Templating Biology for Design

Product Design, Architectural Design, Fabrication Design

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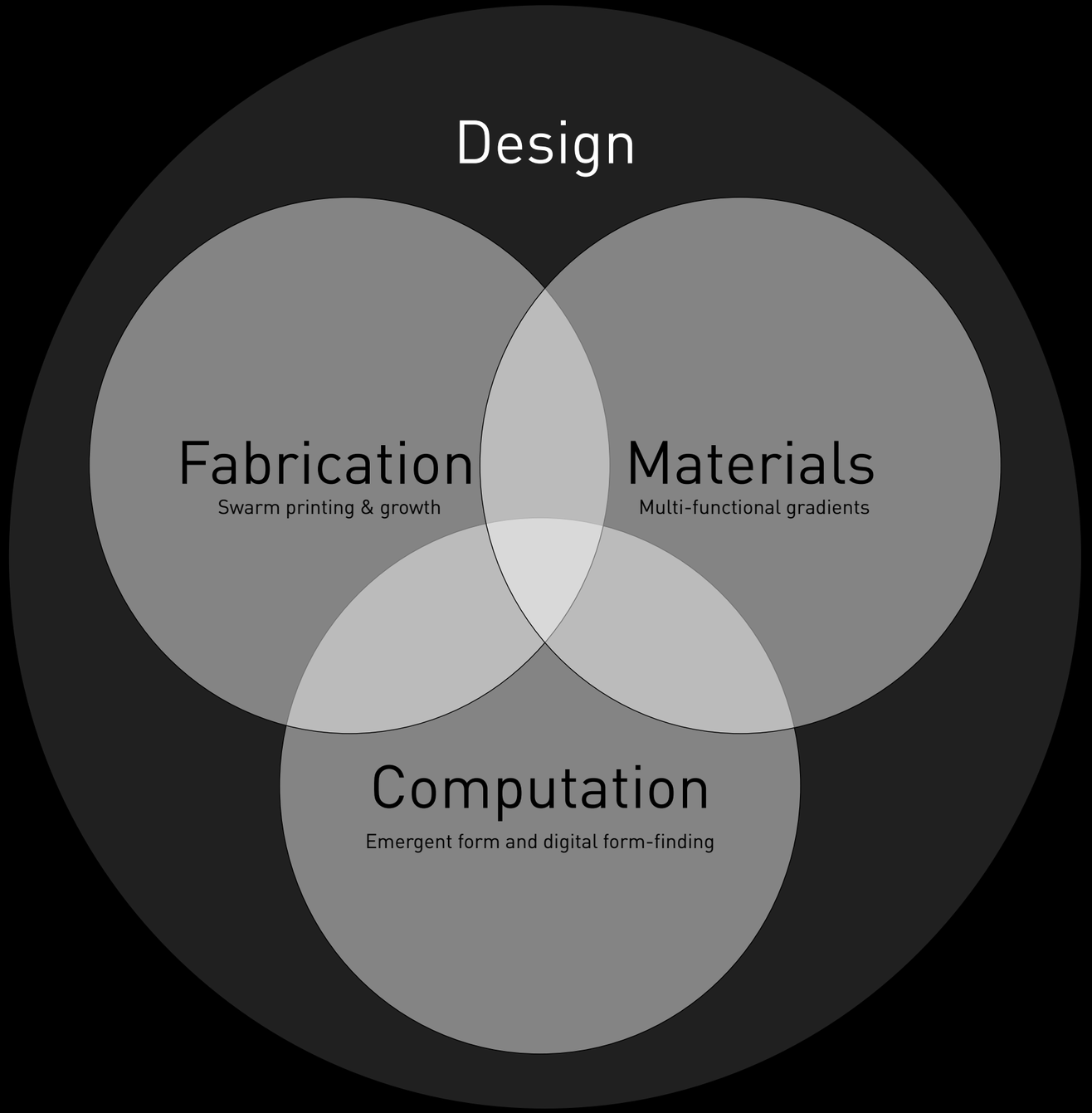
Design
Fabrication
Swarm printing & growth
Materials
Multi-functional gradients
Computation
Emergent form and digital form-finding

Spatiotemporal variation in material properties

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MIT Media Lab

Spatiotemporal variation in material properties

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Top down control of bottom up growth

