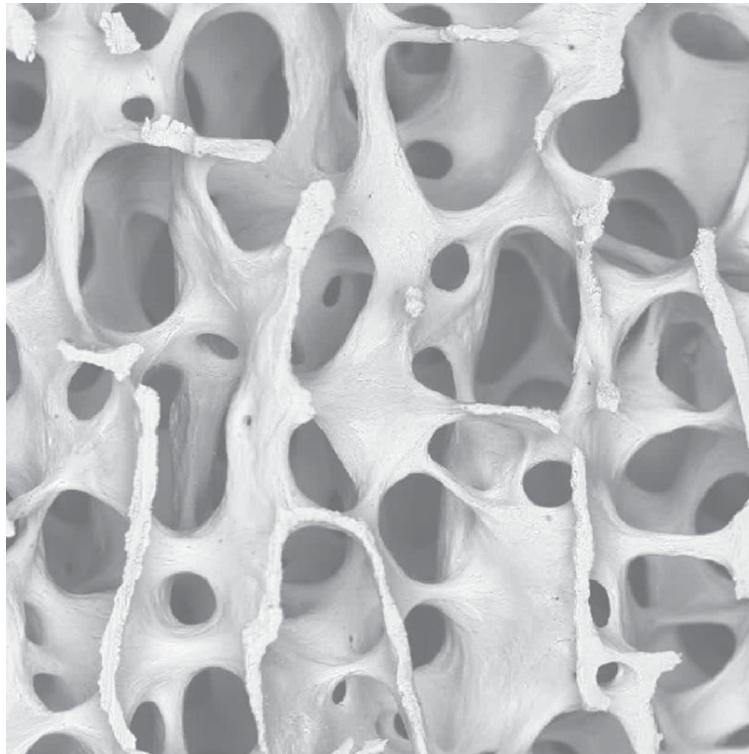


In Search of the (w)hole

Research - Through - Making Grant Program



Microscopic image of human bone. Photographed by Alan Boyde.

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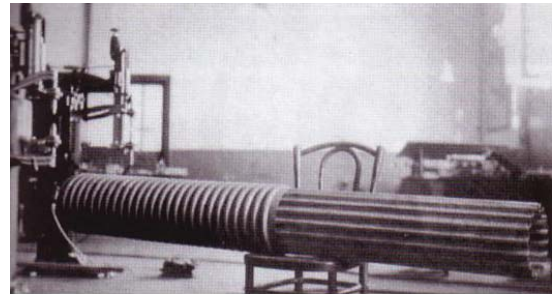
Background

It was Robert Le Ricolais, early pioneer of surface and space frame structures, that said “the art of structure is where to put the holes”. His eloquent statement is even more relevant today given the ability to link the precision of the computer with the precision of computer controlled cutting equipment. While his statement was in reference to building-scaled openings, it is true of smaller scale cuts, perforations and slices and his statement highlights the potential of a detail to inform a process.

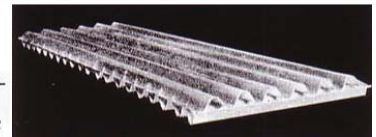
Digital Fabrication is most often celebrated for the construction of exuberant form achieved through extreme material usage. In this equation computer driven tools process neutral materials, resulting in bins full of saw dust or foam dust. This process perpetuates the idea that form comes first and construction is the act of replicating the form in the most exploitable material.

Proposal

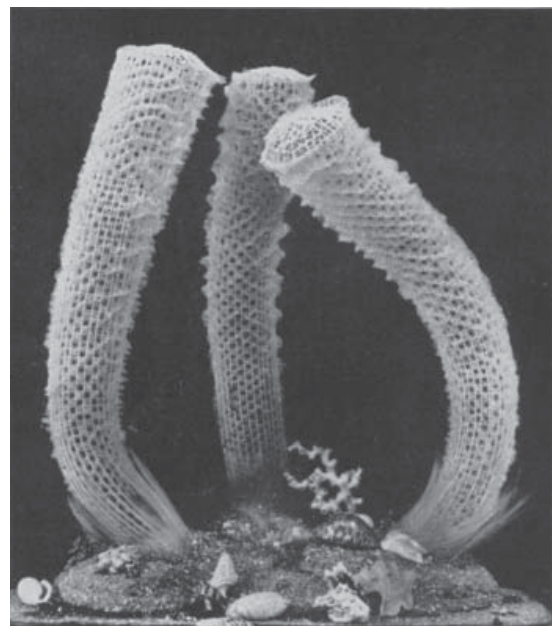
The Research-Through-Making Grant offers a chance to give material and process an upper-hand where forms might emerge directly through experimentation. This proposal takes a defiant stance against form over material. Two-dimensional cutting of sheet metal offers many opportunities because of the abundance of local shops equipped with cutting technologies and an array of readily available building materials. Both the material and technology are on the low-cost end of their respective spectrums, allowing for increased / iterative experiments given the budget. This material and technology price-point allows for further implementation in practice with standard budgets. By constraining the material and process to 2D-cut sheet-metal, the project will highlight



