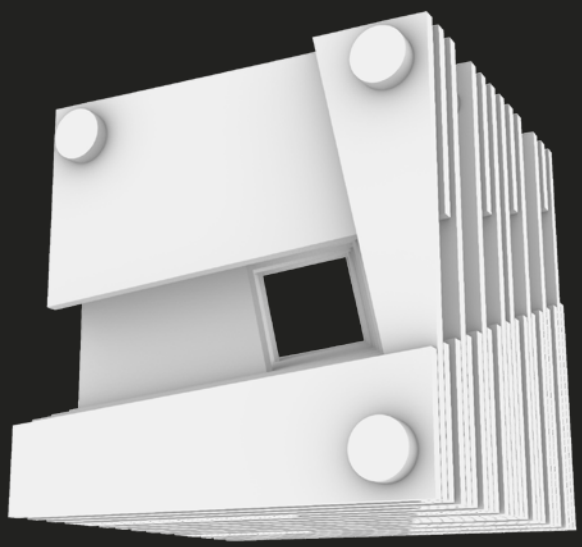
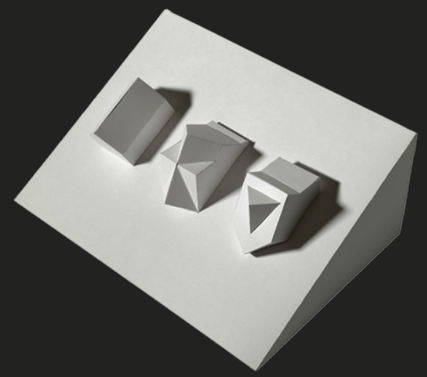
Portfolio

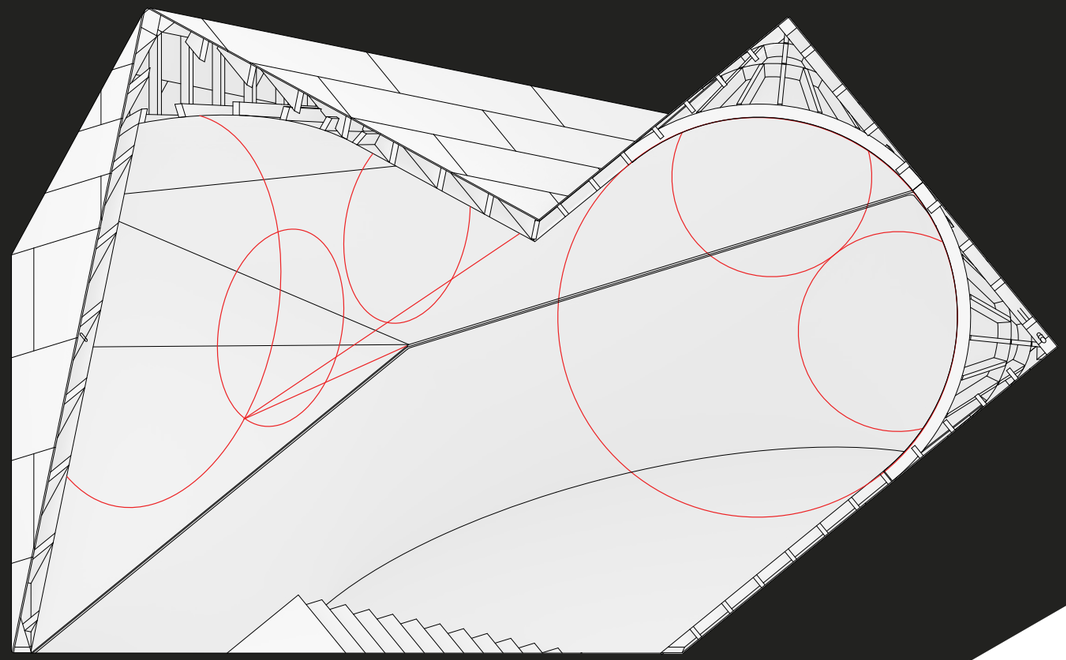


Howard Timlin

Gable Reflections

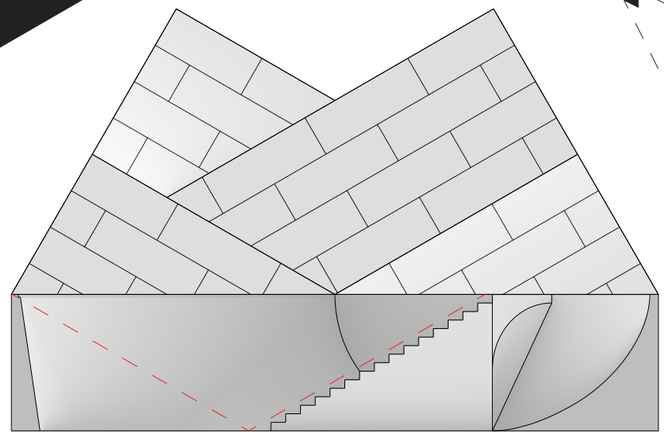
Off: On A Tangent — taught by Sean Canty

