IN THE AGE OF THE ANTHROPOCENE:

Preliminary Investigations in the Future of the Built Environment

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Thesis Concept Presentation

B.A, Astrophysics, Columbia University

M.A, Statistics, Columbia University

NASA | NRAO | Goldman Sachs | JP Morgan

DEFINITIONS

The **built environment** is a material, spatial and cultural product of human labor that combines physical elements and energy in forms for living, working and playing. It has been defined as "the human-made space in which people live, work, and recreate on a day-to-day basis."

Clive Dilnot describes climate change, namely global warming, as one of the “destructive historical markers” of the “Age of the Artificial” and suggests that we are now defined by the **Anthropocene Age**—the era where humans begin to impact the environment to such a degree that even the Earth’s geology is forever altered.

THESIS DOMAINS

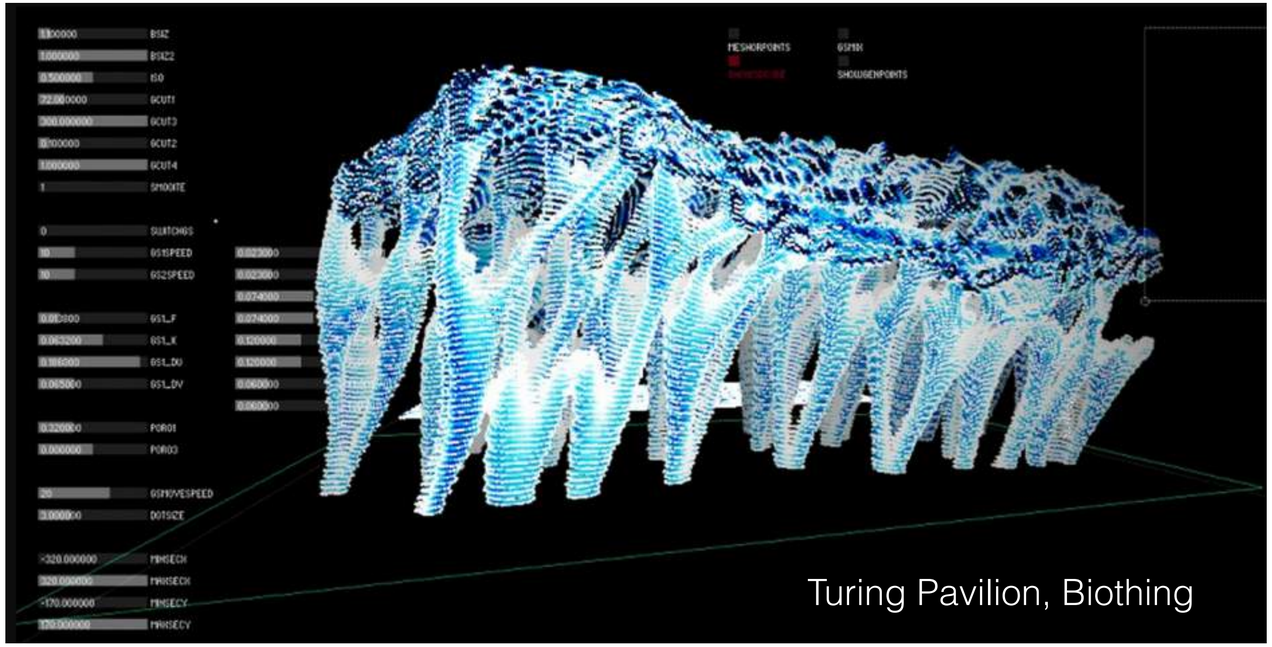
‘FUTURES’ ARCHITECTURE

MATERIAL ECOLOGY

Francois Roche, New Terretories

Silk Pavilion, MIT Mediated Matter

DIGITAL FABRICATION



Turing Pavilion, Biothing

BIO FABRICATION

Bio Scaffold, Syn.De.Bio

THESIS CONCEPT

I am researching the relationship between digital and biological fabrication to build an architectural sculpture using alternative materials and computational and mathematical modeling methods in order to broaden the social conception of the built environment in the age of the anthropocene.

The physical installation of the thesis will be an architectural sculpture that will be constructed using innovative biofabrication techniques using a biological media (such as fungi, silk worms, slime mold, or algae) paired with traditional fabrication methods such as 3D printing, laser cutting, robotic milling/machining, and CNC (Computer Numeric Control) tools.

The project will also be heavily rooted in computational/algorithmic modeling, and involve a series of creative coding experiments, that will help simulate and model the biological systems.

COMMUNITY OF PRACTICE

Oliver Medvedik, GenSpace Co-Fonder

Kevin Slavin, MIT Media Lab

Carlos David Gonzalez Uribe, MIT Media Lab

Francois Roche, New Territories

Mitchell Joachim, Terreform One

David Benjamin, Columbia / AutoDesk

BIOFABRICATE

Suzanne Lee

Annelie Koller, MFADT ‘15

Ali Schachtschneider, Parsons ‘15

Upcoming Interviews:

Marcos Cruz, Bartlett School of Architecture

Alisa Andrasek, Biothing

Fiorenzo Omenetto, Tufts

Upcoming Conferences:

Association for Computer-Aided Design in Architecture
2015 International Conference

CONFERENCE: October 22-24, 2015
Cincinnati, Ohio, US

BIOFABRICATE

DESIGN, BIOLOGY, TECHNOLOGY: GROWING A BETTER FUTURE

22nd October BIOFABRICATE 2015 fall conference!