Prototypen der "Tubulaire"-Röhre und der "Isoflex"-Bodenplatte



Early Le Ricolais experiments that used corrugated sheets as laminations in opposing directions.

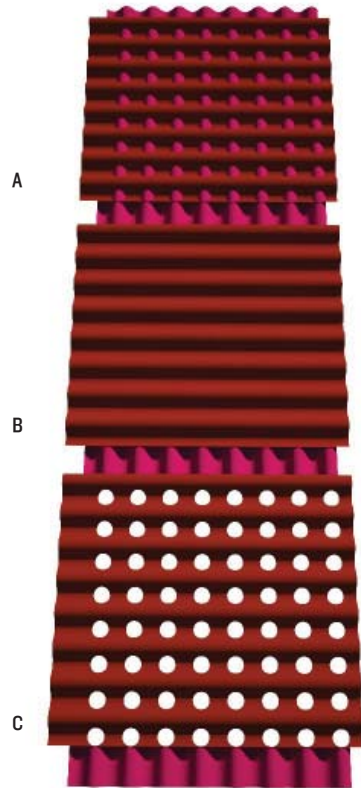


Japanese deep sea sponge with filaments in opposing directions to give stability. The holes in the surface allow for filtration.

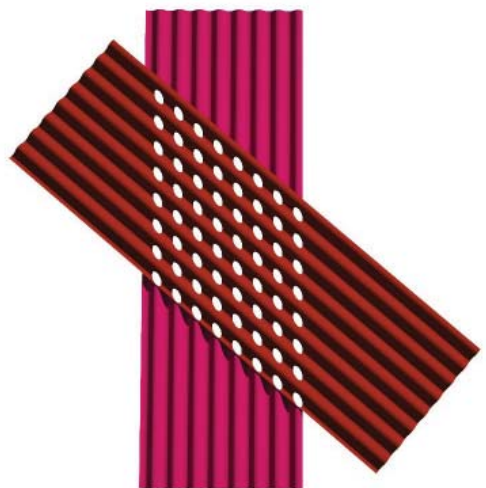
the ability of the architect to 'post-process' standard materials and as a result breathe new life into the banality of off-the-shelf materials through the creation of new structural organizations and material affects. It is in these routinely used tools and materials that a designer can make the most significant impact, altering the landscape of production.

2D cutting is a subtractive process creating a strong conceptual and structural link where the removal of material both reduces weight and potential strength. The use of sheet metal allows for the creation of lattice or surface structures dependant on material properties and material organization. The assembly of the cut sheet metal extends the structural logic through the location of holes or tabs for potentially complex assembly by unskilled labor. This project will be used to build a structure capable of spanning at least 25' which will require multiple assembled parts to achieve the required length and depth. Beyond the dimensional constraints of most materials available under 25', the project aims to span beyond the scale of most lost-cost conventional framing systems (standard wood framing) while offering increased material and spatial affects.

The project will make use of parametric modeling software to develop a logic between the sheet size, flat pattern, and resulting 3D form. Because of the associativity possible with parametric modeling tools, the 2D cut patterns can move beyond material efficiency, exploring cut patterns and their ability to produce complex 3D form. Again the process and material might dictate the form.



The grant would allow for a series of material / assembly studies to be built and tested. A starting point would be to build on Le Ricolais' corrugated studies. The precision of the cutting and location of holes allows for performance variations. A. Only top surface cut. B. Only back surface cut. C. Both surfaces cut.



