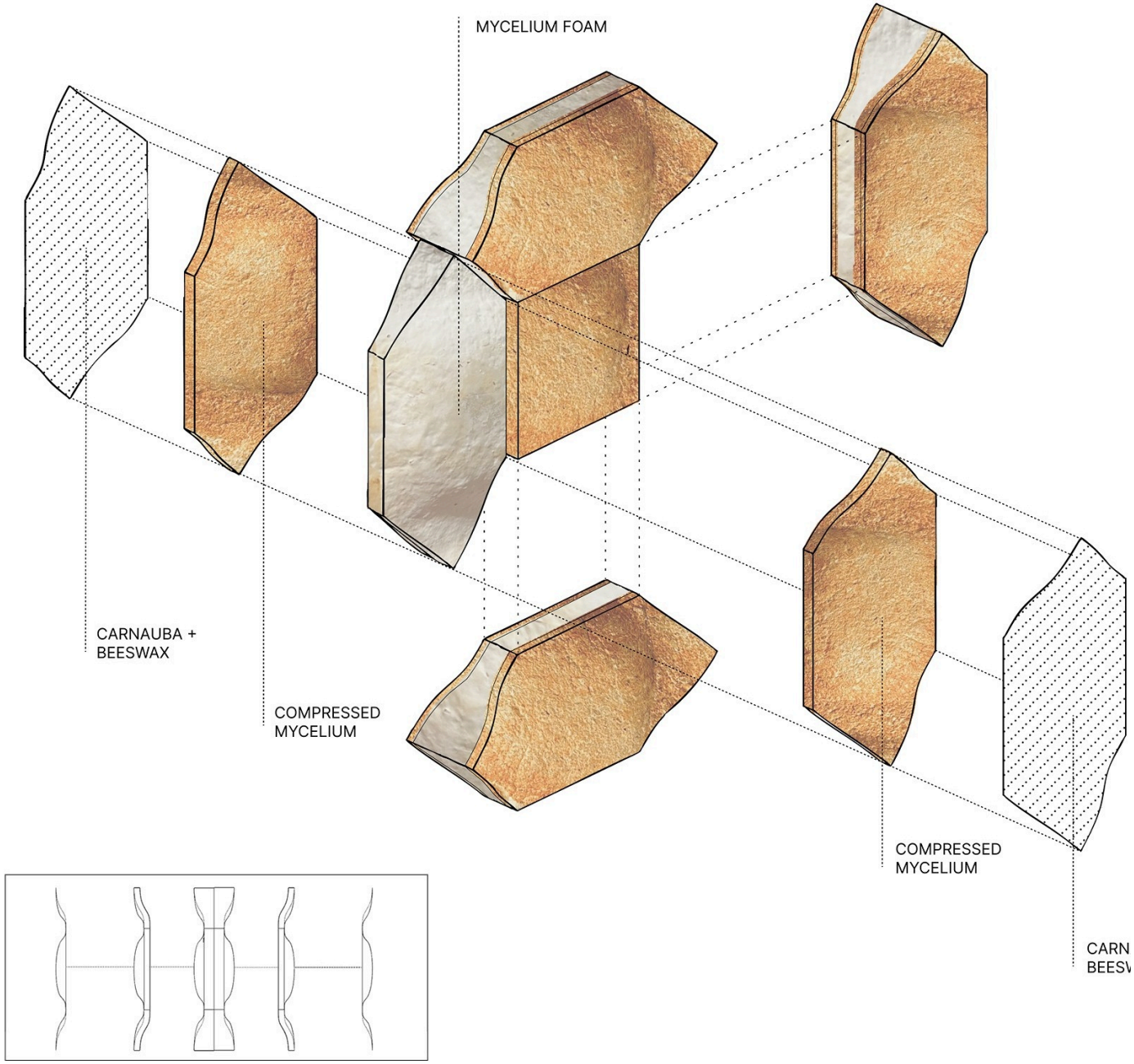
Panels are grown in vacuum-formed molds cast from CNC-milled positives, then compressed in a hydraulic Carver press at 2 to 4 metric tons, held for about 10 minutes and reapplied as the material loses height. A parafilm layer prevents sticking and gives consistent panels of roughly 0.8 to 0.9 cm. Panels left too long before pressing dry out and crack, so moisture control is critical.

A custom 3D-printed fill jig aligns the panels and introduces new growth at the joints. Assembling early lets the panels fuse before final drying, and dowels add mechanical reinforcement to the material bond. Live blocks run about 14% larger than dry ones.