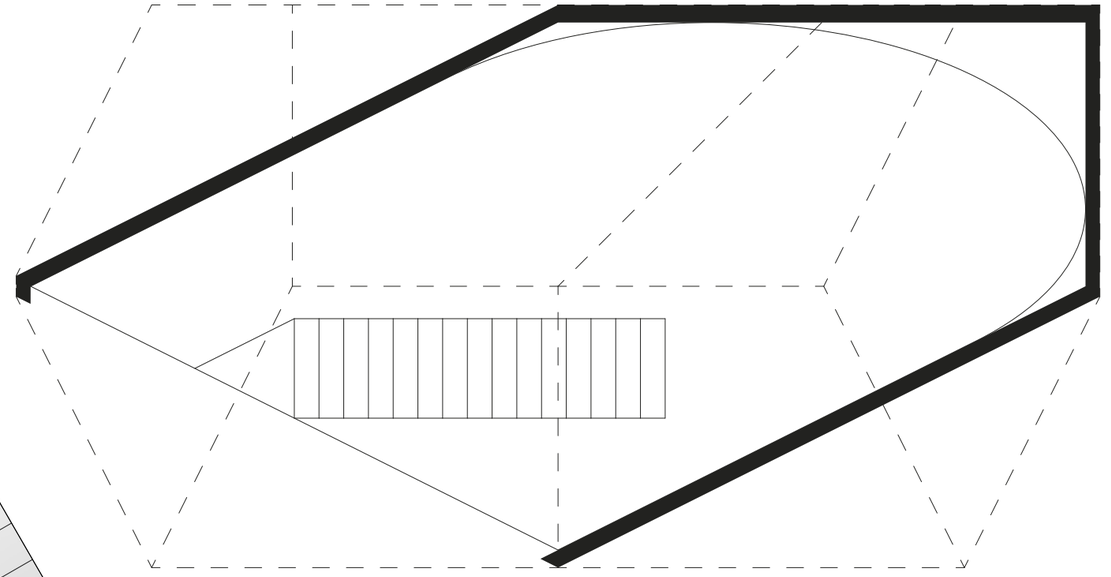


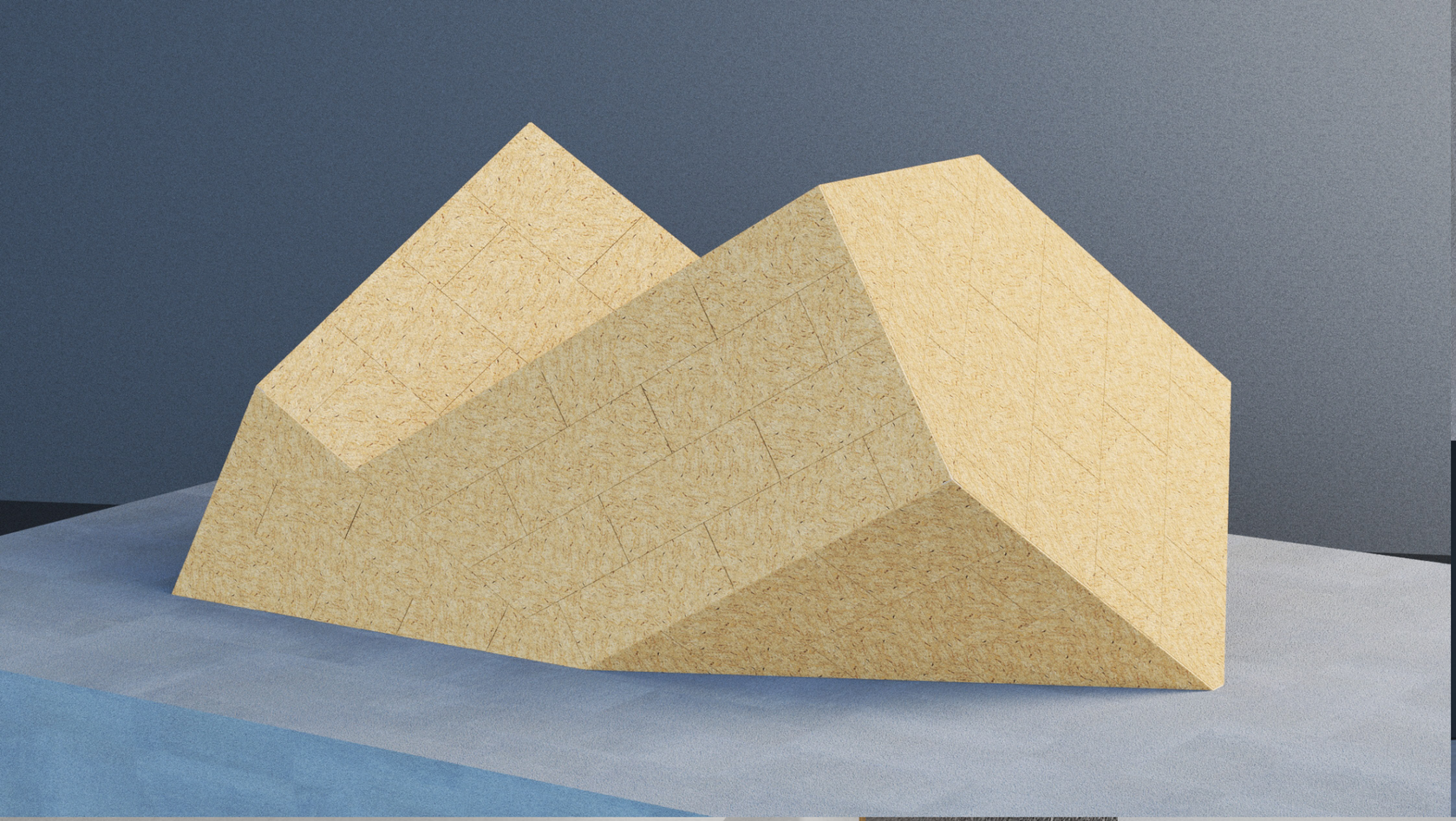


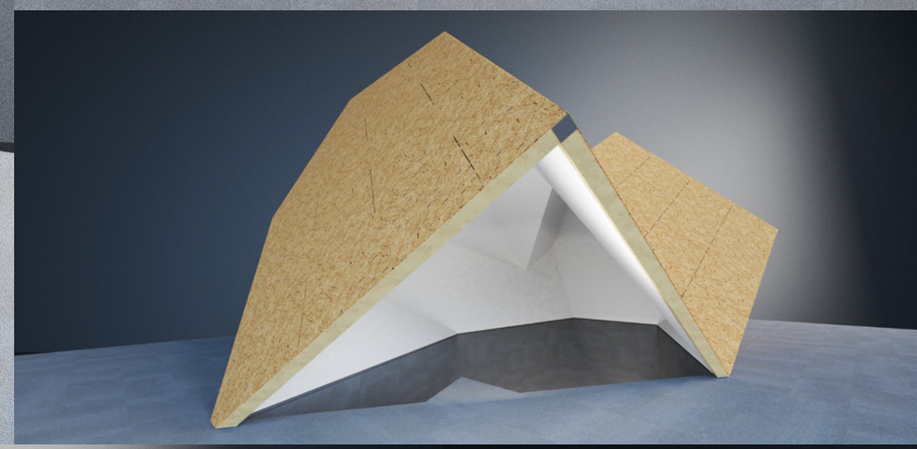
For most solid masses, reflecting a portion back onto the whole muddles the composition and renders the origional form, and therefore also the reflection operation, illegible. However, iconicity can cut through the noise created by this entropic transformation. The gable house is unique in that it is both a deeply entrenched architectural symbol and a simple, near-platonic solid. These qualities enable the legibility of the formal operations composing the initial study model above and final proposal.

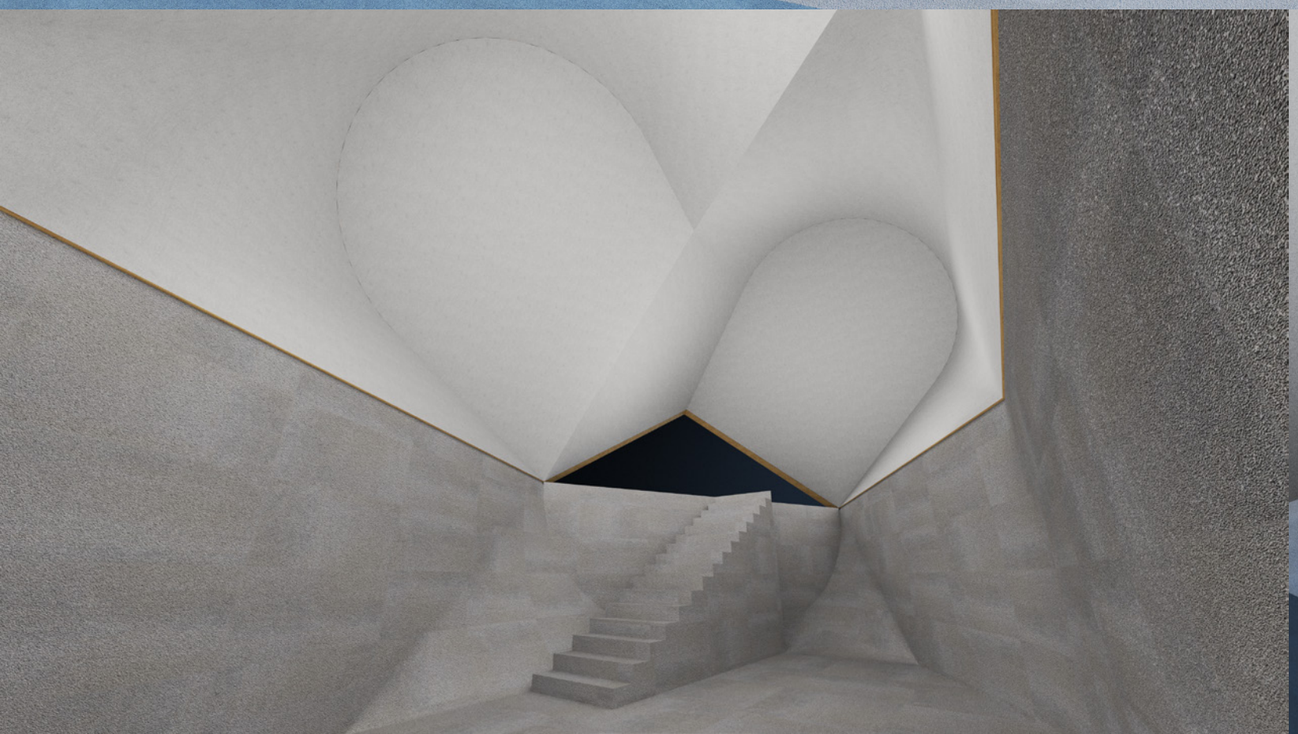
Reflection at once connotes both a specular, glancing redirection of a moving agent and the act of careful contemplation. This project explores how reflection can be embodied and centers an idealized gable house as its subject. The formal properties of this realization of an iconic symbol enable it to exist coherently in a state of specular reflection, and its associated material traditions provide a medium for self-reflection on the rigidity of the gable typology.

