XENABLOOM
FIRST EVER ‘XENAFORM’ SHADE STRUCTURE
ACKNOWLEDGEMENTS

THANK YOU...

Edmond Saliklis for being our supportive professor
Nathan Lundberg for the grasshopper script
Breedan Peers for the member capacity spreadsheet
Our Senior Capstone Project class for inspiring us to do our best
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THE TEAM
ELIZABETH SHAW
• COLUMBIA, SC
• LIKES TO RUN
• ENJOYS EATING TACOS
• DESIGN SKILLS

SOPHIA MAGLABE
• CARSON, CA
• LIKES TO PLAY THE GUITAR
• ENJOYS EATING ICE CREAM
• CONNECTIONS MODELING

SHEYNA RONGONG
• LOS GATOS, CA
• LIKES TO WATCH MOVIES
• ENJOYS EATING SUSHI
• STRUCTURES ANALYSIS

RYER LAUTH
• DENVER, CO
• LIKES TO BE OUTDOORS
• ENJOYS EATING PASTA
• RENDERING SKILLS
OVERVIEW

INSPIRATION & PURPOSE
“THE ENJOYMENT OF SCENERY EMPLOYES THE MIND WITHOUT FATIGUE AND YET EXERCISES IT; TRANQUILIZES IT AND YET ENLIVENS IT.”

FREDERICK LAW OLMSHEAD
DISCIPLINE AND PLAY ARE THE FUNDAMENTAL AND LEADING PRINCIPLES GUIDING PROJECT. WE EXPLORED THE ARCHITECTURAL DESIGN, INTERACTING WITH VARIOUS SITE LOCATIONS, AND CONSIDERED CREATIVE CONNECTION IDEAS THROUGHOUT THE PROCESS. THIS PROJECT, HOWEVER, WOULD NOT BE POSSIBLE WITHOUT DISCIPLINE AND INCORPORATING OUR STRUCTURAL ENGINEERING SKILLS.

AT THE INTERSECTION BETWEEN THESE TWO PRINCIPLES LIE OUR DESIGN PROCESS AND FINAL STRUCTURE. XENABLOOM EMBODIES DISCIPLINE AND PLAY, COMBINING A DYNAMIC SHAPE WITH CONSIDERATION OF STRUCTURAL DESIGN.
DESIGN PROCESS

FORM FINDING –
THE PROCESS OF ENGAGING WITH IDEAS AND EXPLORING POSSIBLE DESIGNS. HERE, WE CONSIDERED WHAT ASPECTS BEST INFORMED THE STRUCTURE AND TWEAKED ATTRIBUTES ACCORDINGLY.

FORM TESTING –
THE UTILIZATION OF OUR ENGINEERING BACKGROUND TO ANALYZE THE FORM. WE ENGAGED IN MULTIPLE METHODOLOGIES TO CHECK AND VERIFY RESULTS IN ORDER TO MAKE DECISIONS ABOUT THE STRUCTURE.

FORM MAKING –
THE STAGE WHERE IMAGINATION BECOMES REALITY. WE CREATED PHYSICAL MODELS AND DIGITAL RENDERINGS OF BOTH CONNECTIONS AND THE STRUCTURE.

FROM HERE, THE CYCLE BEGINS AGAIN WITH LESSONS LEARNED TO CONTINUE THE DESIGN PROCESS MOVING FORWARD.
THE LEANING PINE ARBORETUM PROVIDES A DIVERSE HORTICULTURAL DISPLAY OF STUDENT AND CLASS PROJECTS, EXEMPLIFYING THE “LEARN BY DOING” PHILOSOPHY OF CAL POLY.