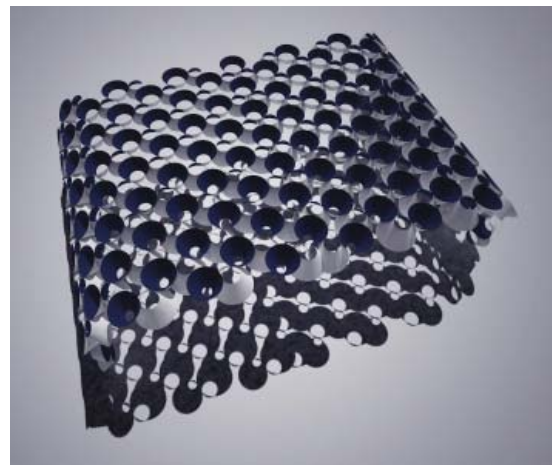
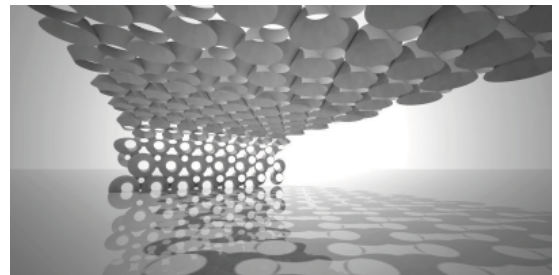
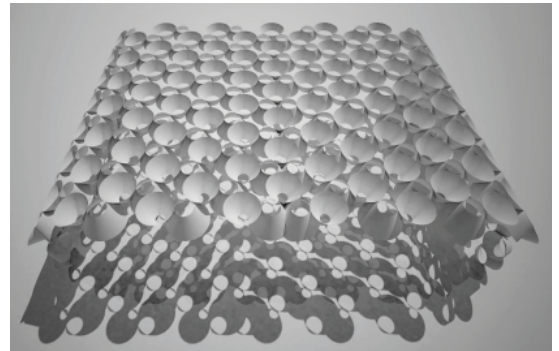
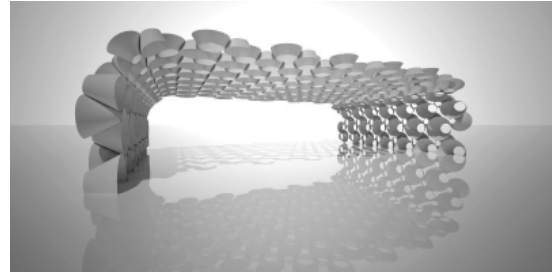
The project seeks to exploit the flexibility of the material in one direction and the rigidity in the other. Here two corrugated surfaces are splayed and the intersections are cut. Geometry and structural performance result for material distortions. Another form of cutting would allow for bending the strong orientation of the material.

Proposal Examples

The images included in the proposal are to help explain the general themes of the research more than to show that this is what will be built with the funding. The corrugated studies and conical studies are more of a starting point to initiate the research. As feedback is gained from initial material studies, the project and the form may move in different trajectories to fully investigate material outcomes or assembly techniques.

Portfolio

The portfolio projects were either for commission or for exhibition. They show a range of work in the area of the research proposal but were not carried out under the explicit aims of this research. The intent is to take these ideas further and in a more explicit mode of operation. Most of the projects are not structural and as a result this proposal seeks to intensify the scale and performance of this line of inquiry. The project for the exhibit table creates a coherent form (a zig-zag table / truss) through the use of nested radii, using the cut pattern to inform the final form. The screen wall project also shows how the form might evolve so that the parts could be cut with zero waste (shown in the rendering of the parts laid flat in front of the screen wall). The restaurant ceiling uses all unique parts cut from flat sheet material illustrating the economy of the method. The plywood light shades are the odd project because of the use of wood but show an interest and ability to work with material to bring about unexpected results. And finally, the inclusion of the building addition is because it is a design build project. It is an essential aspect of this research to develop methods that can be scaled up in size and complexity to create viable building systems.



A series of conical elements are assembled to create a 3D lattice structure capable of spanning and controlling opacity. As the assembly varies its thickness, density, and size the structure becomes more or less rigid allowing for emergent form.