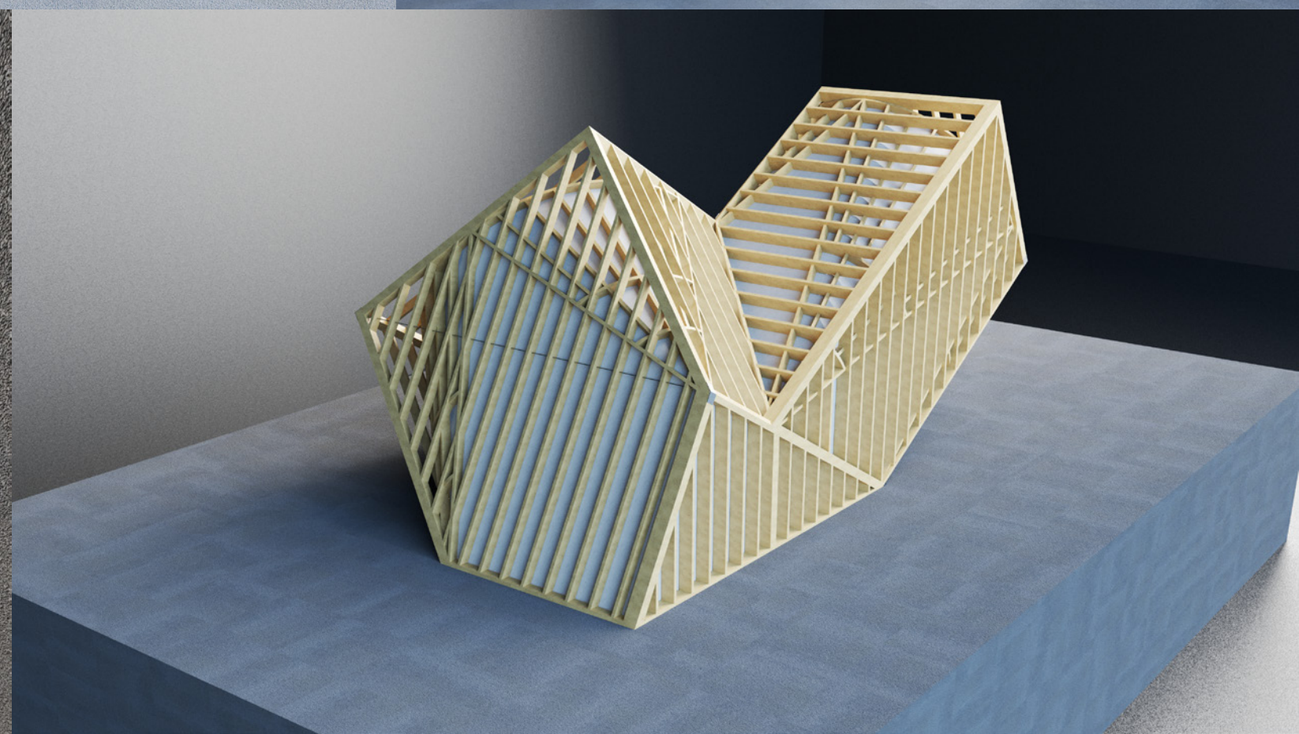








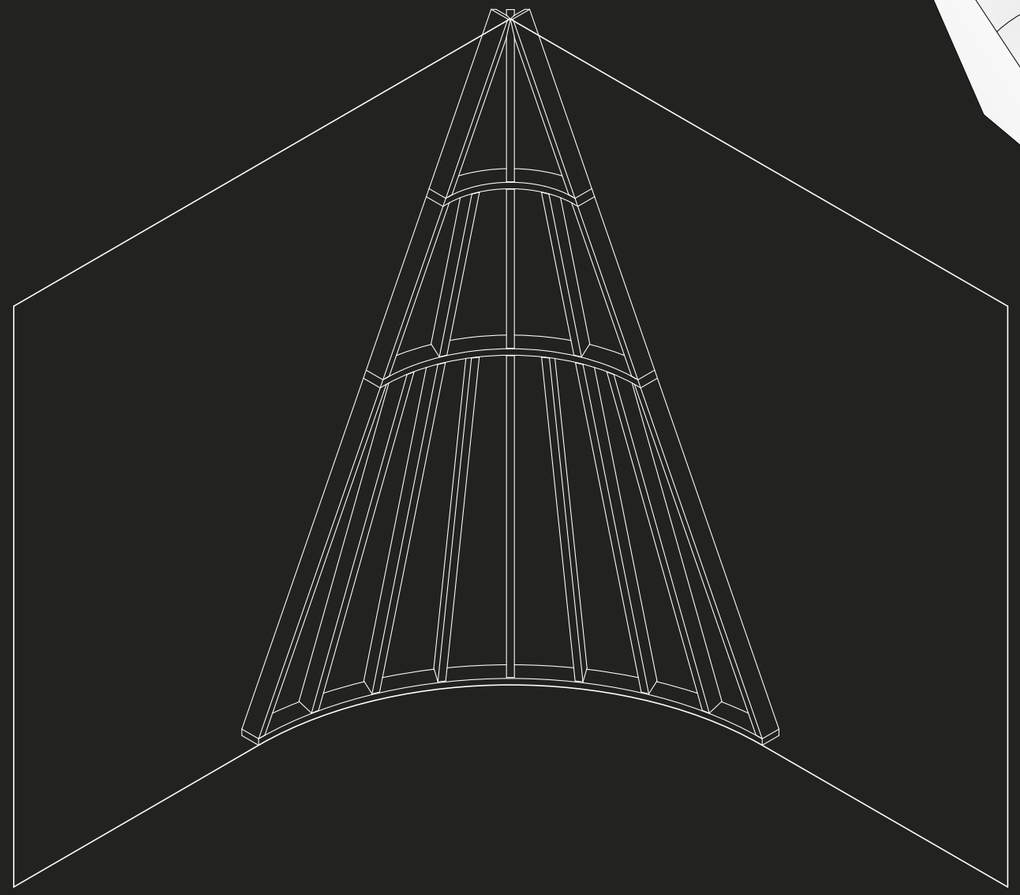


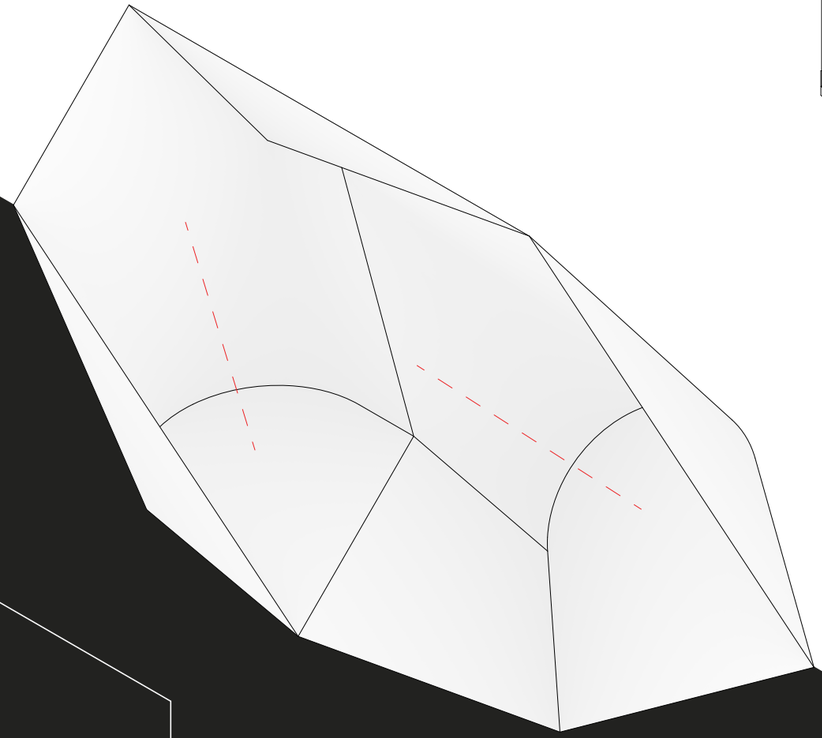


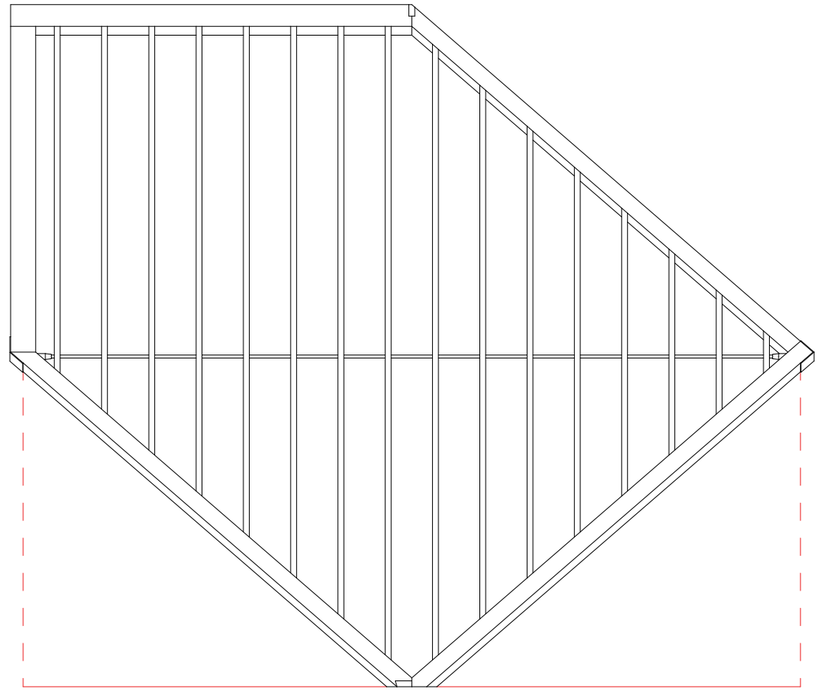
At least to an American mind, the eidetic icon of the gable house is most naturally corporealized through the material tradition of American wood frame construction. Concessions from this tradition are necessitated by this proposal due to the oblique positioning of the gable relative to the ground/mirror plane. However, wood framing proves to be a flexible enough construction system to accomodate departures from both tradition and typology. Moreover, leaving the exterior of the structure unfinished reveals how the relative rigidity of different aspects of the construction system induce differing levels of obedience to the initial gable form now occluded by the reflection operation.

The interior vaults leverage the versitility of wood framing to achieve a departure from the gable typology. The conic sections composing the vaults are framed using a pattern inspired by the works of the *Compagnons du Devoir* guild of stereotomic carpenters.

The developability of drywall sheets enables the framed conic sections to coalesce into a seamless interior space which interpolates between curve and straight edge, vault and gable.





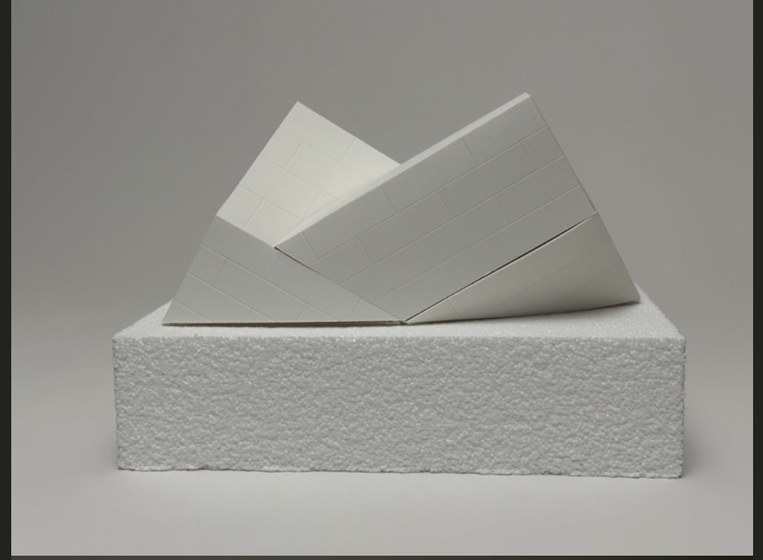
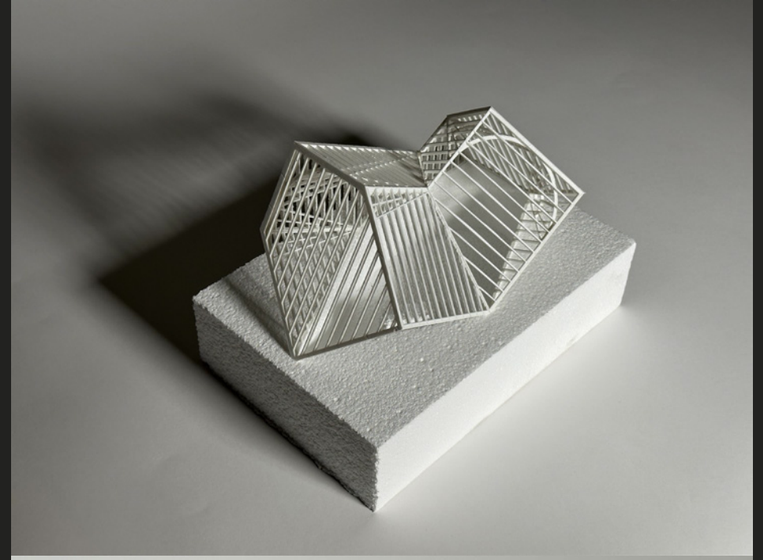