AS THE CLIENT OF THIS PROJECT, THE LEANING PINE ARBORETUM AIMS TO INCREASE THE VISIBILITY OF THE SPACE AND ENCOURAGE VISITORS TO EXPLORE THE AREA THROUGH THE ADDITION OF AN ATTRACTIVE AND FUNCTIONAL STRUCTURE.
CAL POLY’S CAMPUS RESIDES ON THE TRADITIONAL LANDS OF THE YAK TITʸU TITʸU YAK TİŁHINI NORTHERN CHUMASH TRIBE. THESE INDIGENOUS PEOPLES STEWARDED THEIR ANCESTRAL HOMELANDS WITHIN SAN LUIS OBISPO COUNTY.
The original proposed location is the front lawn of the Arboretum.

However, we wanted to preserve this space as it serves as a central point for visitors to take in the beauty of the Arboretum right as they enter.
Our proposed location is towards the back edge of the arboretum to encourage visitors to explore further and see the beauty the arboretum has to offer.

This location is a small, grassy patch of land where views of the Madonna and Seesaw peaks can be seen from. Part of our design goal is to emphasize these views and block off the sides where less attractive views are observed.
INSPIRATION

We took inspiration from the beautiful and bright California poppies that grew in abundance during the super bloom. The shape of the poppy represents the “play” side of our design. This provides an interesting shape that integrates the nature of the arboretum within our structure. However, a poppy’s petals have a low stiffness, making the deformations large when a force is applied.

From here, we transitioned into the “discipline” side of our design: the origami flower. The folds within the origami flower combat our issue of stiffness while still holding onto the idea of integrating nature within our structure.
MATERIALITY

PLYWOOD SHELLS

LODGEPOLE PINE

STEEL ANCHORS (HILTI KBTZ2)

CONCRETE WITH COLORFUL PEBBLES
FORM FINDING

ITERATION & PLAY
XENAFORM

THE XENAFORM IS A NEW STRUCTURAL TYPOLOGY COINED BY EDMOND SALIKLIS, FOUNDER OF POLY SHELLS, LLC AND PROFESSOR IN THE ARCHITECTURAL ENGINEERING DEPARTMENT AT CAL POLY, SAN LUIS OBISPO.

THIS IS INSPIRED BY ARCHITECT-ENGINEER IANNIS XENAKIS’ 1958 PHILIPPS PAVILION AND INVOLVES THE STABILIZATION OF POINTS IN 3D SPACE—FOCUSING ON RESTRAINING UNSTABLE SPHERICAL AND CIRCULAR PATHS OF “MECHANISM” EXPERIENCED BY UNCONSTRAINED STRUCTURAL ELEMENTS. BY CONNECTING THESE POINTS IN SPACE, HYPERBOLIC PARABOLOIDS ARE CREATED.

THIS IS THE METHODOLOGY EMPLOYED IN THE FORMATION OF THE XENABLOOM. HERE, THE HYPERBOLIC PARABOLOIDS ARE TO BE MADE WITH A DOUBLE-SKIN SHELL.
PLAYING

USING GEOGEBRA, A CHILDREN’S SOFTWARE INTENDED TO TEACH MATHEMATICS, WE STARTED THE PROCESS OF “PLAY”. WE BEGAN CREATING BASIC XENAFORMS AND BUILDING UPON IT TO FIND CREATIVE SHAPES. PULLING OUR INSPIRATION FROM THE ORIGAMI FLOWER, WE WERE INSTANTLY DRAWN TO THE DRAMATIC SHAPE OF THE FORM SHOWN ON THIS PAGE. THE HIGH POINTS ON THE ROOF SERVED TO SHOWCASE VIEWPOINTS WE ENJOYED, AND THE OCULUS CREATED IN THE MIDDLE WOULD ALLOW FOR THE SUN TO SPLASH INTO THE STRUCTURE.