Next: a new fill shape with a void that leaves room for “grout,” and more molds running at once to improve growth timing. Wax finishes with glycerin are being tested for water resistance.



MULTI-DENSITY MYCO-BLOCK, FINISHED



MULTI-DENSITY MYCO-BLOCK: COMPRESSED MYCELIUM SKIN AROUND A FOAM CORE, WITH A CARNAUBA AND BEESWAX COATING

CNC



VACUUM FORMING



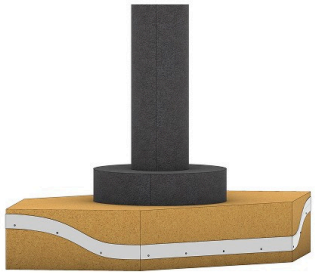
FILL MOLD



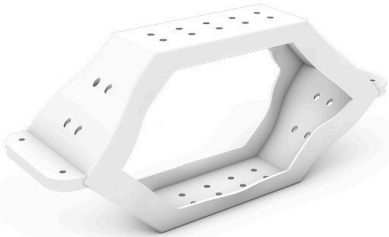
GROWTH STAGE 1



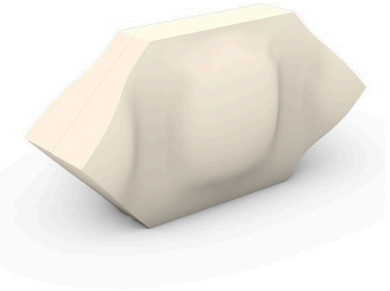
HYDRAULIC COMPRESSION



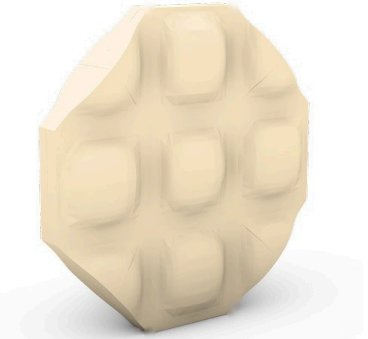
SANDWICH TWO COMPRESSED PANELS WITH MYCELIUM



GROWTH STAGE 2



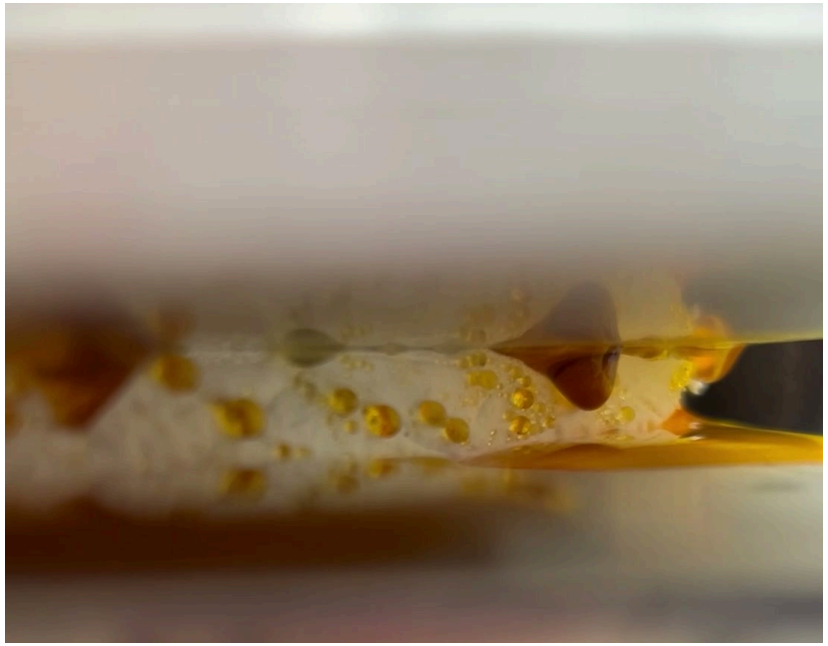
GROWTH STAGE 3



FABRICATION SEQUENCE, FROM CNC MOLDS TO THE GROWN AND ASSEMBLED BLOCK



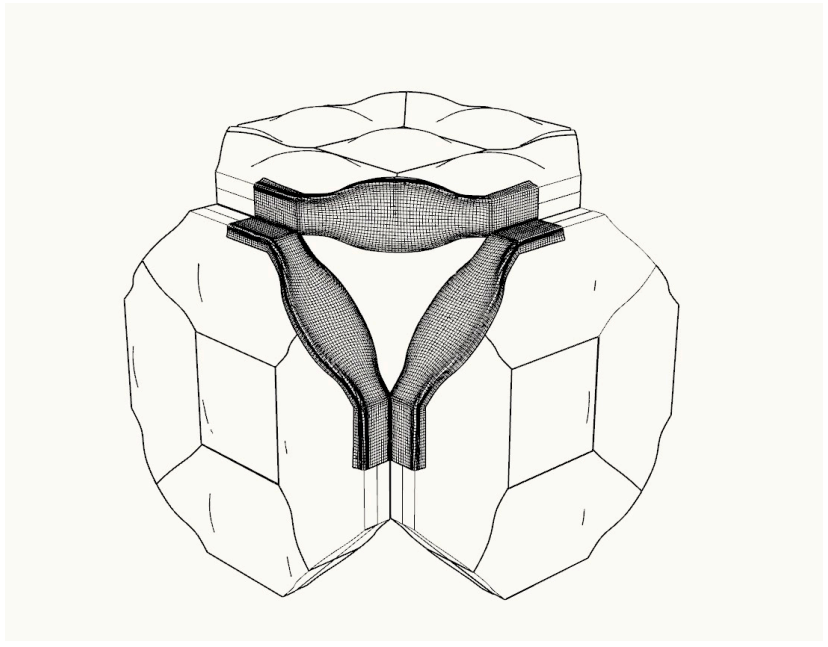
VACUUM FORMING THE MOLD



HYDRAULIC COMPRESSION OF A PANEL



FOAM FILL: THE ICE CREAM SANDWICH



CORNER JOINT IDEATION



FINISHED BLOCK, FRONT



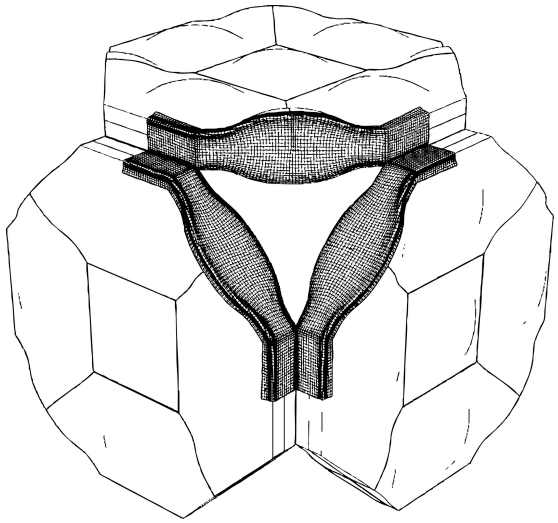
FINISHED BLOCK, THREE-QUARTER VIEW SHOWING THE DOWEL HOLES



BLOCK PROFILE, LIVE AND DRY



3D-PRINTED FILL JIG



CORNER JOINT DETAIL



FILL JIG DEVELOPMENT

Changes to design

Reduced material

Holes for dowel alignment

Extensions for clamp attachment









PANEL ADHESION

Inert panels adhere to live mycelial growth, so live panels are used to mitigate contaminants

Live blocks are 14% larger than dry blocks

COMPRESSION TESTING

Compression is performed using a hydraulic Carver press at 2–4 metric tons, held for about 10 minutes and reapplied as the material loses height. A parafilm layer prevents sticking and produces consistent panel thicknesses (about 0.8–0.9 cm). Panels that sit too long before pressing dry out, becoming brittle and prone to cracking under higher loads, which makes moisture control critical.

JOINERY & ASSEMBLY

A custom 3D-printed jig aligns panels and introduces material at joints. Earlier assembly allows panels to fuse before final drying, improving continuity across connections. Dowels are added for reinforcement, combining mechanical support with material bonding.

NEXT STEPS: CORNER SYSTEM + FINISHING

Next iterations will develop a 3D-printed corner mechanism for more complex assemblies. Surface finishes using carnauba and beeswax are being tested for water resistance and durability, with glycerin additives explored to improve flexibility and reduce cracking.