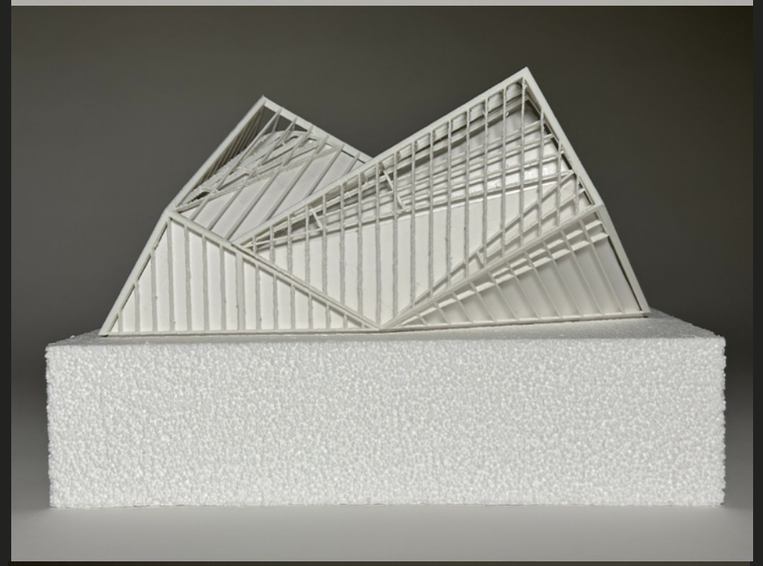
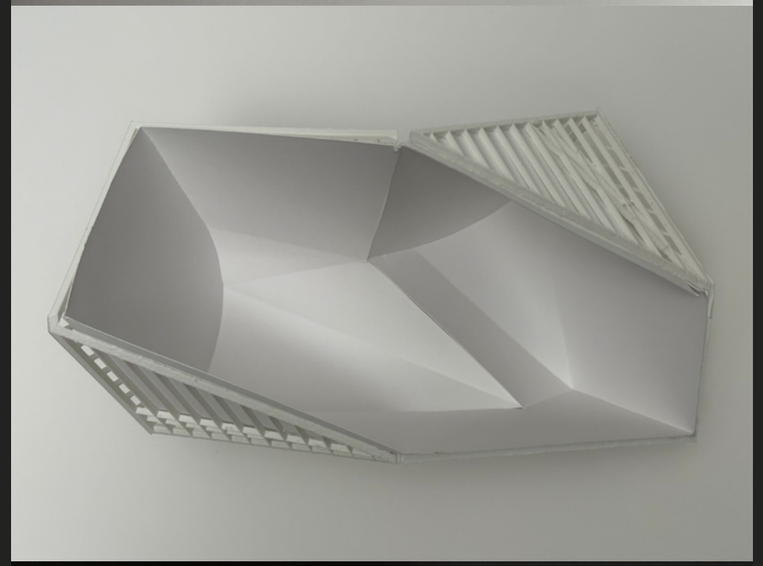
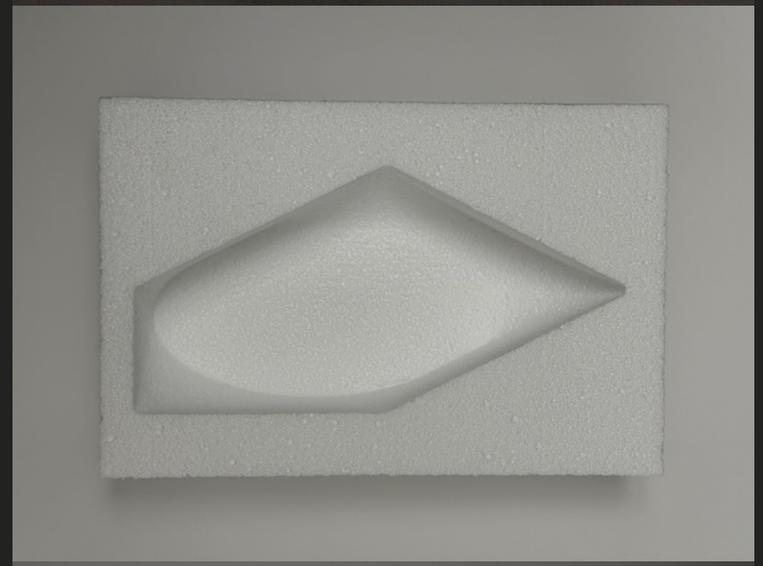
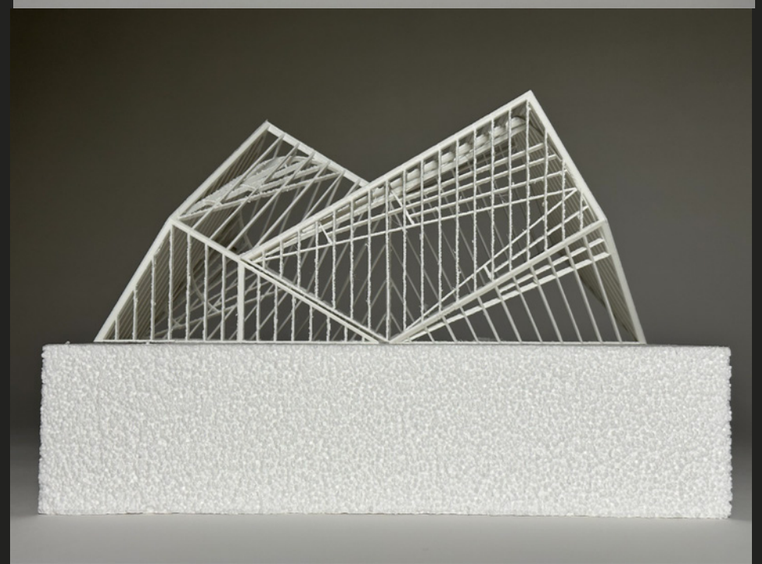
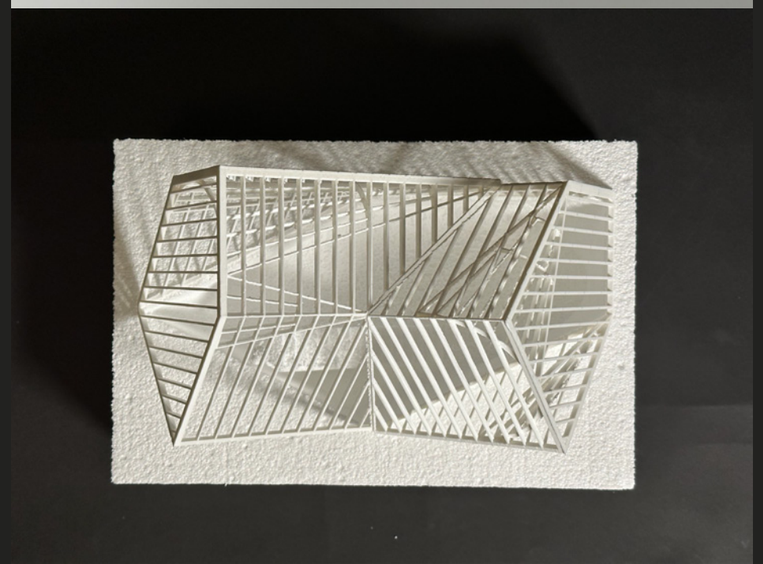
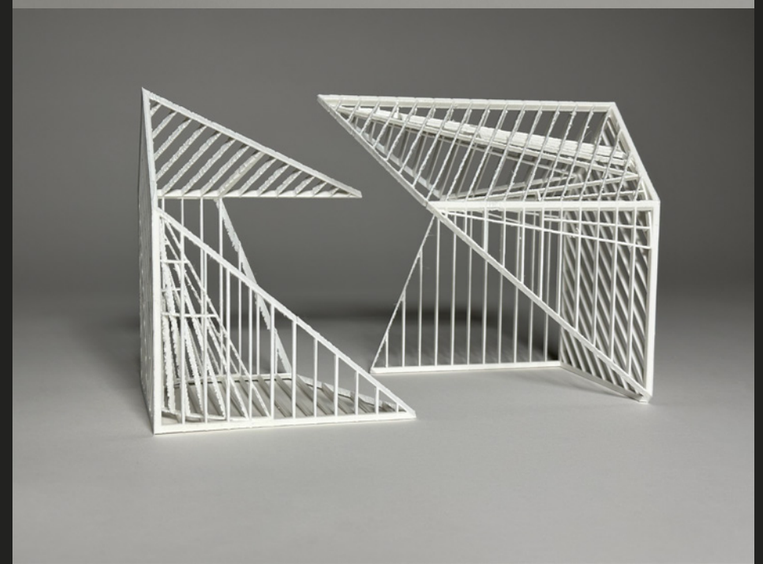
The standard sizing of the oriented strand board cladding on the exterior enforces a rectilinearity consonant with the axis of the untransformed gable. Panels corresponding to roof sections are cut slightly skinnier to create a uniform pattern obeying the rules of specular reflection when viewed from the side.

The oblique walls relative to the ground plane break the structural logic of a traditional gabled structure necessitating an altered stud orientation as well as tensioned steel cables to support the ridge beam roof.

Where the gable form kisses the reflection plane, it leaves behind an oblique gable section in plan. The concrete basin is formed by extruding this lipstick mark, this ephemeral moment of reflection. The basin also retains versions of the vaulted roof segments. Each concrete conic section is a distorted reflection of its drywall counterpart, retaining the same relative orientation with respect to the gable silhouette. The result is a basin whose plan morphs as one decends from a smeared gable to a distorted nave.