BIOFABRICATE 2015 is the annual summit for the emerging world of grown materials. We're excited to once again be hosted by Microsoft at their wonderful Times Square headquarters in New York city.

From yeast and bacteria to mushrooms and mammalian cells, international attendees will discover the disruptive research and companies literally growing the materials of the future. From fashion and textiles to automotive and architecture, this is an amazing opportunity to hear how biotechnology is facilitating a new material revolution.

RESEARCH QUESTIONS

1. What specifically are you trying to say about The Age of the Anthropocene? What research question/social problem are you trying to convey? How can you create a piece that becomes a critical design of current architectural methods?

2. How can the built environment help tell a story and convey a message? How can a “sculpture” evoke emotion and instill impact (Terreform One, *Bio Map of 11 Billion*)? In what way can an architectural scale installation (compared to a small diorama on a table) help dictate a narrative? (Think about the scale ramp of the solar system at natural history museum.)

3. What living organism is best suited for this research? What bio fabrication techniques are feasible and actually aid in the story telling?

4. How can materials help aesthetically tell the story? (See Silk Pavilion)

5. What geometrical shapes/forms best represent and help conceptualize the problem, i.e. Anthroponcene Living? (See Buckminster Fuller)

6. Am I thinking too literally about using living systems in construction? Is there something else that living systems can tell us about our built environment? Think about Alisa Andrasek’s project modeling electromagnetic flows and how applying those flows can effect the actual thermodynamics of a building. What other phenomenon could you think to model that might convey a similar idea without going through the pains of lab cultivation? (Slime Mold models Tokyo subway)

7. Methodological: How will computational modeling support the physical installation and general thesis question? (See Evan Roth, *Graffiti Analysis* - i.e. is this a thesis about process?*).* Perhaps, as a series of more directed experiments, you could write an Open Frameworks add-on to create parametric shapes and 3D print these shapes using high quality printing and experimenting with other materials (metal, paper)? Using Biothing as a reference and precedent, is there a natural phenomenon that you could model mathematically and begin to narrow in on a shape that is connected to your concept and visually compelling?

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PROTOTYPES

COOPER HEWITT

PROVOCATIONS: THE ARCHITECTURE AND DESIGN OF HEATHERWICK STUDIO

1

Paper Prototypes → *Arch. Sculpture*

3

3D Printed Prototypes → *Arch. Sculpture*

2

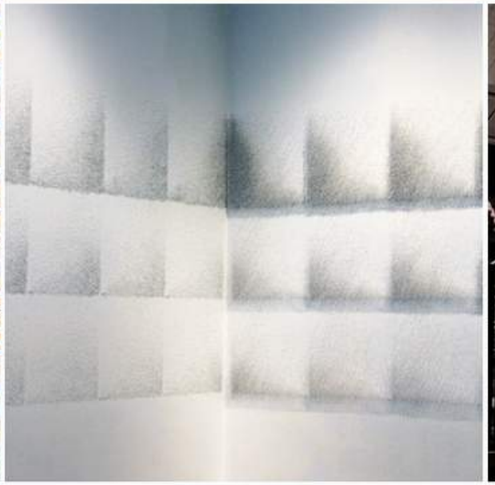
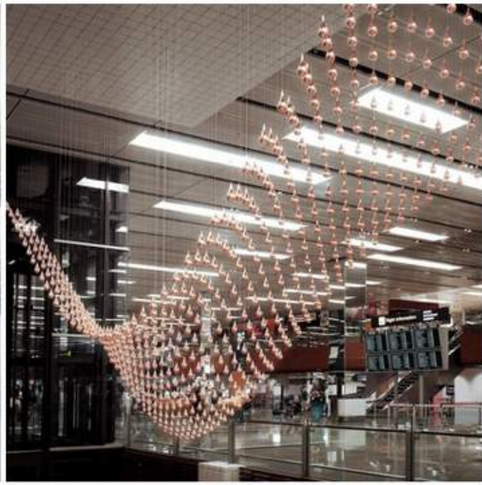
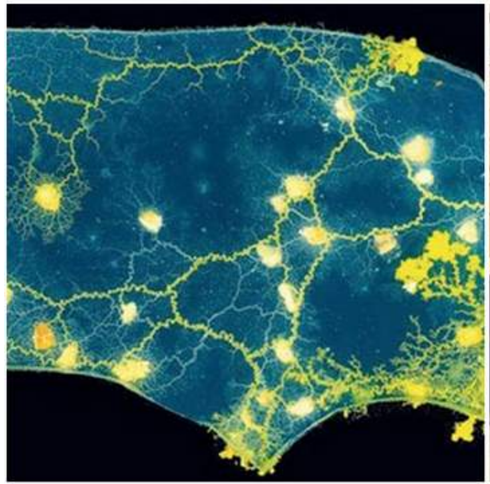
Wooden Scale Model → *Arch. Sculpture*