GEOGEBRA GAVE US SUFFICIENT INSIGHT OF THE GEOMETRY OF OUR STRUCTURE AND PRELIMINARY NUMBERS TO CONTINUE DESIGNING. THE GEOGEBRA MODELS WERE RENDERED IN RHINO3D TO GET A BETTER GRASP OF THE SPACE AS WELL AS THE SHADOWS THAT INTERACT BETWEEN THE STRUCTURE AND ENVIRONMENT.
MIDPOINT MODELS
INFORMING THE DESIGN

EXPLORE
FLOW & CIRCULATION

STAY
SIT & EXPERIENCE

VIEW
ENHANCING & PROHIBITING

SUN STUDY
OCULUS & SHADE
WE WANTED TO CONSIDER HOW SOMEONE WHO IS WALKING THROUGH THE ABRORETUM MIGHT INTERACT WITH THE SPACE. THIS INFORMED HOW WE COULD TRANSITION THIS EXPERIENCE INTO HOW ONE WILL INTERACT WITH XENABLOOM. THE SENTIMENTS WE DISCOVERED INSPIRED THE INCORPORATION OF THE CALIFORNIA POPPY AND THE EMOTIONS IT ENVOKES, IN ADDITION TO THE FLOW THROUGH AND AROUND THE STRUCTURE.
The intent of Xenabloom is to provide shade for the warm months in San Luis Obispo, when it is essential to have a cool shaded area to sit outside and enjoy the weather and scenery. We designed stairs integrated with the foundation that provides a spot for arboretum visitors to sit, stay, and experience the beauty of our structure, as well as the surrounding nature.
CONSIDERING THE SURROUNDINGS OF THE SITE, WE SOUGHT TO USE OUR SHELLS TO ENHANCE STUNNING VIEWS WHILE PROHIBITING UNDESIREABLE ONES. TWO MOUNTAINS ARE CLEARLY VISABLE FROM XENABLOOM, SO THE DRAMATIC CURVATURE OF THE SHELL COMPLIMENTS THE SLOPE OF THE PEAKS. SEEN HERE IS SEESAW PEAK BEHIND THE ARBORETUM.
SUN STUDY

TO ANALYZE CHANGES IN THE SHADOWS THAT XENABLOOM CASTS, WE STUDIED THE SUN PATH OF A DAY IN EARLY MAY.

OUR FIRST CHANGE BROUGHT THE FRONT FACING SHELL FROM THE RIGHT SIDE OF THE STRUCTURE TO THE LEFT IN ORDER TO PROVIDE MORE SHADE IN THE AFTERNOON.

OUR SECOND CHANGE PINCHED IN THE OCCULUS TO PROVIDE A MORE INTERESTING SHADOW AS WELL AS MORE SHADE.

WITH THE FINAL ITERATION, WE OBSERVED VARIOUS STAGES THROUGHOUT THE DAY.
9 AM

12 PM

4 PM
ASSUMPTIONS

MODEL INPUTS

STRUTS
CROSS-SECTION = 6” DIAMETER
MODULUS OF ELSTICITY = 1,000,000 PSI
DENSITY = 40 PCF

DOUBLE-SKIN SHELL
THICKNESS = 3”
MODULUS OF ELSTICITY = 1,000,000 PSI
DENSITY = 40 PCF
MODERN MULLER BRESLAU METHOD

The Modern Muller Breslau Method (MMB) is a geometric analysis method used to analyze 2D and 3D indeterminate or determinate structures. This method is coined by Edmond Saliklis. Through MMB, an unknown external or internal force or moment can be found by perturbing the unknown member and examining the work in the rest of the structure due to the perturbation.

The only equation needed is the one shown on the right. It is a work energy equation using the ideas of force times distance. The unknown force or moment can be solved by rearranging the equation after the occurrence of the perturbation. The perturbation and loft are parallel to the loading on the member.