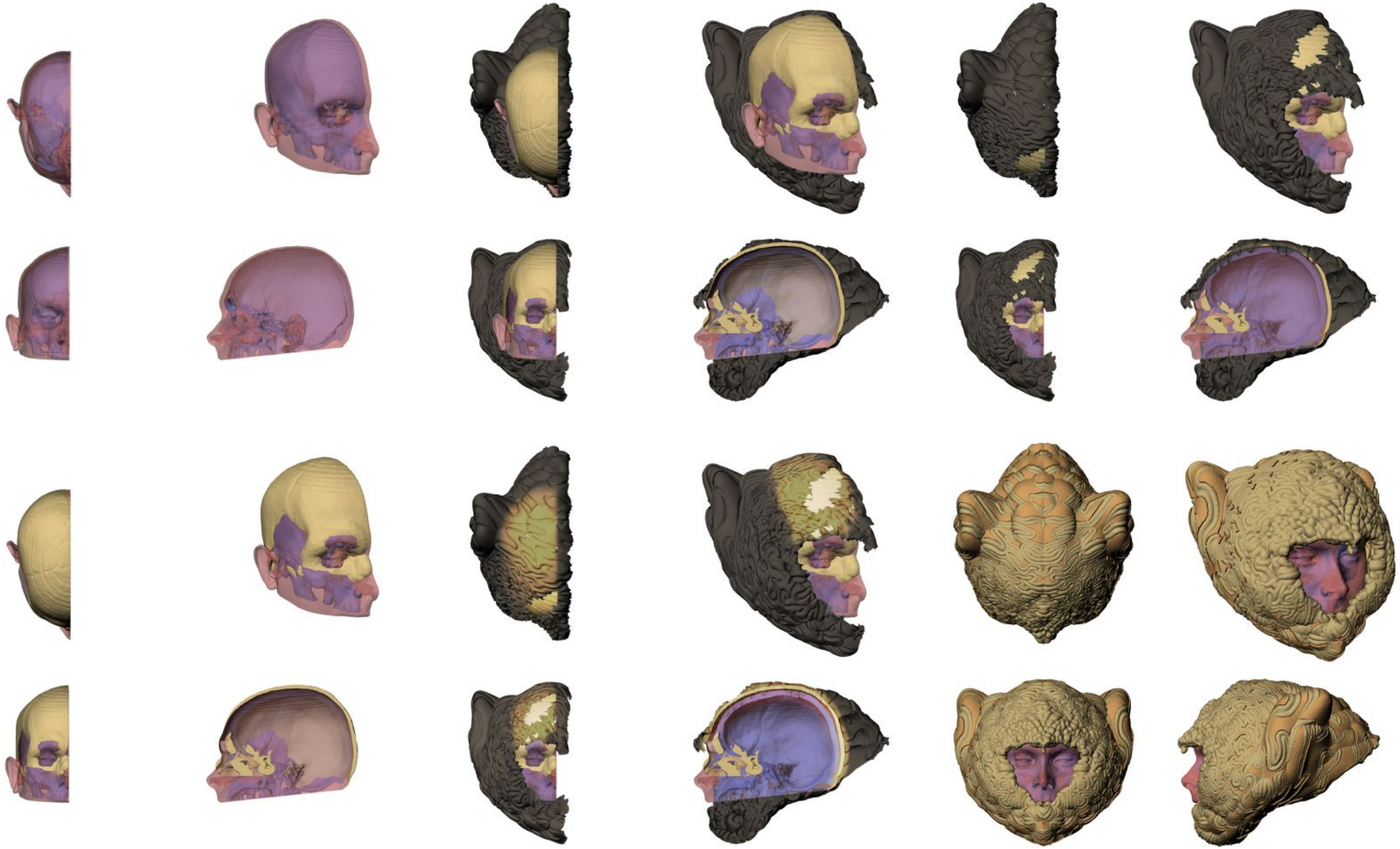
Templating algorithms from biology
Templating fabrication for biology
Templating design with biology

Templating algorithms from biology

Imaginary Beings

Mythologies of the Not Yet, 3D Printing – 2013, Centre Pompidou, Paris (FR)

In collaboration with Professor Craig Carter(Dept. of Materials Science and Engineering) and Stratasys



Inverse mapping between physiological tissue and synthetic skin: material and fabrication approach: physical approach to generating human-fit prototypes. Tissue composition data extracted from CT scan analysis informs geometrical and physical material properties in the design of a helmet.