Play with Scale

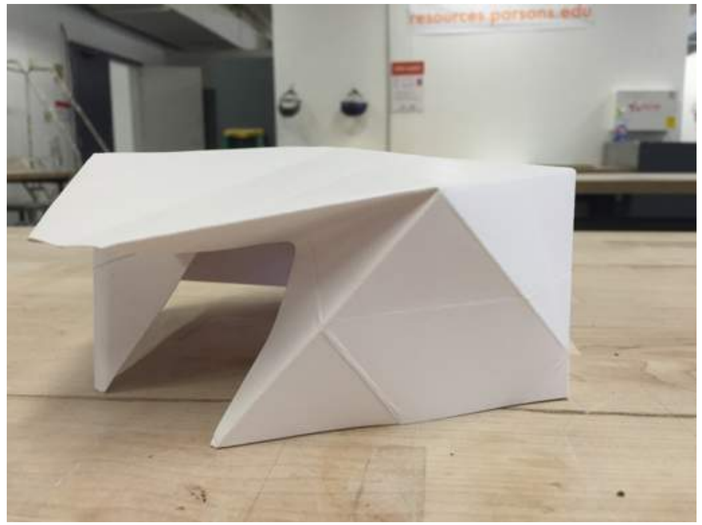


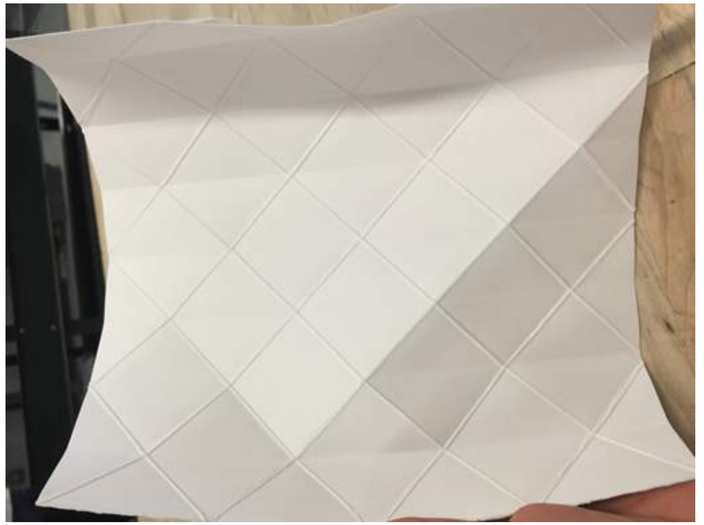


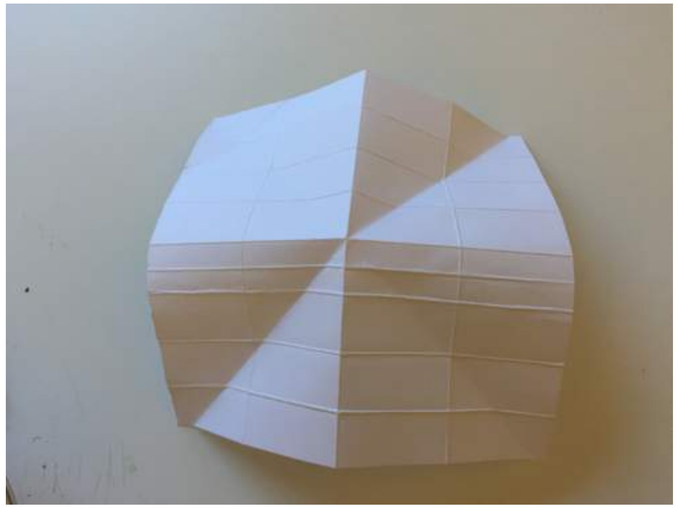


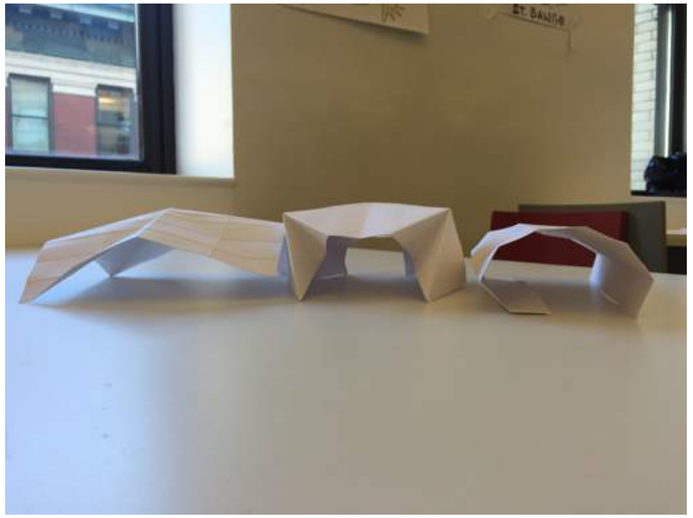





PROTOTYPE 1A:



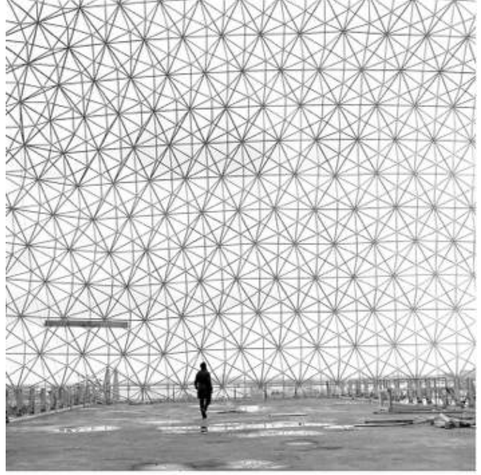
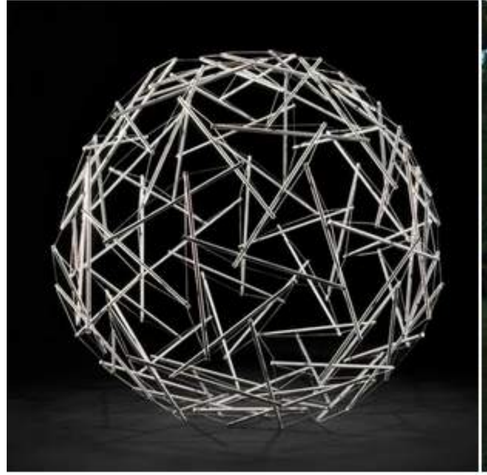