This methodology is used as a hand calculation check to verify our SAP2000 model outputs. With very small perturbations, the values from MMB should be close, if not exact to the computer software results.

\[ \text{Unknown} \times \Delta + \sum (\text{Force}_i \times \text{Loft}_i) = 0 \]

### SAP VERIFICATION

**GEOGEBRA: MMB**

<table>
<thead>
<tr>
<th>AXIAL</th>
<th>1531 LBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOMENT</td>
<td>1732 LBS-FT</td>
</tr>
</tbody>
</table>

**SAP2000**

<table>
<thead>
<tr>
<th>AXIAL</th>
<th>1493 LBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOMENT</td>
<td>1733 LBS-FT</td>
</tr>
</tbody>
</table>

By determining the maximum axial and flexural forces due to dead loads through the Modern Muller Breslau method, and comparing them with results from SAP2000, we are able to confirm the accuracy of the finite element analysis model. With that, we gain confidence in moving forward with the model for further analysis.
BUCKLING

The first check done after verifying the SAP2000 model with MMB was the buckling due to dead load check. We determined the member with the highest compression force and used the Euler’s critical buckling force formula shown on the right. After determining the critical force value, we calculated a factor of safety of this value over the initial compression force and found a factor of 10.

Considering that this structure is simply a shade structure, we were confident with this value and knew that it would not be susceptible to any self weight buckling.
LATERAL WIND

PER ASCE 7-22, EQUATION 26.10-1, AND CONSERVATIVELY ASSUMING THE “K” FACTORS TO BE 1, THE WIND VELOCITY PRESSURE IS:

\[ q_z = 0.00245 K_z K_{zt} K_e V^2 (psf) \]

\[ q_z = 0.00245(86 \text{ mph})^2 = 18.93 \text{ psf} \]

THIS VELOCITY PRESSURE IS SMALL RELATIVE TO THE SEISMIC FORCES IN THE FOLLOWING PAGES, AND, THEREFORE, WE CONCLUDE THAT THE LATERAL WIND LOAD WILL NOT GOVERN FOR ANALYSIS.
ONCE WE DETERMINED THAT SEISMIC GOVERNS FOR LATERAL LOADING, WE WERE ABLE TO MOVE ON WITH SEISMIC ANALYSIS. WE FIRST PERFORMED A STATIC LATERAL CHECK PRIOR TO THE EXTENSIVE SEISMIC ANALYSIS TO ENSURE THE MODEL WAS OUTPUTTING TRUSTWORTHY VALUES. WE APPLIED 30% OF THE STRUCTURE’S SELF WEIGHT IN THE X-DIRECTION AND Y-DIRECTION.

BY EXAMINING THESE FORCES AND STRESSES, ALL OF WHICH ARE RELATIVELY LOW, WE HAVE A GOOD ESTIMATION OF WHAT THE SEISMIC ANALYSIS OUTPUTS WOULD SHOW AND CONFIDENCE THAT THESE VALUES WERE NOT OF CONCERN.

LOOKING AT THESE VALUES, THERE WERE SOME DISCREPANCIES BETWEEN WHAT WE PRESUMED AND WHAT WAS OUTPUTTED. WE BELIEVE THAT SOME OF THE HIGHER MEMBER FORCES AND SHELL STRESSES COULD BE DUE TO THE ORIENTATION IN WHICH WE PLACED XENABLOOM. IN THE SAP2000 MODEL, THE GROUND MOTIONS ARE SHAKEN RELATIVE TO THE GLOBAL X, Y, AND Z AXES. OUR MODEL DID NOT LINE UP WITH A PARTICULAR AXES NOR DID WE THINK ABOUT THE ACTUAL ORIENTATION OF THE STRUCTURE ON THE SITE; THUS, WE BELIEVE THAT THE STRUCTURE MAY NOT HAVE DEMONSTRATED A PERFECTLY ACCURATE RESPONSE TO THE GROUND MOTIONS. REGARDING THE SHELL STRESSES SPECIFICALLY, HYPERBOLIC PARABOLOIDS ARE SUSCEPTIBLE TO HIGH DIRECT SHEAR STRESS. THIS COULD EXPLAIN THE LARGE OUTLIER IN THE SHELL STRESS OUTPUT.
SHELL STRESSES

<table>
<thead>
<tr>
<th></th>
<th>IBC 2012</th>
<th>EL CENTRO</th>
<th>NORTHRIDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>S11</td>
<td>132 PSI</td>
<td>400 PSI</td>
<td>188 PSI</td>
</tr>
<tr>
<td>S12</td>
<td>67 PSI</td>
<td>250 PSI</td>
<td>105 PSI</td>
</tr>
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</table>
MEMBER CAPACITIES

WITH THE DEMANDS DETERMINED THROUGH HAND-CALCULATIONS AND SAP2000 ANALYSIS, THE CAPACITIES MUST NOW BE CALCULATED.