Gemini Acoustic Chaise

Multi-Material 3D Printing & wood CNC milling – 2014, Le Laboratoire, Paris (FR)

In collaboration with Professor Craig Carter (Dept. of Materials Science and Engineering), MIT


Color, Stiffness and Opacity gradient

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Anthozoa: Cape & Skirt

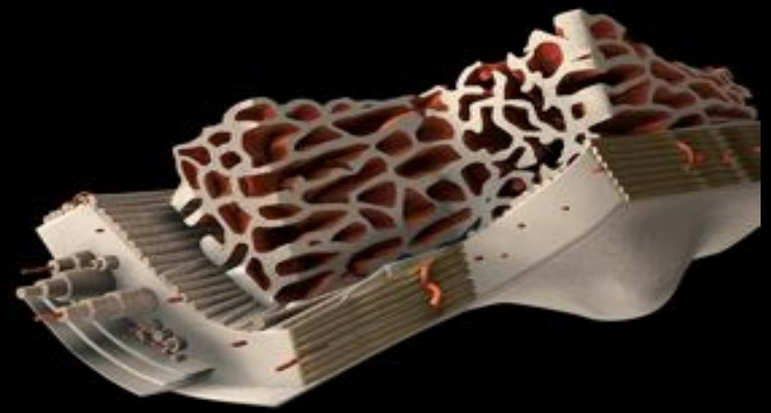
Objet Connex Multi-Material 3D Print, Voltage Fashion Show – 2013, Paris (FR)

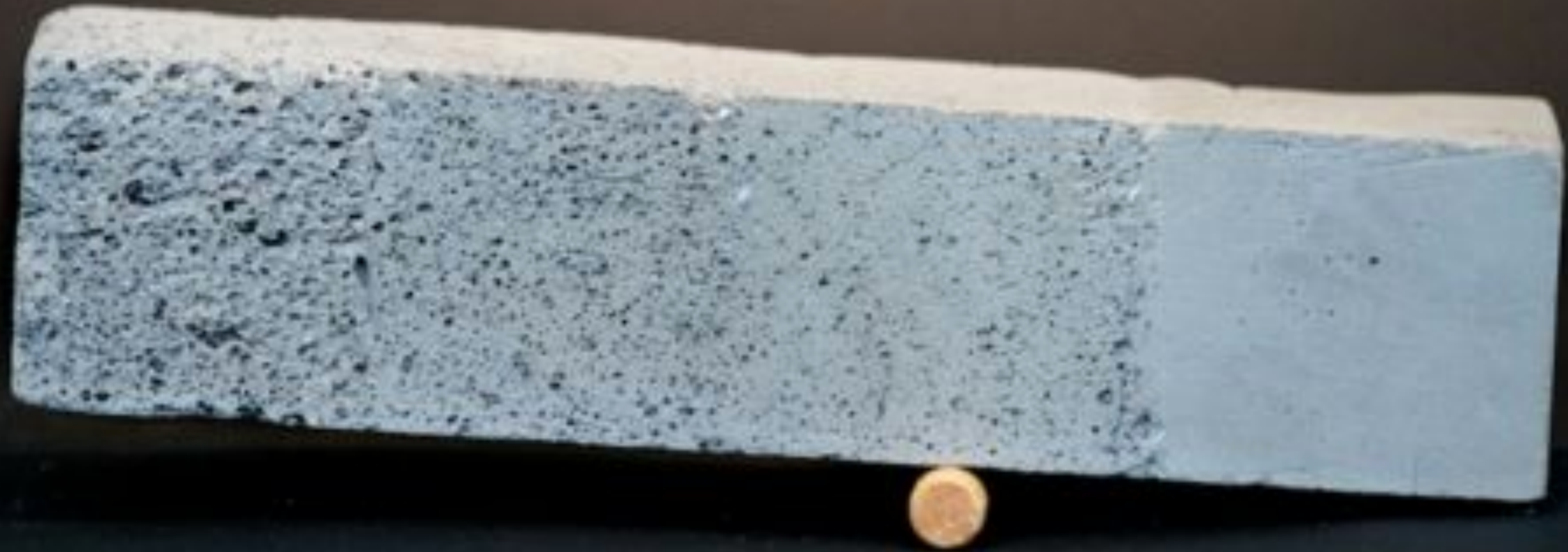
In collaboration with Iris Van Herpen and Stratasys