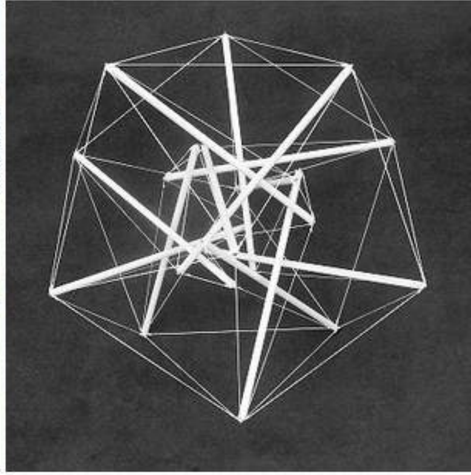


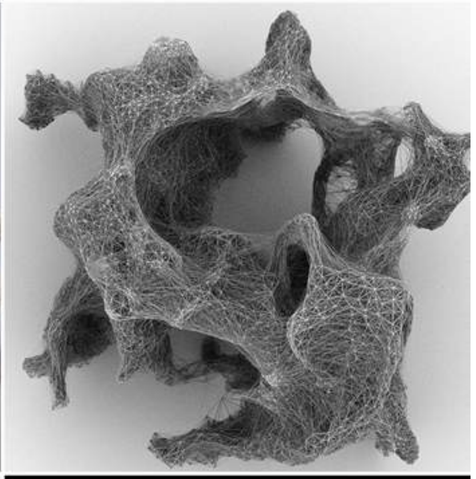


PROTOTYPE 1B:

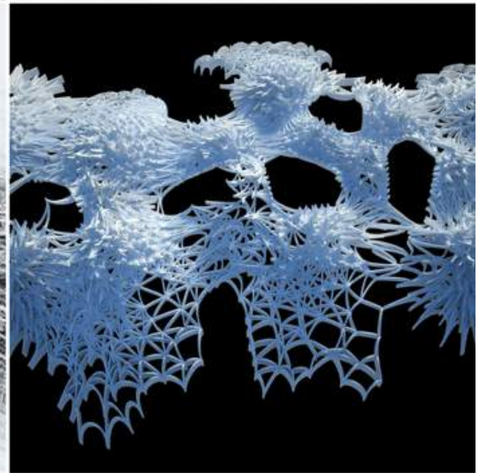
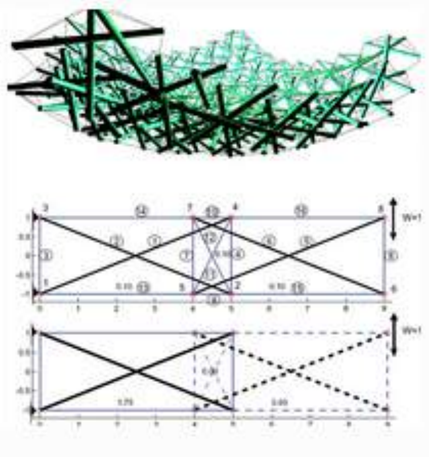
Play with Models