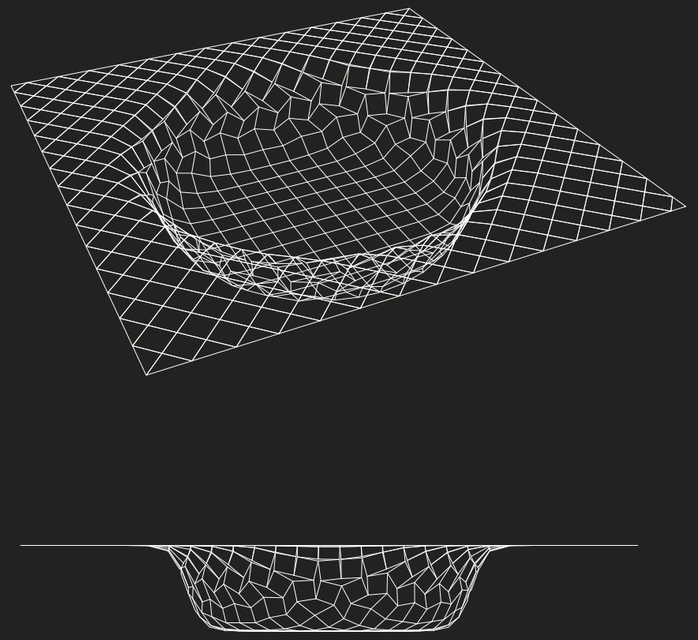
Extending a ray from the principle axis of the initial gable house generates a stairway with occupancy flow which further reinforces the specular reflection operation. Additionally, a conic trompe accomodates the encroaching curvature of the basin walls.

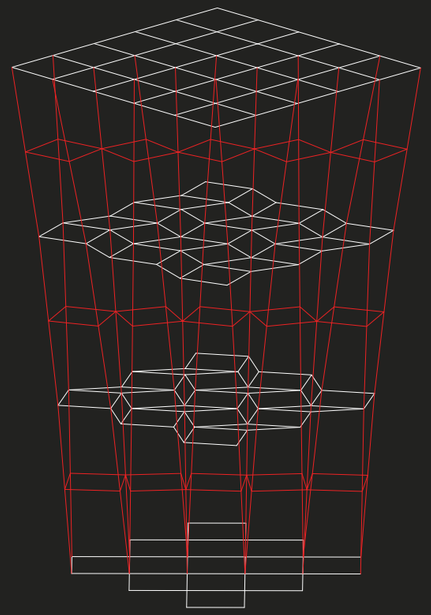



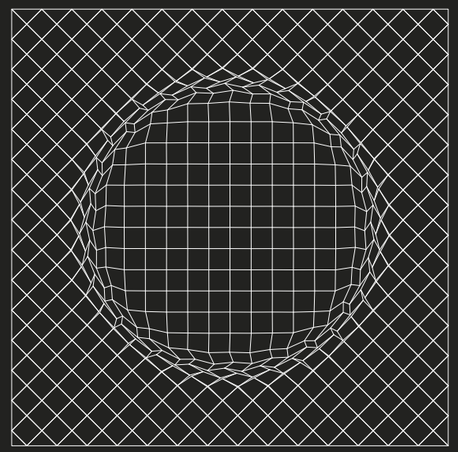







Auxetic Grid

Writing Form — taught by George L. Legendre

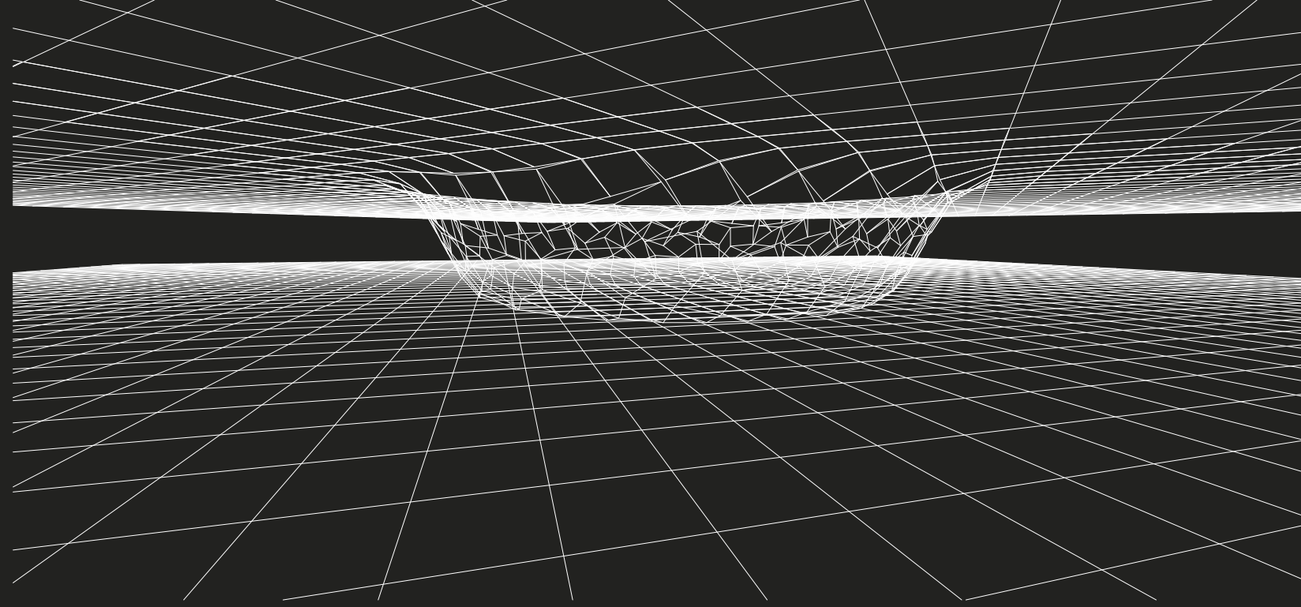






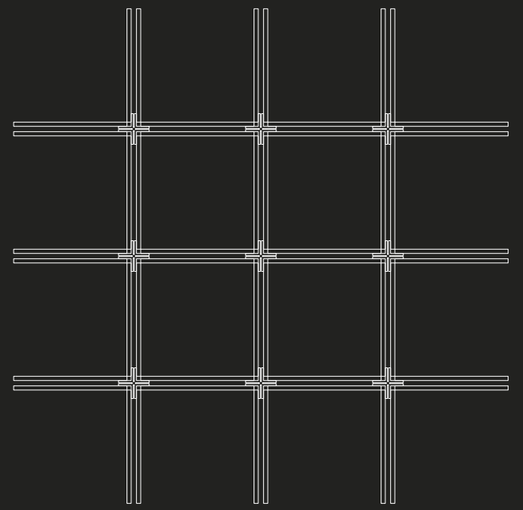
Philibert de l'Orme begins his premier tome de l'architecture with the assertion that no work in architecture can commence "without them first laying out a straight line and a perpendicular." On a flat surface, this definition of abscissa and ordinate generate a grid which organizes all of space. However, when curvature occurs in both axes, an initial act of squaring up no longer suffices to organize space---a standard grid becomes impossible.

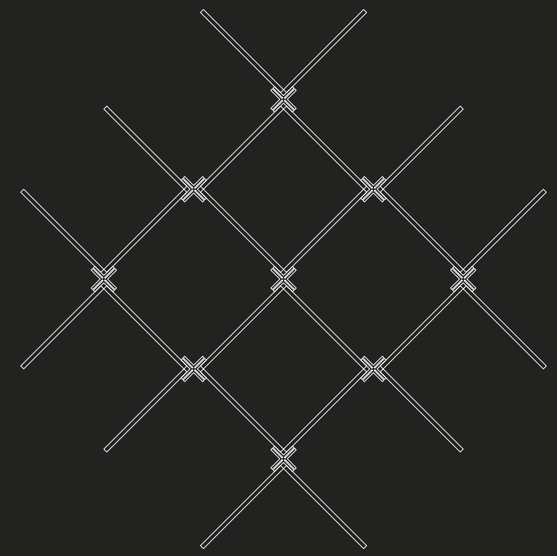
This project balances the distortions of double curvature with the expansion of an auxetic grid. The grid unfolds to accomidate curvature and what results is an interpolation between two systems of grid 45° out of phase.



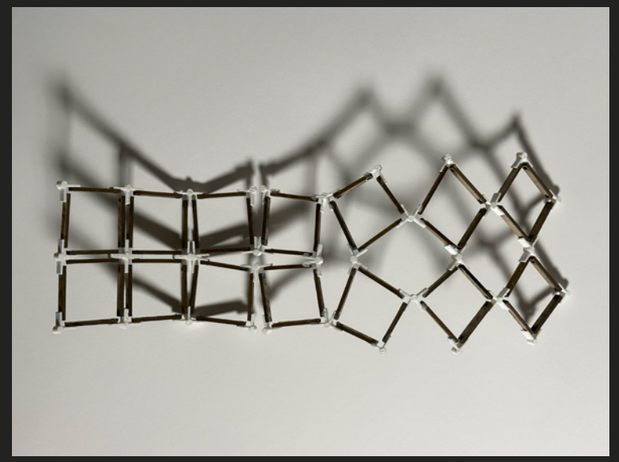
Auxetics are structures which expand uniformly in all directions when stretched. This property means the expansion of auxetics embodies a discrete analog of conformal transformations. As such, a conformal map between a flat plane and a curved surface provides a recipe for how a flat section of an auxetic structure can be unfolded into that curved form. Moreover, the Uniformization Theorem in differential geometry guarantees that any curved surface deformed from the plane has a conformal map giving this deformation.