Functionally Graded Concrete

Density gradients in concrete – 2013, MIT

In collaboration with Timothy Cooke, Building Technology Program at MIT





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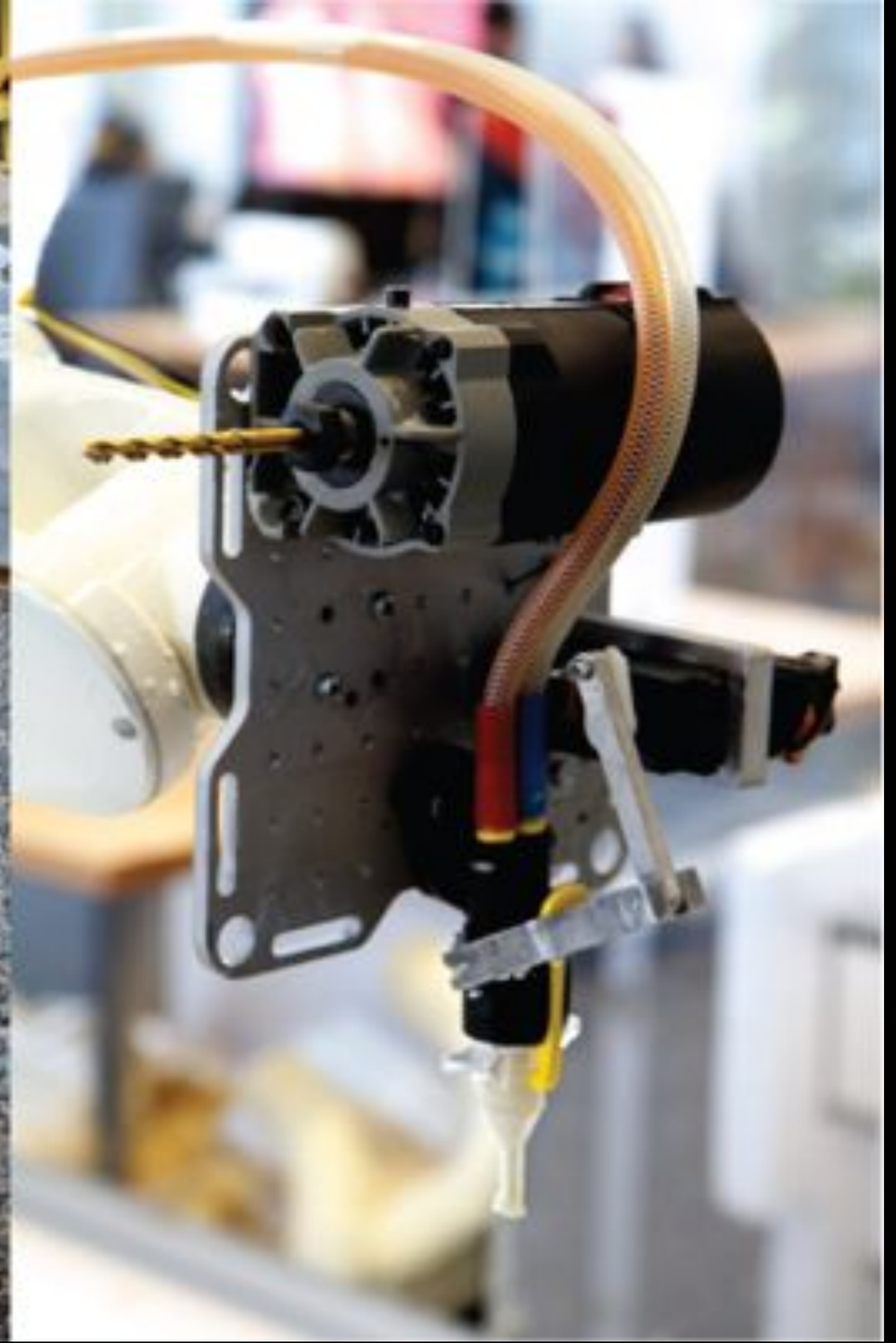
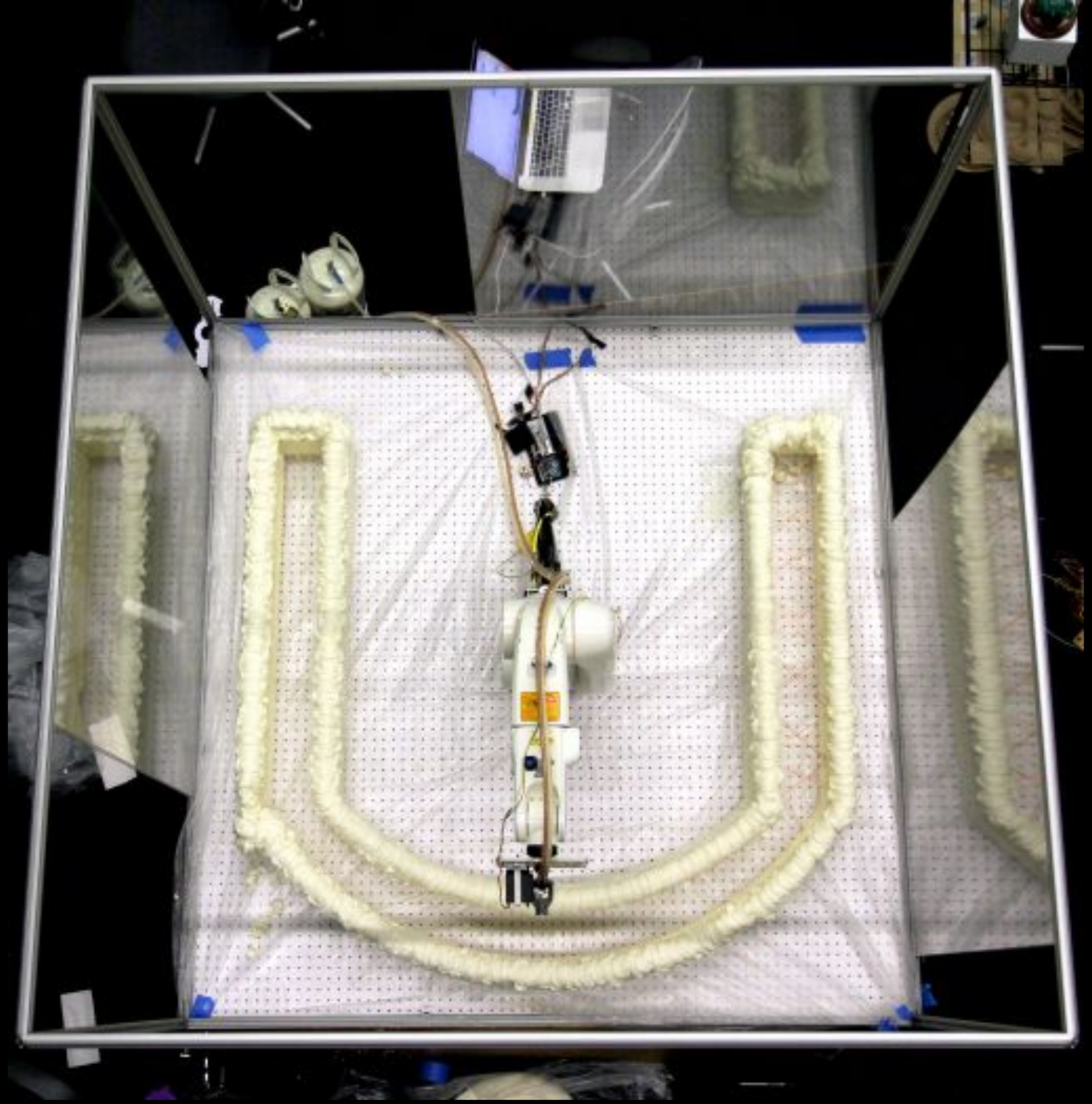
Digital Construction Platform