07
PARAMETRIC DRAWINGS

YEAR
FALL 2025–2026

TYPE
GENERATIVE DRAWING STUDIES

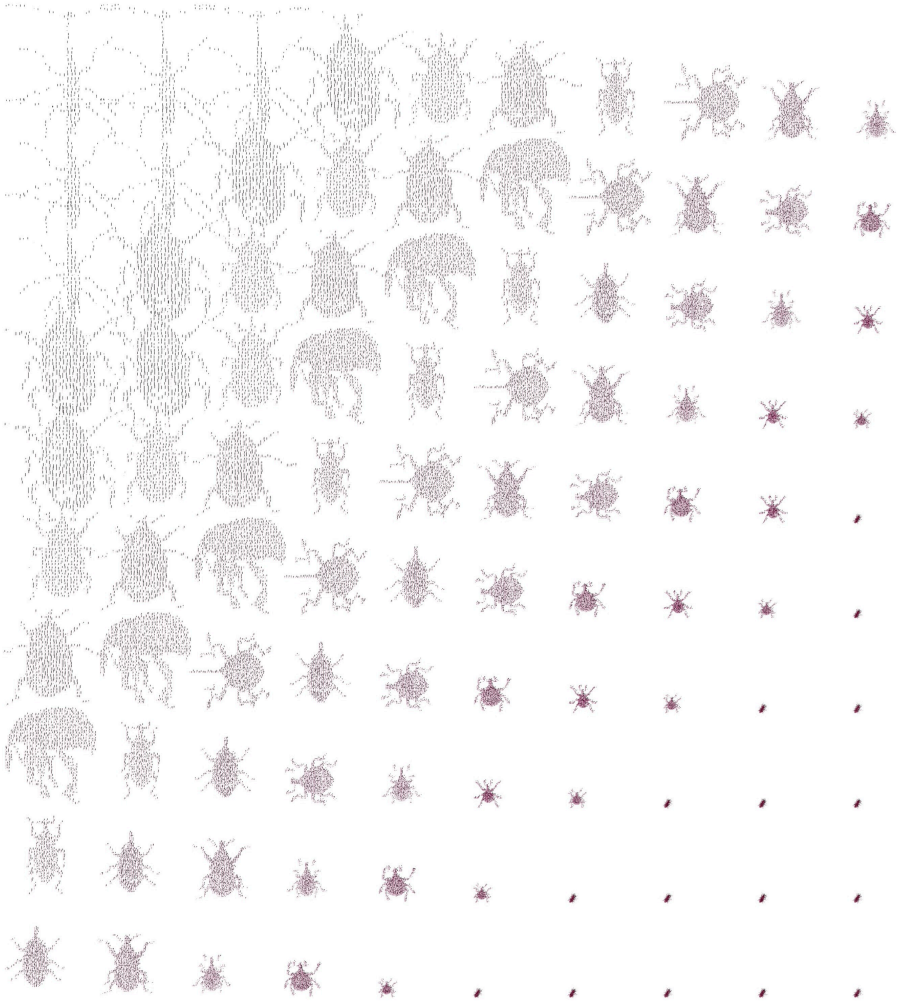
TOOLS
RHINO PYTHON, GRASSHOPPER

INPUT
CURSOR POSITION, ATTRACTOR POINT

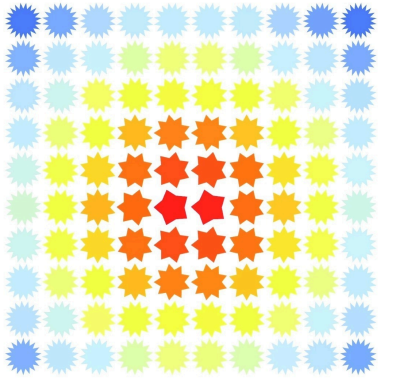
One point of interaction, a whole field of variation.

In the first study, a grid of radial shapes is continuously shaped by the cursor. Each shape measures its distance to the cursor and remaps that value to the number of points that construct its form: closer shapes simplify, farther ones grow more complex, giving a gradual transition across a coherent field.

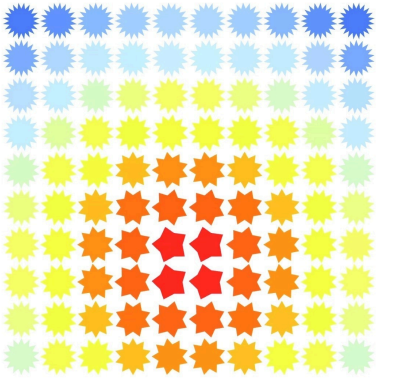
In the second, a 50 by 50 point grid is ranked by distance to an attractor and divided into bins. Each bin draws a different weevil illustration, resampled pixel by pixel into line geometry with Rhino Python, and the drawings shrink with distance, so one point organizes the field from detailed insects to fine specks.