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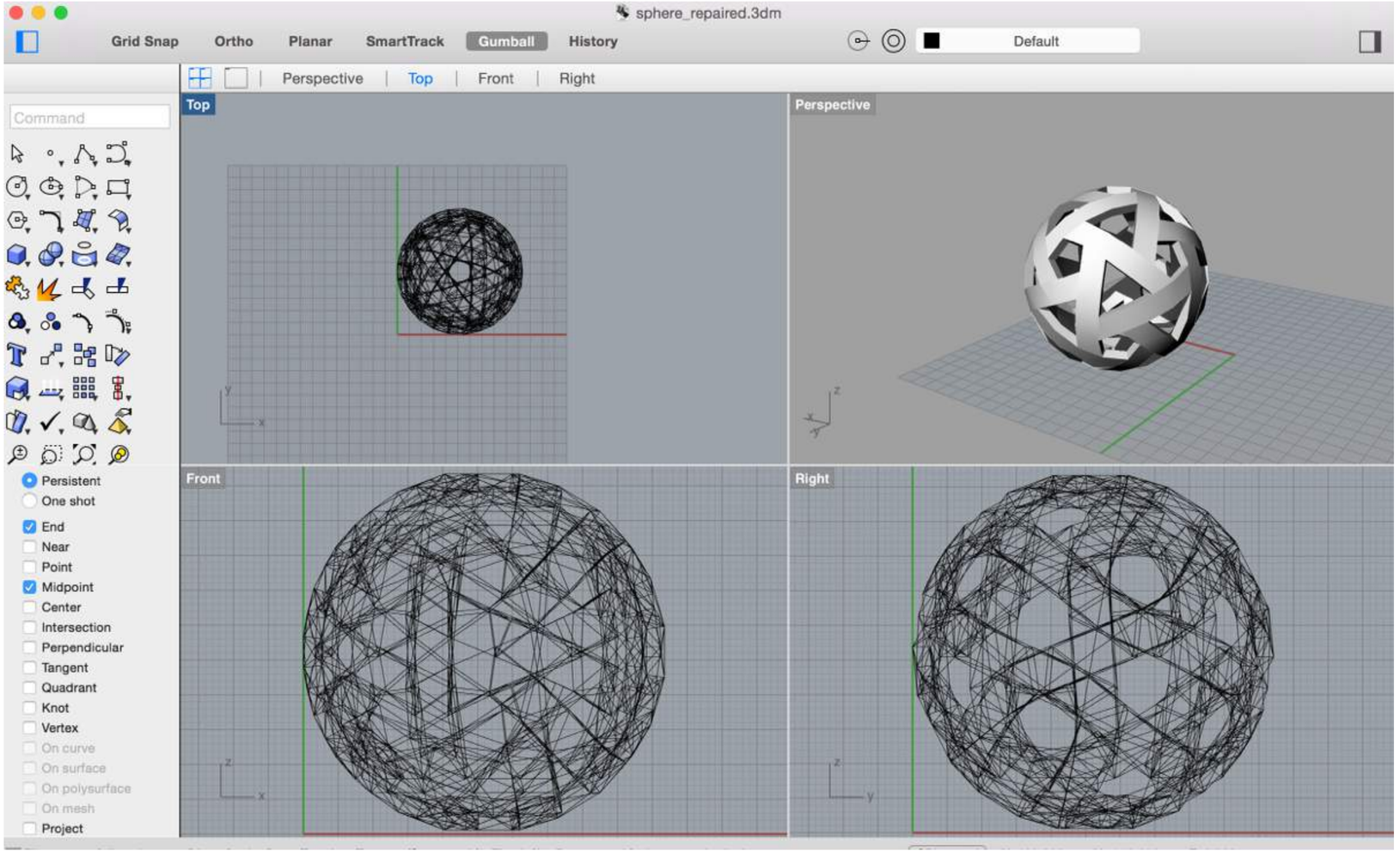
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Ortho
Planar
SmartTrack
Gumball
History
Default
Perspective
Top
Front
Right
Command
Persistent
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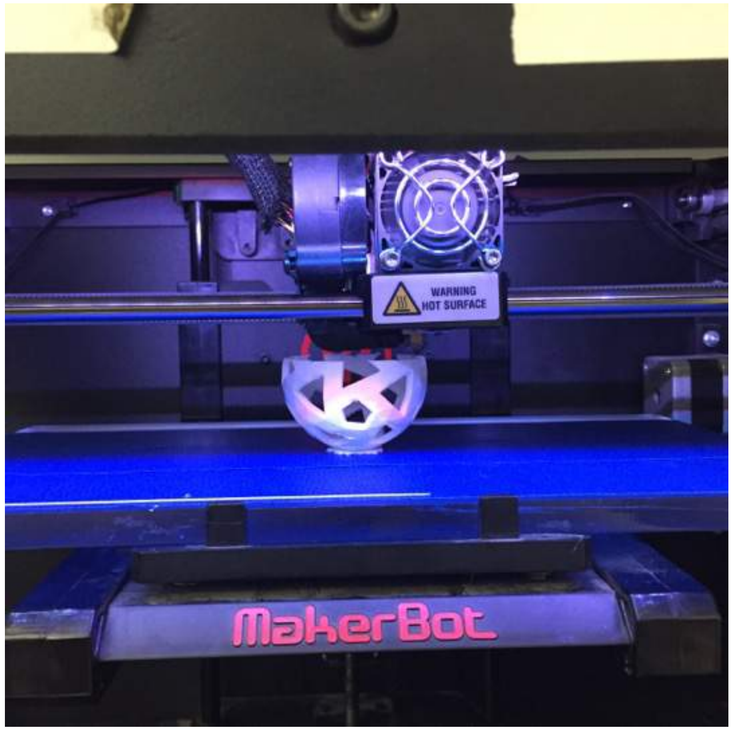
Knot
Vertex
On curve
On surface
On polysurface
On mesh
Project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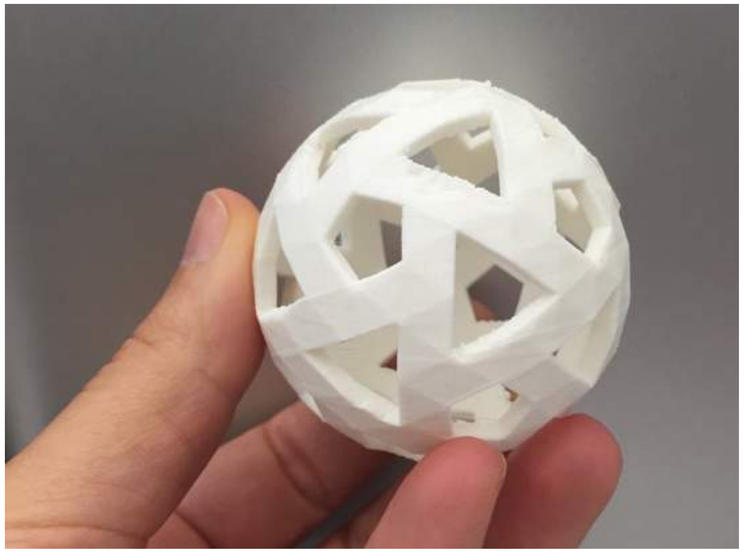
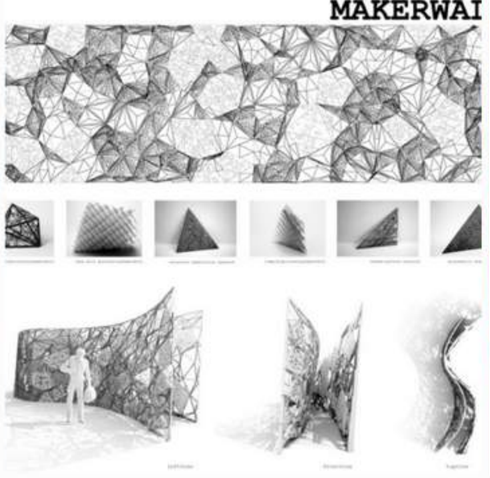
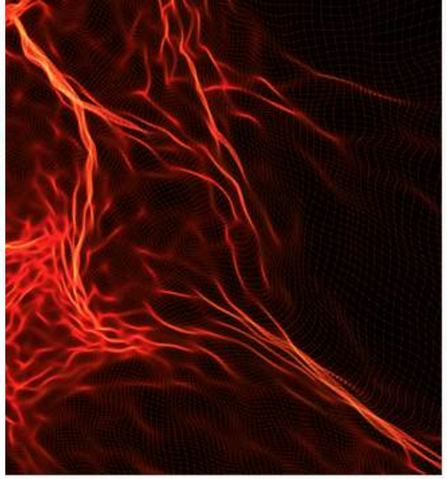
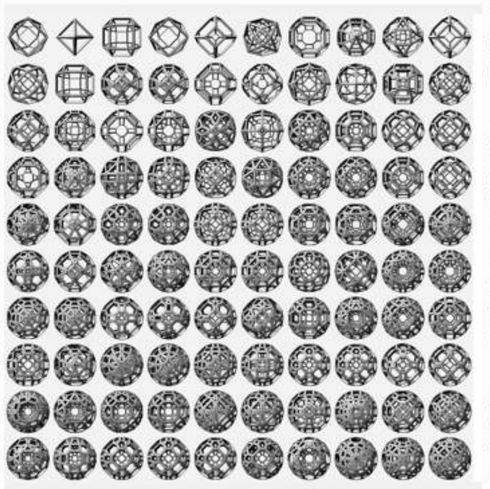
HOT SURFACE
MakerBot