Compound Arm Construction – 2013

In collaboration with Nathan Spielberg, Altec, and BASF





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MEDIA

Templating fabrication for biology

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Silk Pavilion

CNC Deposited Silk & Silkworm Construction – 2013

Collaborators:
Fiorenzo Omenetto, TUFTS and
Dr. James Weaver, WYSS Institue, Harvard

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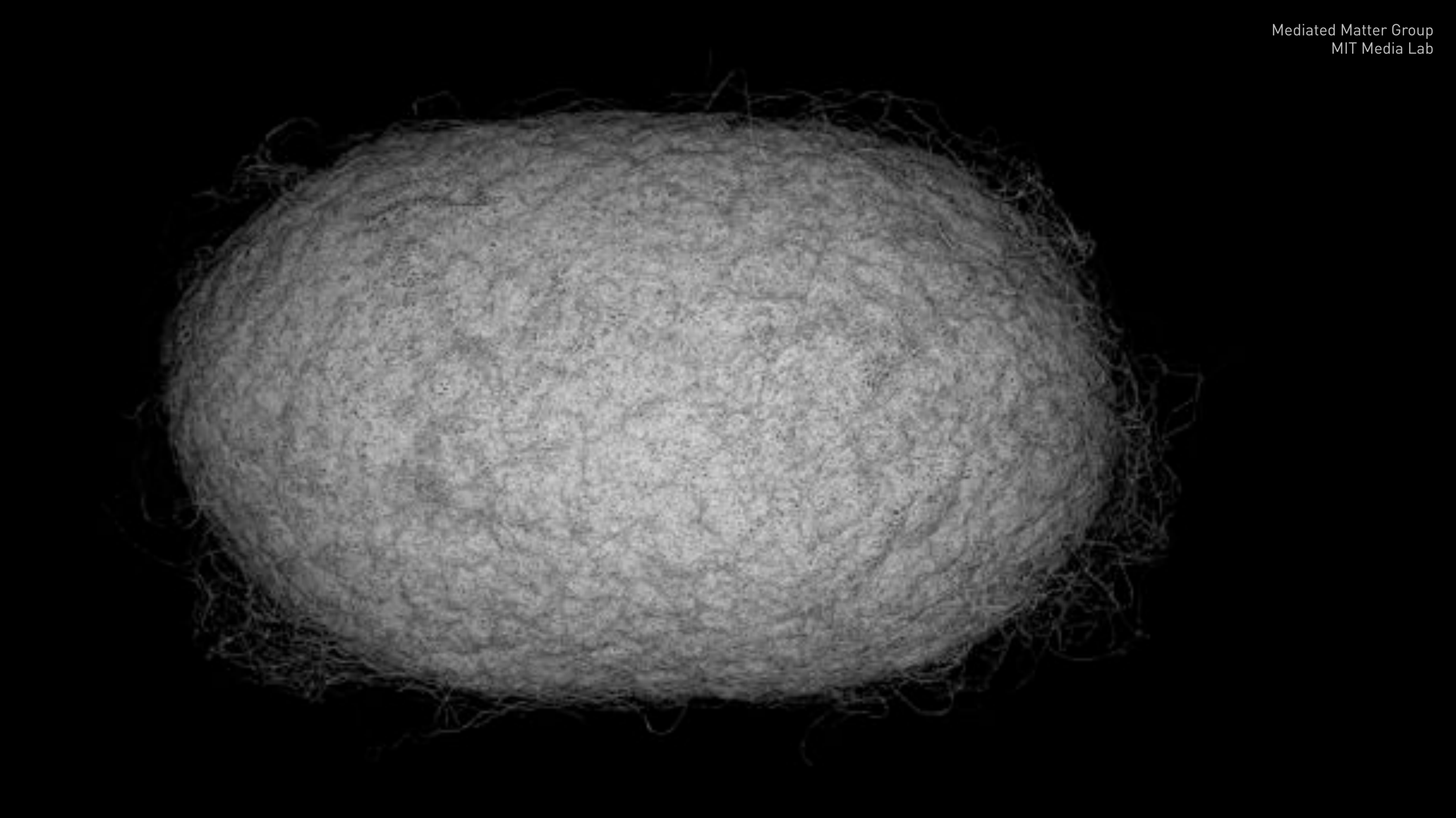