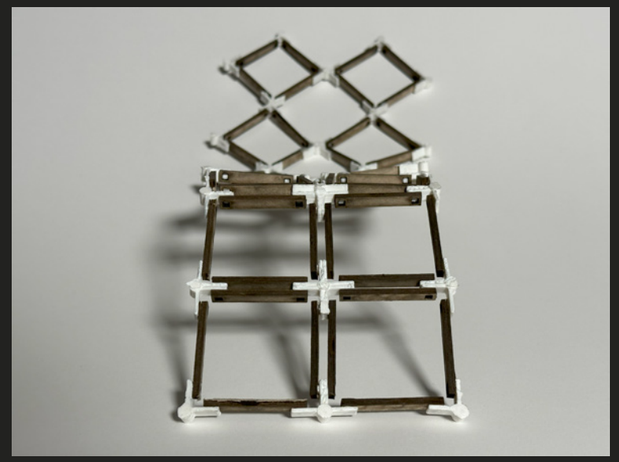
Therefore, any curved surface can be brought into correspondence with an expanded auxetic grid. And by tuning the amount of curvature, the maximum area distortion can be aligned exactly with the maximum expansion of the grid.

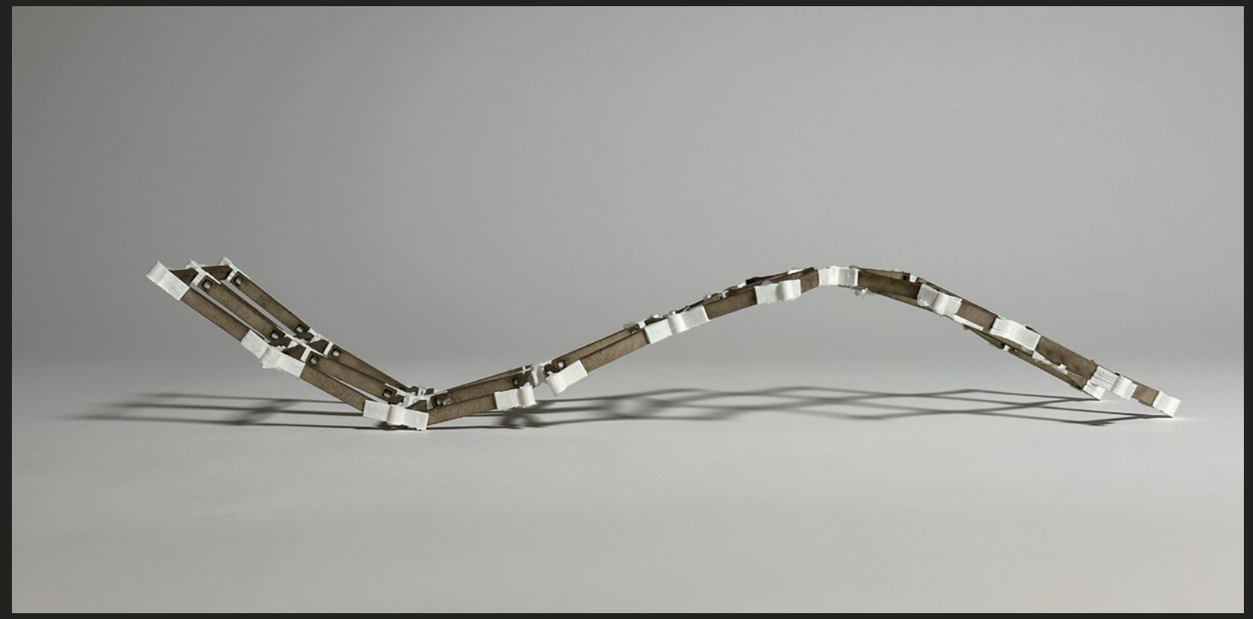




Tectonics break the symmetry between contracted and expanded auxetic grid. They reveal the doubling present in the folded configuration which enables the resolution back to grid as area inflates due to curvature.

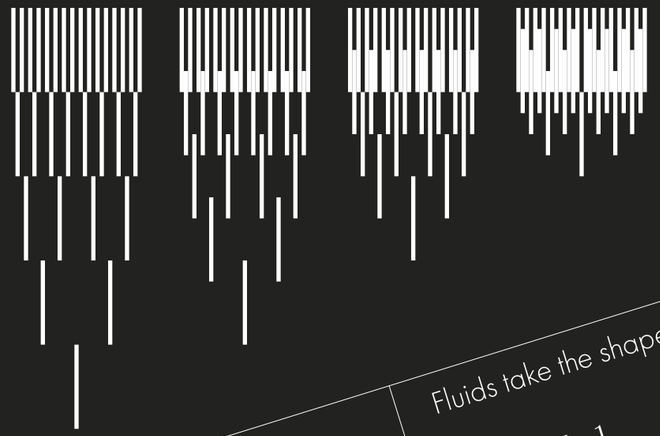


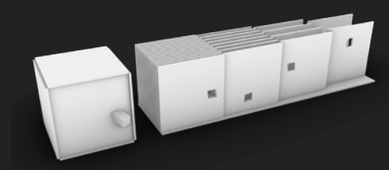


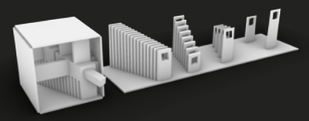


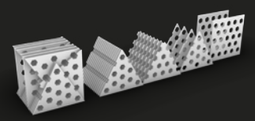
Mechanical Fluid

Transformations — taught by Ian Miley & Zach Seibold





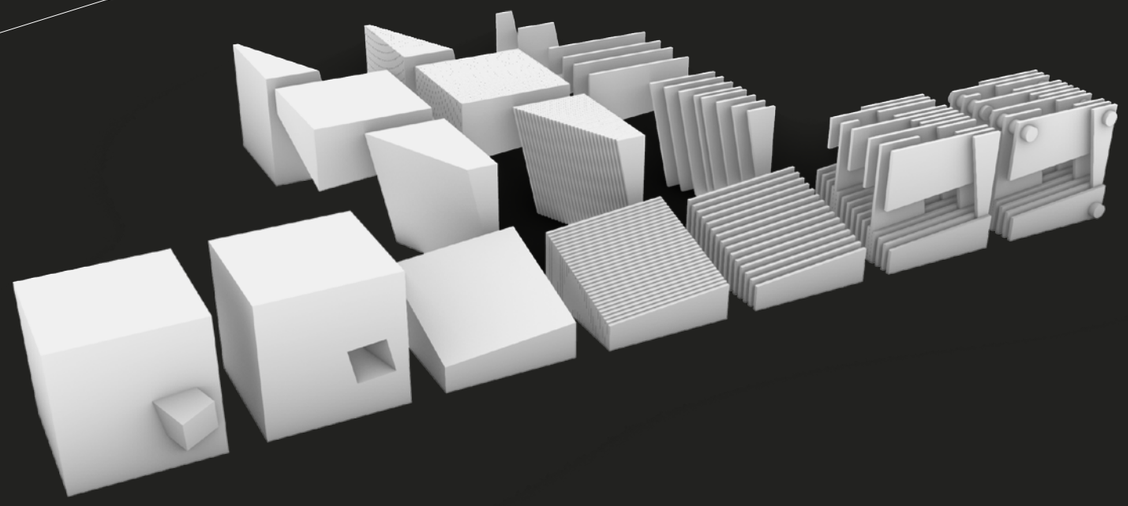




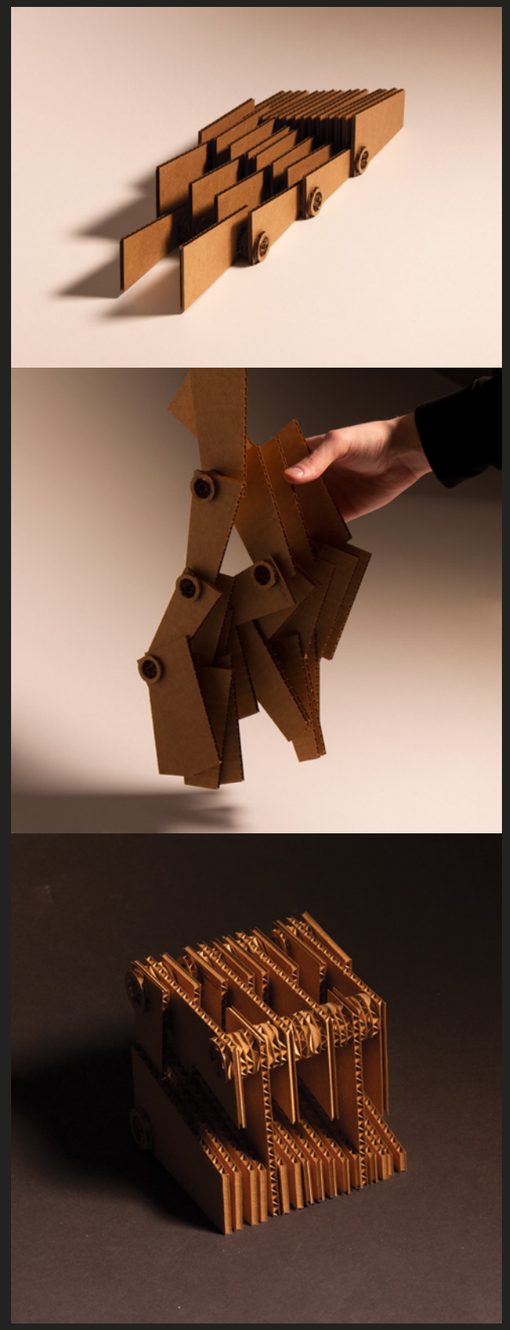
Fluids take the shape of their container.