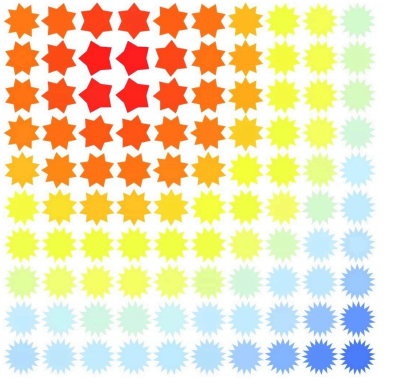
WEEVIL FIELD: ATTRACTOR-RANKED BINS, RHINO PYTHON



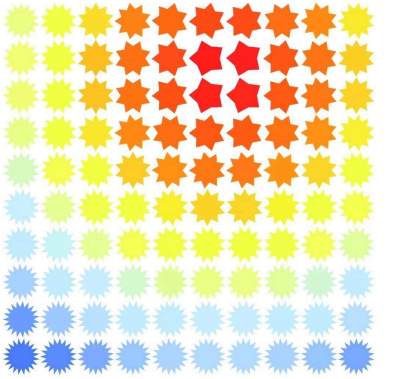
CURSOR POSITION 1



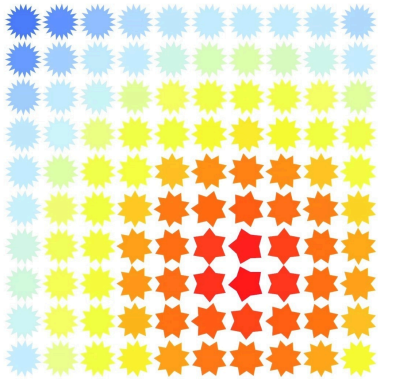
CURSOR POSITION 2



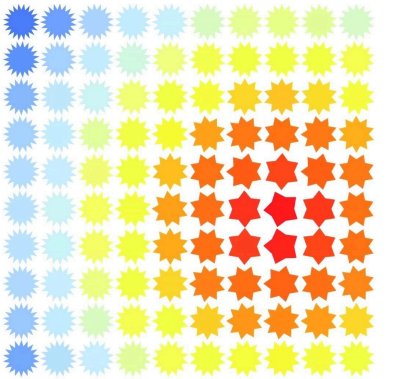
CURSOR POSITION 3



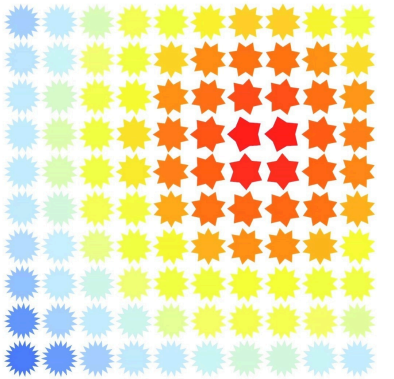
CURSOR POSITION 4