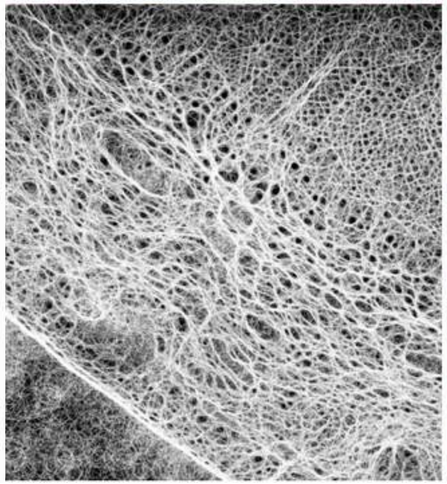


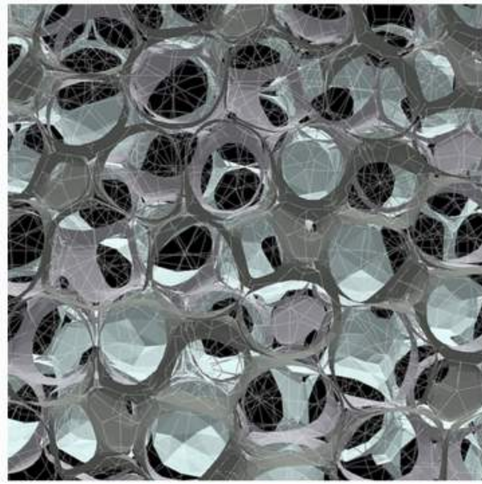
Play with Aesthetic

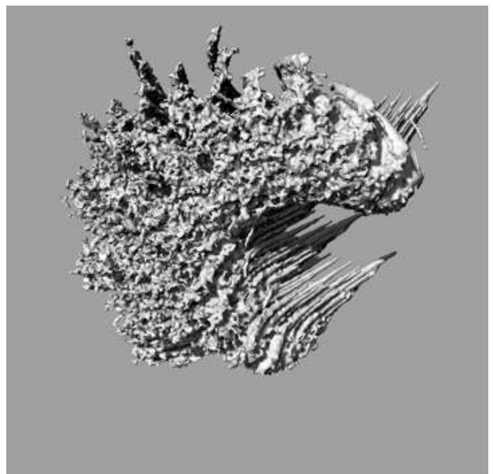


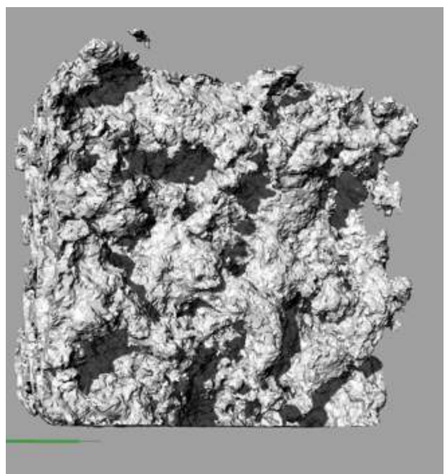


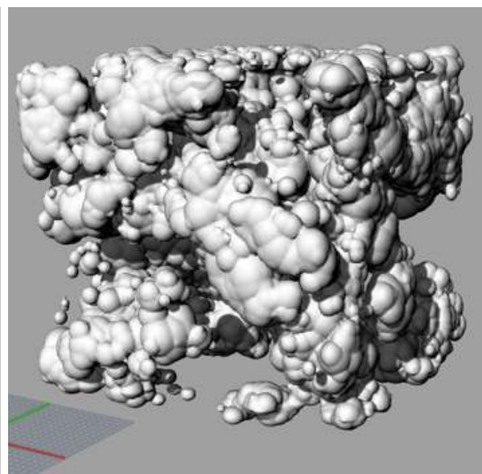












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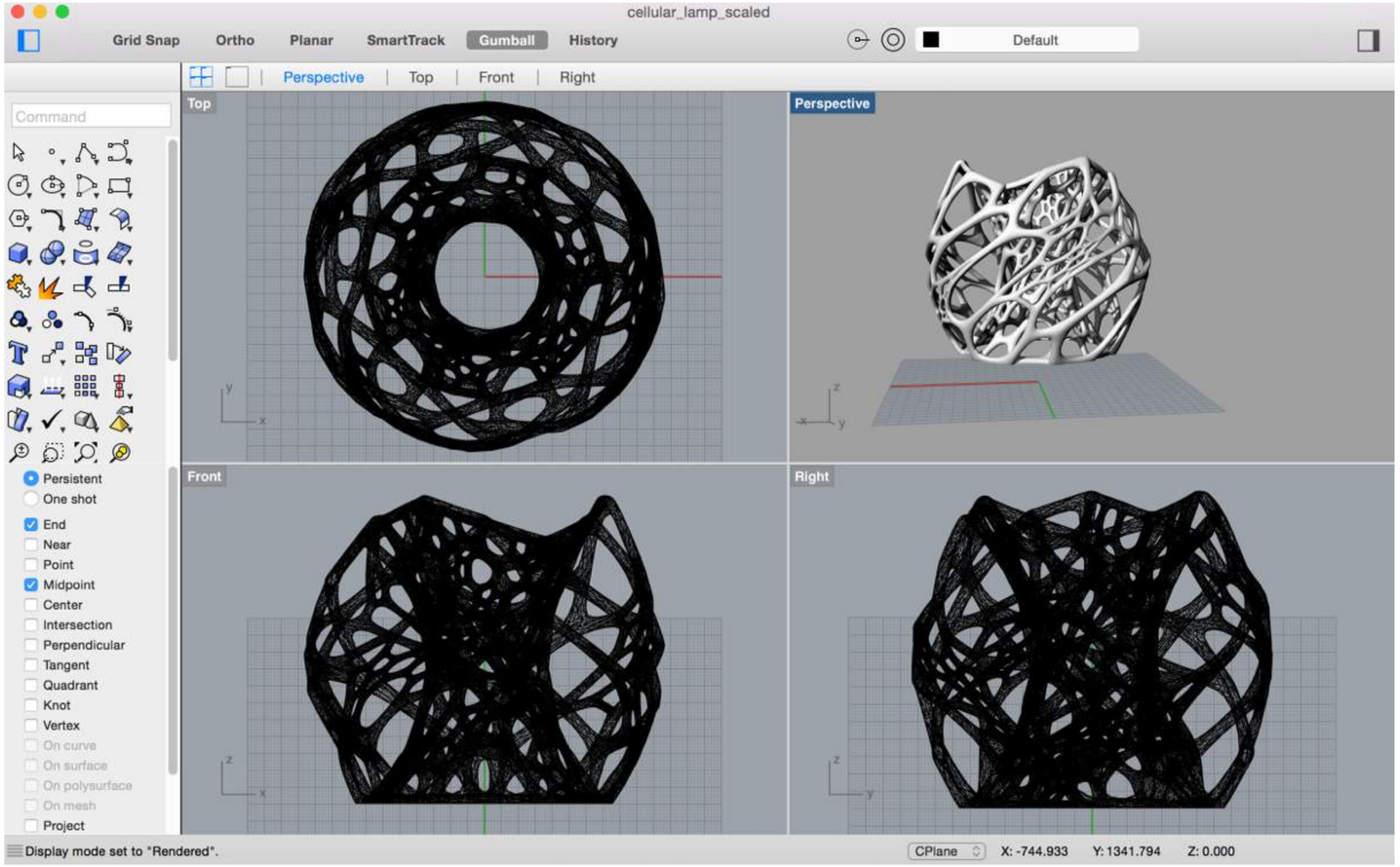
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Ortho
Planar
SmartTrack
Gumball
History