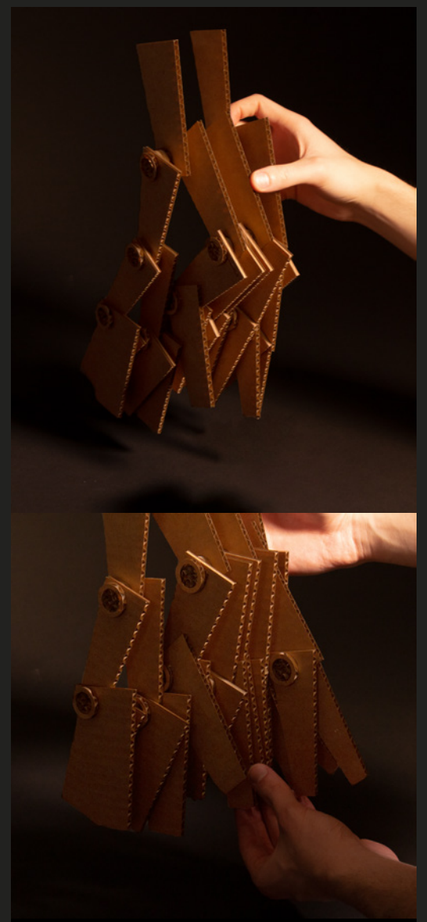
$$\sum_{n=0}^{N-1} 2^n = 2^N - 1$$

Using a property of powers of 2, planes can be densely packed and linked in order to create a fluid mechanism. For the new liquid created by this linkage, concavity is no longer required for a contacted surface to dictate the form of the system.



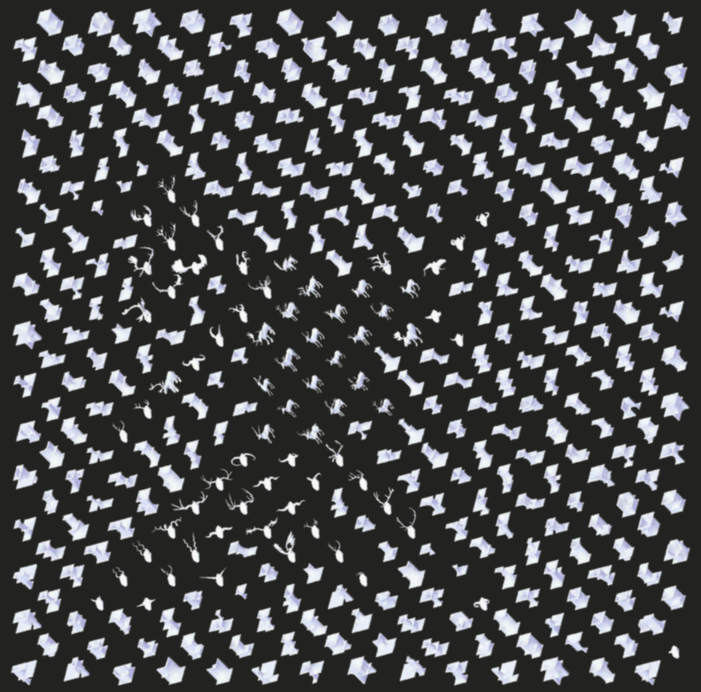
By modulating the edge conditions of the packed planes, one is able to dictate which surfaces impart order on the fluid. The linkage reaches an ordered state when contacting a flat surface or when wrapped around a square peg. Normally, pegs serve to pin a mechanism in place. However, here, it provides an unstable state of equilibrium.





3D GAN Metrics

Research — with GSDAI directed by Andrew Witt

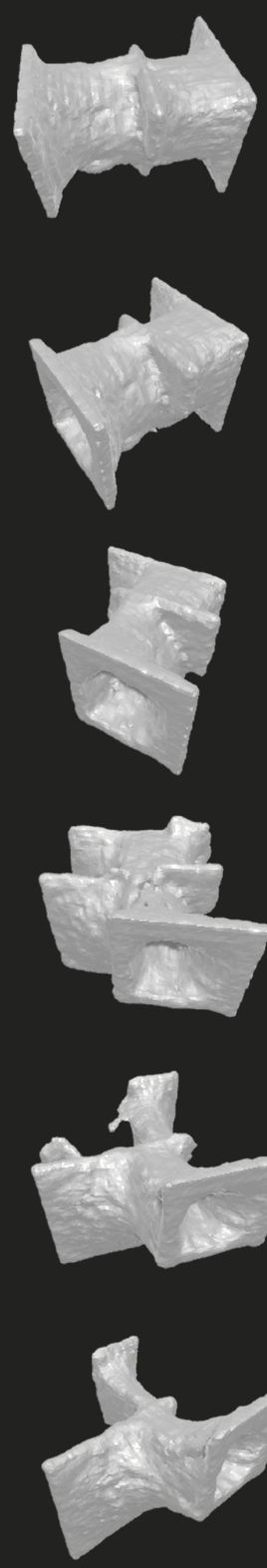


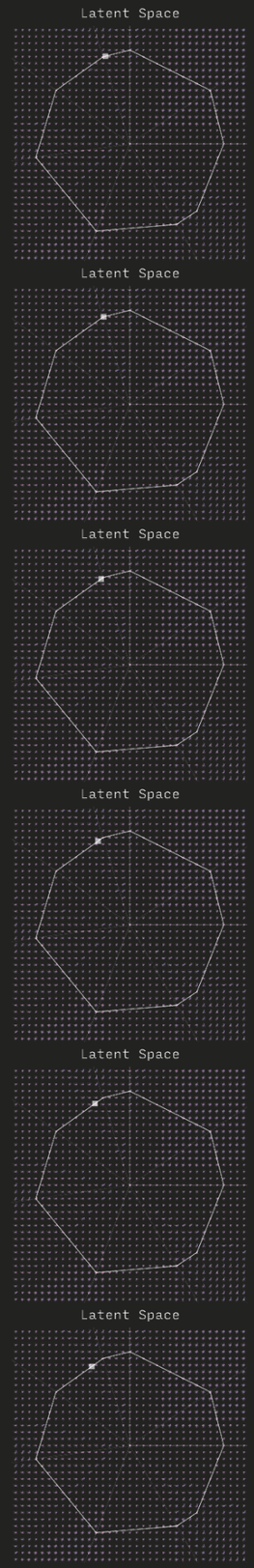
Generative adversarial networks (GANs) are machine learning models which are trained to generate a continuum of data which plausibly interpolates between elements of an existing dataset. This generated data is embedded in a high dimensional latent space such that elements which are similar are close together.

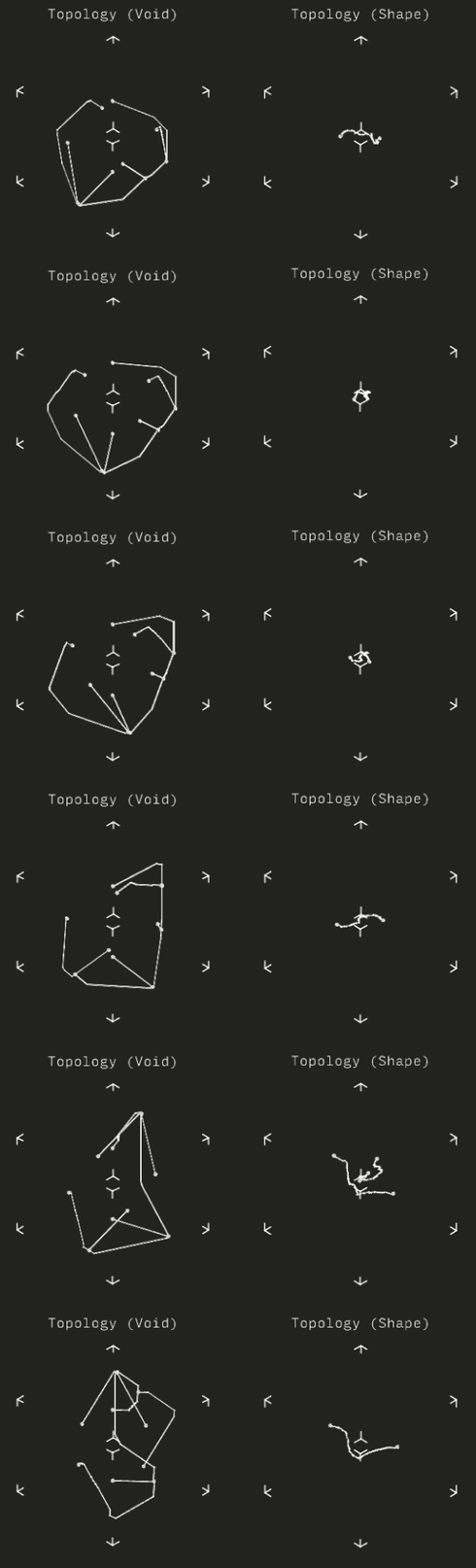
Training a GAN model (shapeGAN) on voxelizations of 3D objects yields a high dimensional landscape of synthetic objects, the topography of which encodes patterns in the spatial structures of these objects. Traversing this landscape produces continuous interpolations between 3D forms which minimally disturb morphology.

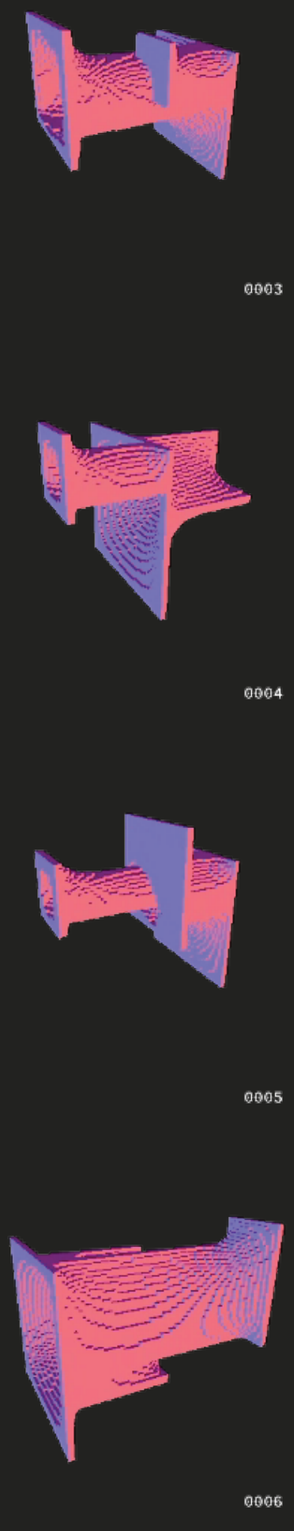
However, the structure of the latent space is not known a priori and the high dimensionality means that this unknown landscape is populated with a huge number of generated data points. Thus, in order to use 3D GANs to practically generate novel morphologies, a methodology for simplifying the latent space and locating desirable generated forms is required.