USING THE 2018 NATIONAL DESIGN SPECIFICATION (NDS) FOR WOOD CONSTRUCTION, THE FLEXURAL, AXIAL, AND SHEAR CAPACITIES OF THE LODGEPOLE PINE STRUTS ARE DETERMINED.

HOWEVER, THE NDS DOES NOT INCLUDE THE TENSILE CAPACITY FOR LODGEPOLE PINE. FOR THIS, WE CHOSE TO USE THE TENSILE CAPACITY OF PONDEROSA PINE, WHICH HAS SIMILAR PROPERTIES COMPARED TO LODGEPOLE PINE.

AS SHOWN IN THE FOLLOWING, A SPREADSHEET CREATED BY OUR CLASSMATE BRENDAN PEERS ALLOWED US TO EASILY AND QUICKLY DETERMINE IF THE CROSS-SECTIONAL AREA OF THE STRUTS ARE SUFFICIENT FOR THE DEMANDS.

NOTE THAT THE MAXIMUM DEMANDS ARE BASED ON THE GOVERNING EL CENTRO GROUND MOTION ANALYSIS.

### Table 6B

Reference Design Values for Round Timber Construction Poles Graded per ASTM D3200

(Tabulated design values are for normal load duration and wet service conditions. See NDS 6.3 for a comprehensive description of design value adjustment factors.)

<table>
<thead>
<tr>
<th>Species</th>
<th>Bending $F_b$</th>
<th>Shear parallel to grain $F_v$</th>
<th>Compression perpendicular to grain $F_{cp}$</th>
<th>Compression parallel to grain $F_c$</th>
<th>Modulus of elasticity $E$</th>
<th>Specific Gravity $G$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific Coast Douglas Fir</td>
<td>2,050</td>
<td>160</td>
<td>490</td>
<td>1,300</td>
<td>1,700,000</td>
<td>690,000</td>
</tr>
<tr>
<td>Lodgepole Pine</td>
<td>1,275</td>
<td>125</td>
<td>265</td>
<td>825</td>
<td>1,100,000</td>
<td>430,000</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>1,200</td>
<td>125</td>
<td>255</td>
<td>775</td>
<td>1,000,000</td>
<td>400,000</td>
</tr>
<tr>
<td>Red Pine</td>
<td>1,350</td>
<td>125</td>
<td>270</td>
<td>850</td>
<td>1,300,000</td>
<td>520,000</td>
</tr>
<tr>
<td>Southern Pine (Grouped)</td>
<td>1,950</td>
<td>165</td>
<td>275</td>
<td>1,250</td>
<td>1,500,000</td>
<td>600,000</td>
</tr>
<tr>
<td>Western Hemlock</td>
<td>1,550</td>
<td>165</td>
<td>275</td>
<td>1,050</td>
<td>1,300,000</td>
<td>560,000</td>
</tr>
<tr>
<td>Western Larch</td>
<td>1,900</td>
<td>170</td>
<td>405</td>
<td>1,250</td>
<td>1,500,000</td>
<td>600,000</td>
</tr>
<tr>
<td>Western Red Cedar</td>
<td>1,250</td>
<td>140</td>
<td>260</td>
<td>875</td>
<td>1,000,000</td>
<td>360,000</td>
</tr>
</tbody>
</table>

1. Pacific Coast Douglas Fir reference design values apply to this species as defined in ASTM Standard D 1760.
4. Specific gravity, $G$, based on weight and volume when oven-dry.