Default
Perspective
Top
Front
Right
Command
Top
Perspective
Front
Right
Persistent
One shot
End
Near
Point
Midpoint
Center
Intersection
Perpendicular
Tangent
Quadrant
Knot
Vertex
On curve
On surface
On polysurface
On mesh
Project
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CPlane
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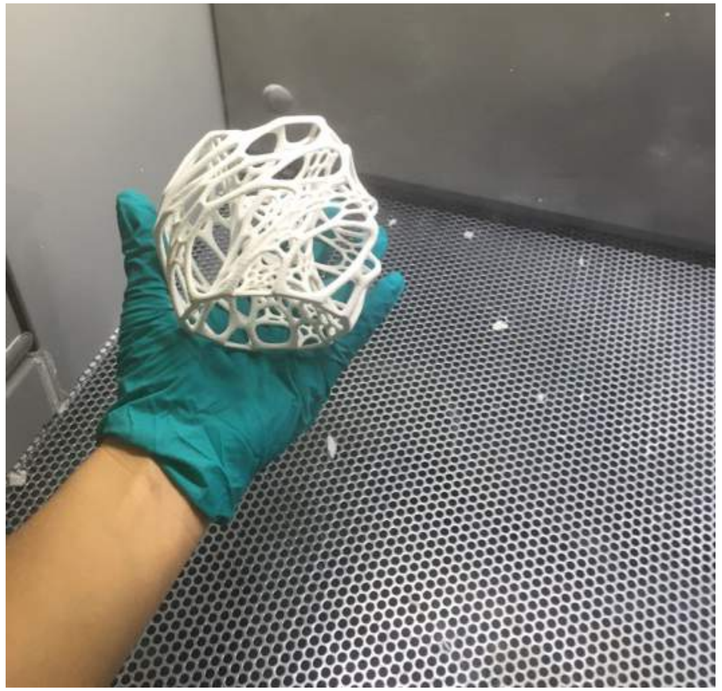
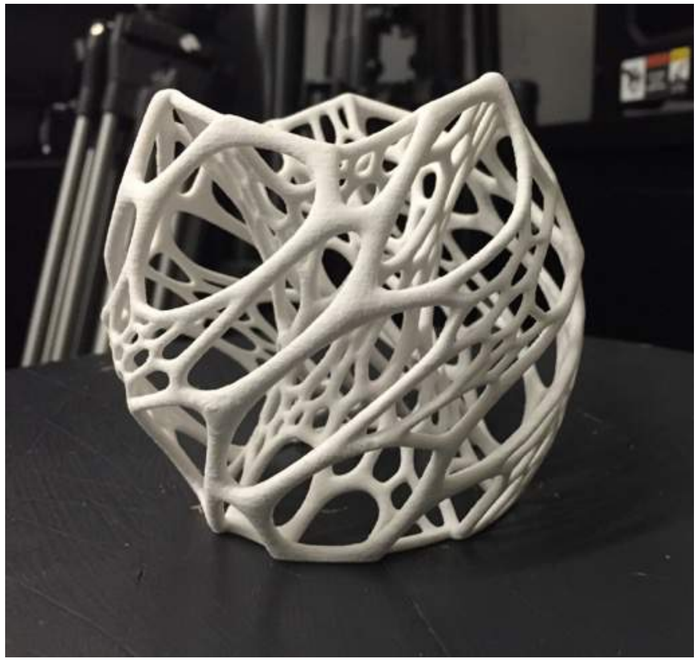