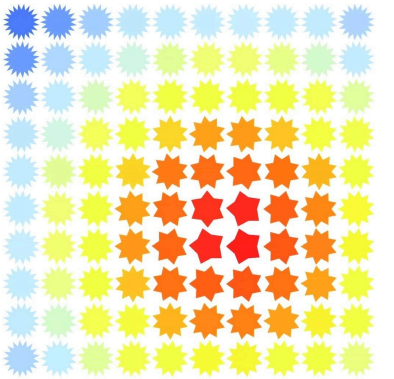
CURSOR POSITION 5



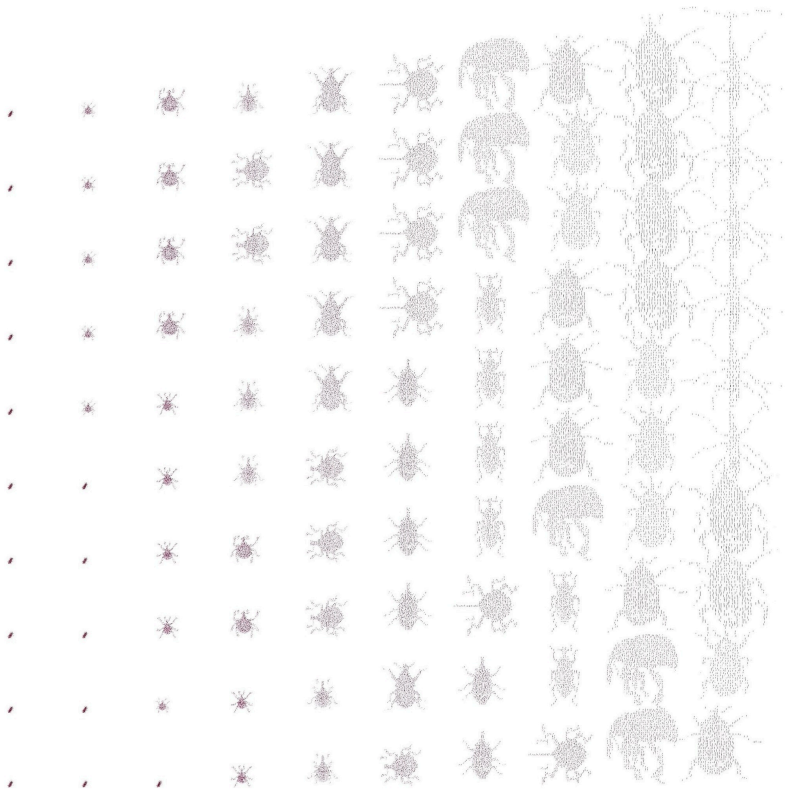
CURSOR POSITION 6



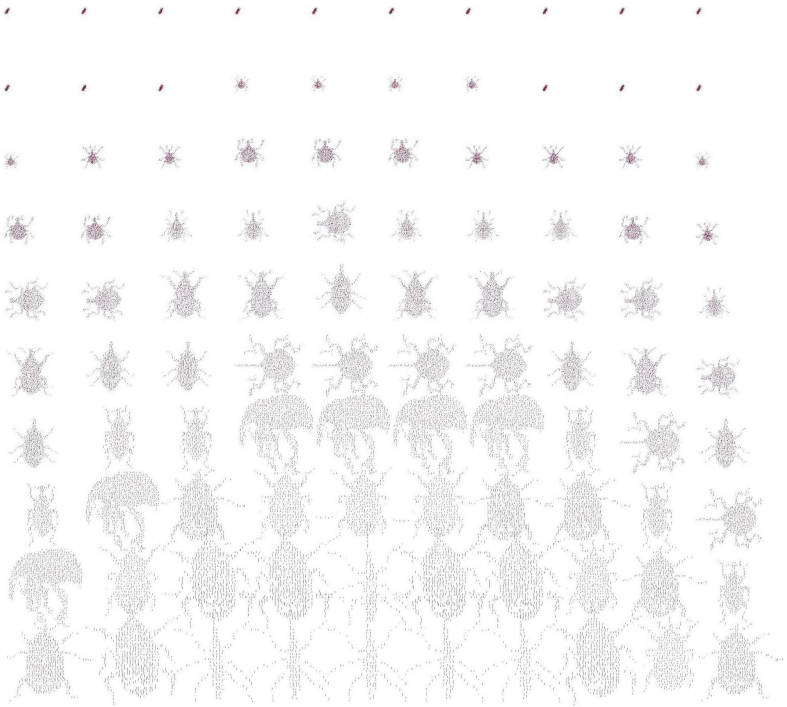
CURSOR POSITION 7



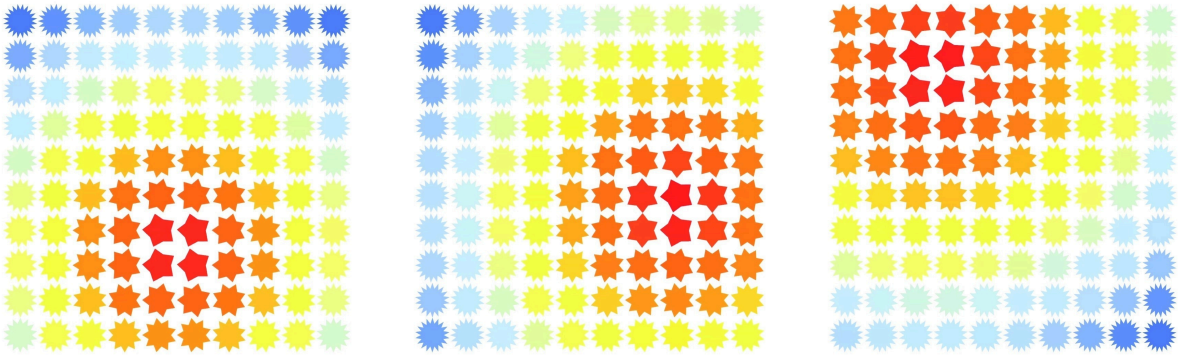
CURSOR POSITION 8



WEEVIL FIELD, VARIATION



WEEVIL FIELD, VARIATION



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