### Table 4D (Cont.)

Reference Design Values for Visually Graded Timbers (5” x 5” and larger)$^{1-3}$

(Tabulated design values are for normal load duration and dry service conditions, unless specified otherwise. See NDS 4.3 for a comprehensive description of design value adjustment factors.)

### Table 4D Adjustment Factors

<table>
<thead>
<tr>
<th>Species and Commercial Grade</th>
<th>Size Classification</th>
<th>Design values in pounds per square inch (psi)</th>
<th>Specific Gravity $G$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ponderosa Pine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.1 Structural</td>
<td>Beams and Stringers</td>
<td>$F_b$ 1,100 $F_v$ 725 $F_{cp}$ 130 $F_c$ 353</td>
<td>0.43 NLGA</td>
</tr>
<tr>
<td>No.2 Structural</td>
<td></td>
<td>$F_b$ 925 $F_v$ 500 $F_{cp}$ 130 $F_c$ 353</td>
<td></td>
</tr>
<tr>
<td>No.1 Select Structural</td>
<td>Posts and Timbers</td>
<td>$F_b$ 1,000 $F_v$ 375 $F_{cp}$ 130 $F_c$ 353</td>
<td></td>
</tr>
<tr>
<td>No.2 Select Structural</td>
<td></td>
<td>$F_b$ 475 $F_v$ 325 $F_{cp}$ 130 $F_c$ 353</td>
<td></td>
</tr>
</tbody>
</table>
# Maximum Demands

<table>
<thead>
<tr>
<th></th>
<th>Tension</th>
<th>Compression</th>
<th>Moment</th>
<th>Shear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long (~40')</td>
<td>5238 LBS</td>
<td>431 LBS</td>
<td>3449 LBS-FT</td>
<td>431 LBS</td>
</tr>
<tr>
<td>Medium (~23')</td>
<td>13567 LBS</td>
<td>13818 LBS</td>
<td>3388 LBS-FT</td>
<td>737 LBS</td>
</tr>
<tr>
<td>Short (~15')</td>
<td>3350 LBS</td>
<td>3386 LBS</td>
<td>2398 LBS-FT</td>
<td>800 LBS</td>
</tr>
</tbody>
</table>
Starting with the assumption of a 6" diameter, it was determined that the longer members, which are around 40' in length, need to be upsized to have a 10" diameter.
LIKE THE LONG MEMBERS, THE CROSS-SECTIONAL DIAMETER OF THE MEDIUM MEMBERS (APPROXIMATELY 23’ LONG) HAD TO BE INCREASED TO 8” IN ORDER TO BE ADEQUATE FOR THE DEMANDS.
THE DEMANDS FOR THE SHORTEST MEMBERS, WHICH ARE ABOUT 15' LONG, WERE QUITE SMALL AND SO THE 6" DIAMETER ASSUMPTION PROVIDED SUFFICIENT CAPACITY.
FORM MAKING
IMAGINE & CREATE
PHYSICAL MODELING

MOVING FORWARD FROM DIGITAL MODELING, WE BEGAN TO CREATE A PHYSICAL MODEL, WHICH STARTED BY DIGITALLY MAKING THE PIECES TO BE CUT.

THE CUT SHEETS WERE CREATED BY USING A GRASSHOPPER SCRIPT ON RHINO THAT WAS WRITTEN BY NATHAN LUNDBERG FROM POLY SHELLS, LLC. FUNDAMENTALLY, WHAT THE SCRIPT DOES IS GENERATE THE TRIANGULAR AND RECTANGULAR MESHES THAT MAKE UP EACH LAYER OF THE DOUBLE-SKIN SHELL AND ARRANGE THEM WITHIN A PRESCRIBED BOUNDARY (I.E., SIZE OF THE SHEET MATERIAL TO BE CUT) AS EFFICIENTLY AS POSSIBLE.

USING A LASER CUTTER, ALL PIECES FOR THE SHELLS WERE THEN CUT AND ASSEMBLED.