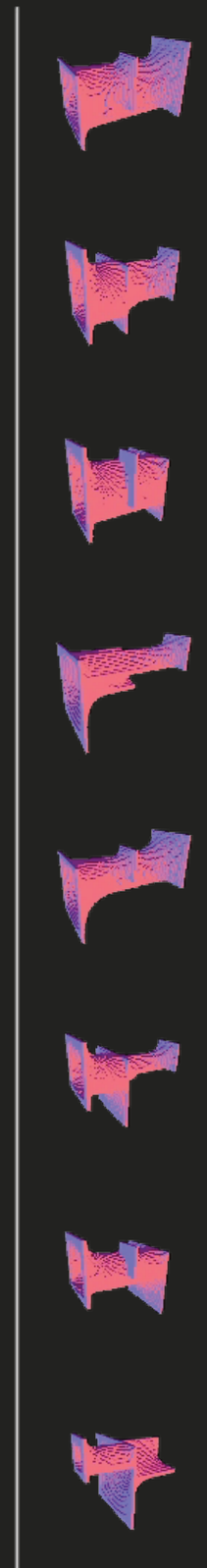
Computing geometric and topological quantities capturing different quantitative notions of form (e.g. Laplacian spectrum of skeletonization, first homology group, homological persistence of Laplacian, among others) provide axes to orient the latent space against, allowing the complex latent space topography to be unfolded into more human readable, lower dimensional representations like the plot above.

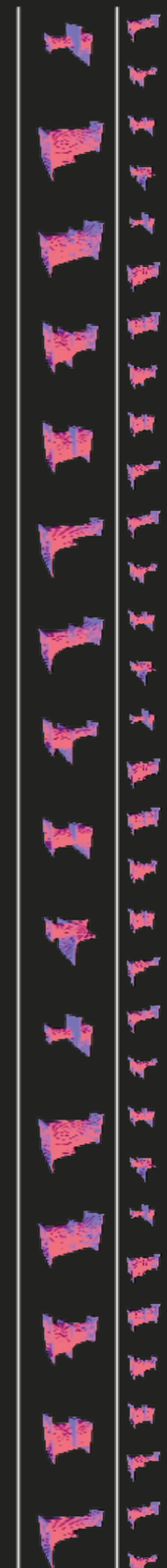






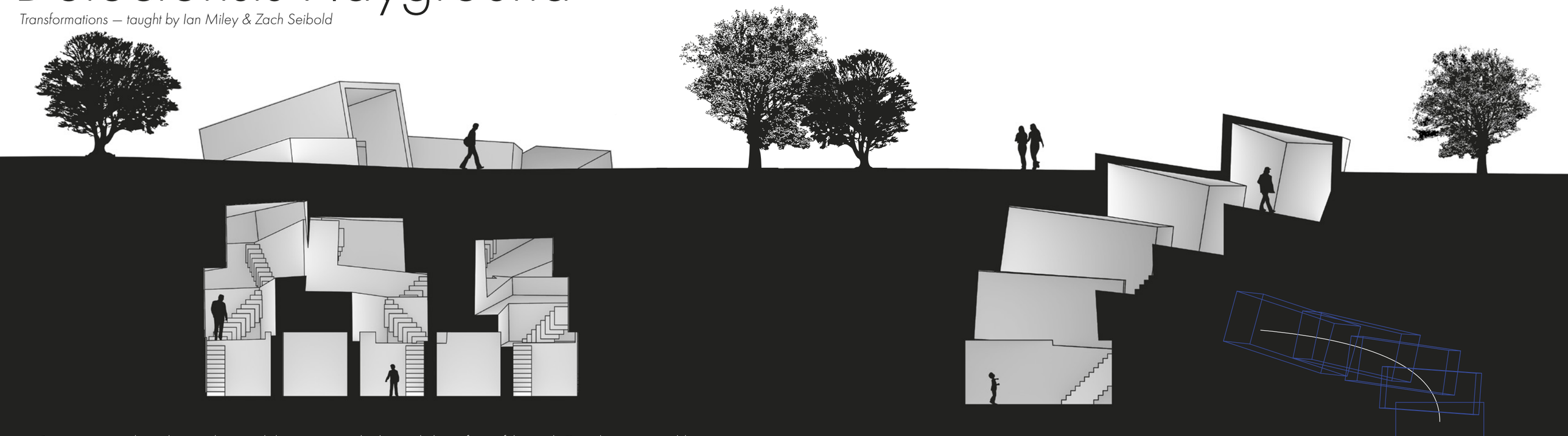




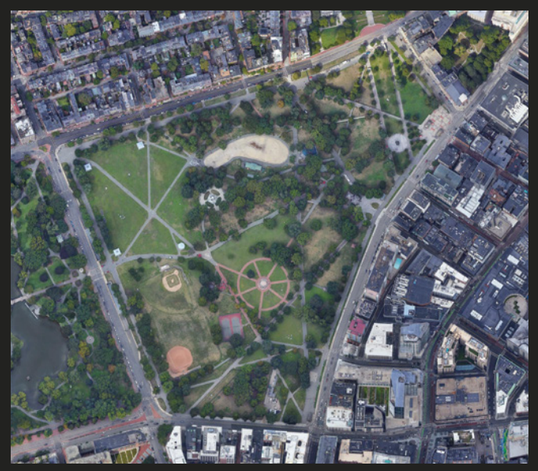


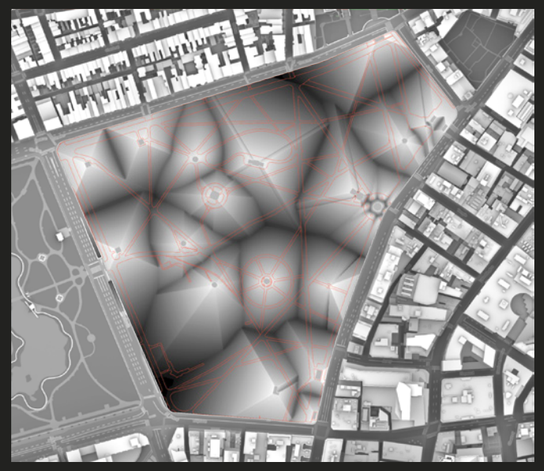
Detectorists Playground

Transformations — taught by Ian Miley & Zach Seibold

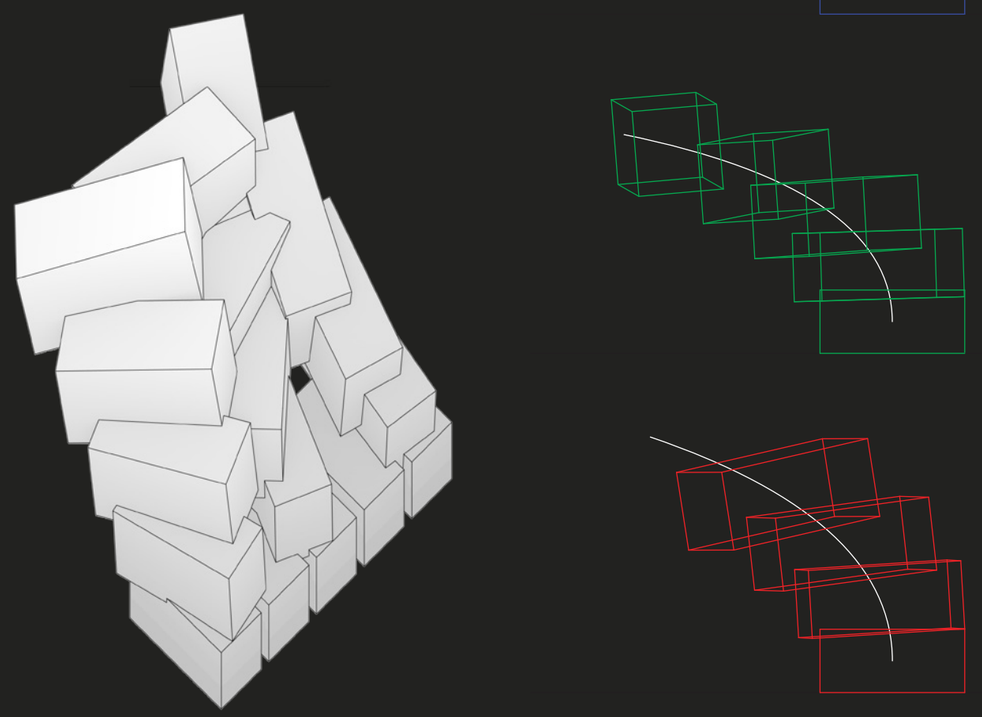


Detectorists are those that employ metal detectors to probe beneath the surface of the earth. To a detectorist, visible form is largely irrelevant. The structure of interest is sensed indirectly and exists in a possibility space which is gradually narrowed through excavation in a process which inherently necessitates a component of deductive imagination. This intervention in the historic Boston Common seeks to materialize the moment this playful forensic process encounters the subterranean infrastructure of the Common.





Sweeping the perimeter of structures in the Common with a metal detector emitting a cone of electromagnetic waves realizes surface forms as the tips vast ziggurats of possible subterranean structure extending into the earth. Archeaological excavation chisels away this conjectured architecture until imagined form fully coincides with reality.



Below this site in the Common is a parking garage filled with rows of metal boxes, the trace of which is carried by a cascade of reflected electromagnetic waves up to the surface where they excite the metal detectors of intrepid hobbyists.