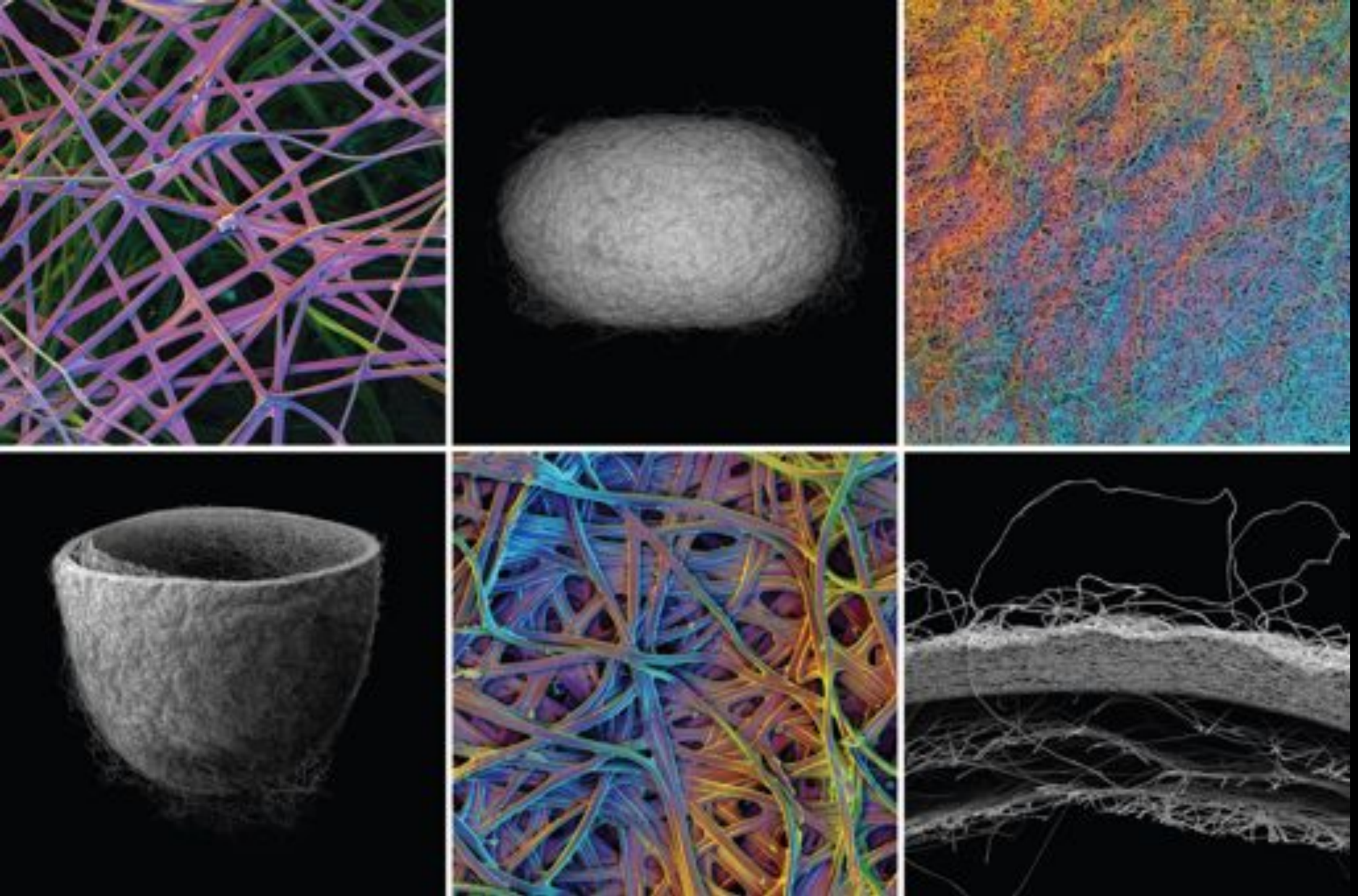

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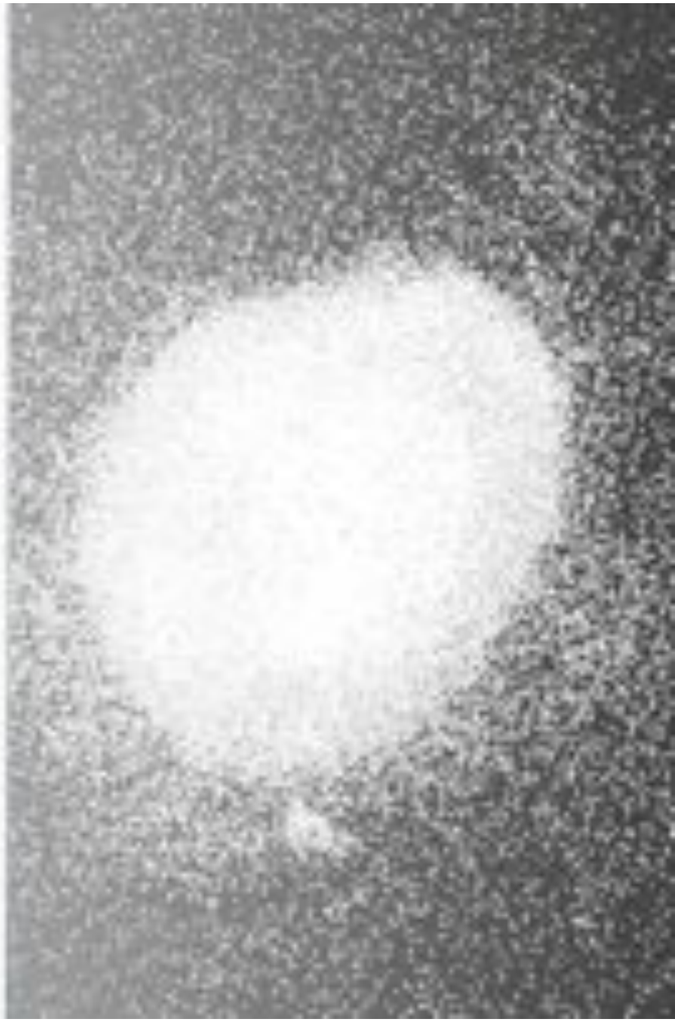
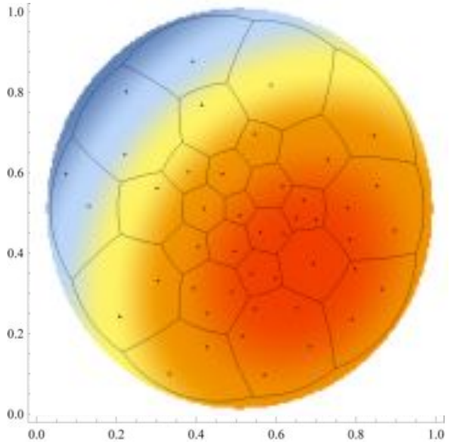
first explorations

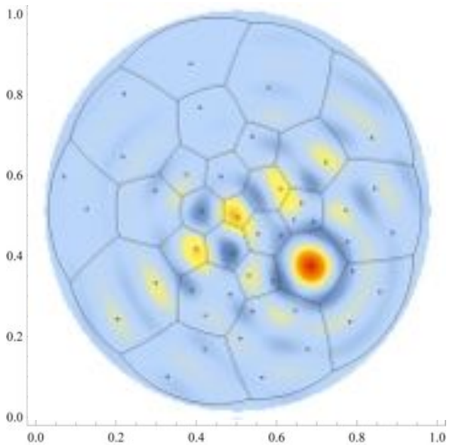
flat square platform 80mm x 80mm
spinning time: 2 days