FROM A STRUCTURAL STANDPOINT, THE WAY THAT THE TWO LAYERS OF SHELLS ARE CONNECTED ARE BY USING “COUPLERS,” WHICH ARE H-SHAPED PIECES THAT GO THROUGH THE LAYERS AND ARE SECURED USING DOWELS.
IMAGINE THROUGH MODEL
CONNECTIONS

All connections were once new connections.

That said, Xenabloom’s proposed connections are exploratory and experimental. At the initial stages, most of the connection ideas used steel as the primary material.

However, as we moved forward, our guiding principle became one that relied on the goals of constructability and sustainability. With this, we decided to take on the challenge of designing all-wood connections. This exclude the strut-foundation connection, which requires steel parts due to the limitations of wood as a material.

In reality, a CNC machine would be used to cut all the plywood panels.
STRUT-STRUT
CASCADING PLYWOOD LAYERS RECEIVING STRUTS SECURED WITH DOWELS
STRUT-SHELL
PLYWOOD LAYERS GLUED TO FORM A HINGE MECHANISM SECURED WITH DOWELS
STRUT-FDN
STEEL PLATE WITH HINGE MECHANISM EMBEDDED IN CONCRETE FOOTING
NEXT STEPS...

MATERIALITY
OUR STRUCTURE ALLOWS FORTHE INCREASE OF SCALE WITHOUT THE LIMITATIONS OF WOOD.

PROGRAM
XEANBLOOM HAS THE POTENTIAL TO BE ADAPTED INTO A STRUCTURE THAT COULD BE USED FOR HOUSING OR SHELTER.

LOCATION
OUR STRUCTURE HAS THE EASE AND FEASIBILITY OF CONSTRUCTION GLOBALLY.

XENAFORM
THE DESIGN TYPOLOGY OF XENAFORM CAN BE APPLIED TO MANY MORE STRUCTURES.

CONNECTIONS
HIGH TECH DESIGN OF CONNECTIONS THAT HAVE LOW TECH CONSTRUCTION AND SUSTAINABLE MATERIALS.
GLOBAL
WITH THE POTENTIAL OF XENABLOOM BEING USING FOR HOUSING OR SHELTERS, IT HAS THE OPPURTUNUTY TO CONTRIBUTE TO THE GLOBAL CONCERN OF COMBATTING THE HOUSING CRISIS.

CULTURAL
THE ABILITY TO EASILY CHANGE LOCATIONS OF THE STRUCTURE ALLOWS FOR THE CULTURAL PRESERVATION OF SPECIFIC SITES.

ECONOMIC
THE EASE OF CONTRUCTABILITY OF OUR STRUCTURE ALLOWS FOR A LOW COST OF CONSTRUCTION, WHICH IS DESIREABLE AND BENEFICIAL FOR LOWER INCOME HOUSING. DEPENDING ON THE LOCATION, LOCAL MATERIALS MAY ALSO BE UTILIZED AND BE MORE ECONOMIC.

ENVIRONMENTAL
WITH THE GOAL OF ALL-WOOD CONNECTIONS, OUR STRUCTURE USES MORE SUSTAINABLE MATERIAL THOROUGHOUT THE FORM.
CLOSING REMARKS

OUR SENIOR PROJECT ALLOWED US TO RETURN TO OUR ARCHITECURE ROOTS. AS ARCHITECTURAL ENGINEERS, OUR EDUCATION FOCUSED HEAVILY ON STRUCTURAL DISCIPLINE, BUT FOR XENABLOOM, WE TOOK BACK THE ROLE OF THE DESIGNER. PLAYING WITH THE AESTHETICS AND FLOW IN CoORDINATION WITH STRUCTURAL INTEGRITY, OUR STRUCTURE ALLOWED US THE FREEDOM TO TAKE OUR OWN DIRECTION. WE ARE INCREDIBLY PROUD TO HAVE XENABLOOM BE THE LAST PROJECT OF OUR UNDERGRADUATE CAREERS.