NEXT STEPS - 2 WEEKS

1 IDENTIFY BIO MEDIA:

ALGEA


FUNGI

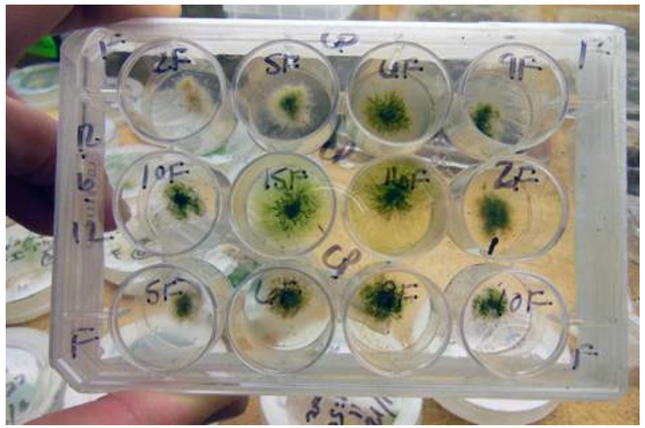

SILK WORMS


SLIME MOLD


BEES

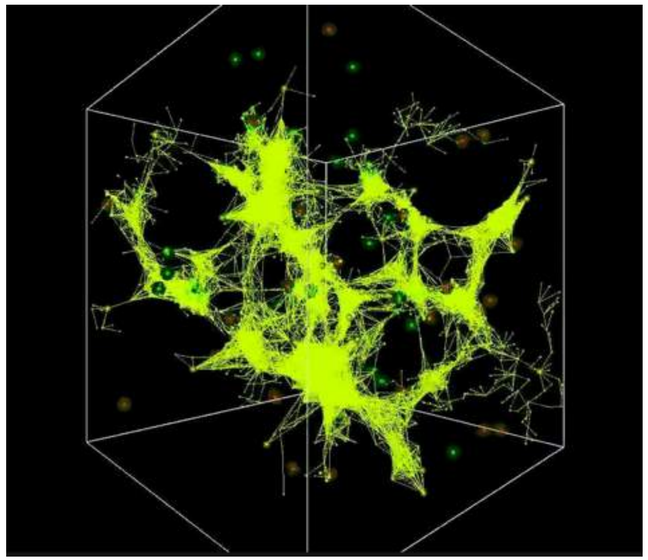

MICROBES

2



BEGIN LAB EXPERIMENTS

3



BEGIN CODE EXPERIMENTS

THANK YOU

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