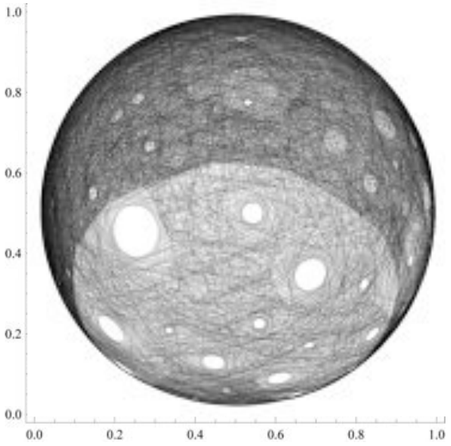
Natural phenomenon: reaction-diffusion

The mathematical space includes quantities of component A, component B and temperature

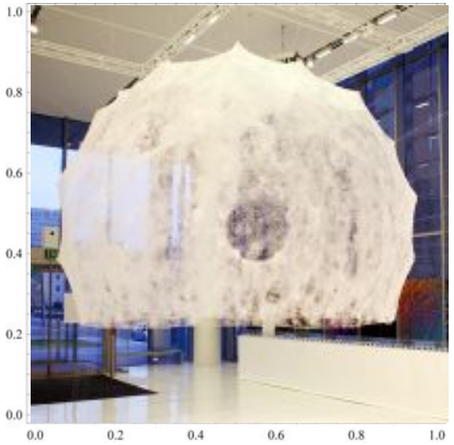


Boundary conditions (BC), initial conditions (IC), and convergence criteria (CC) determined by the object space

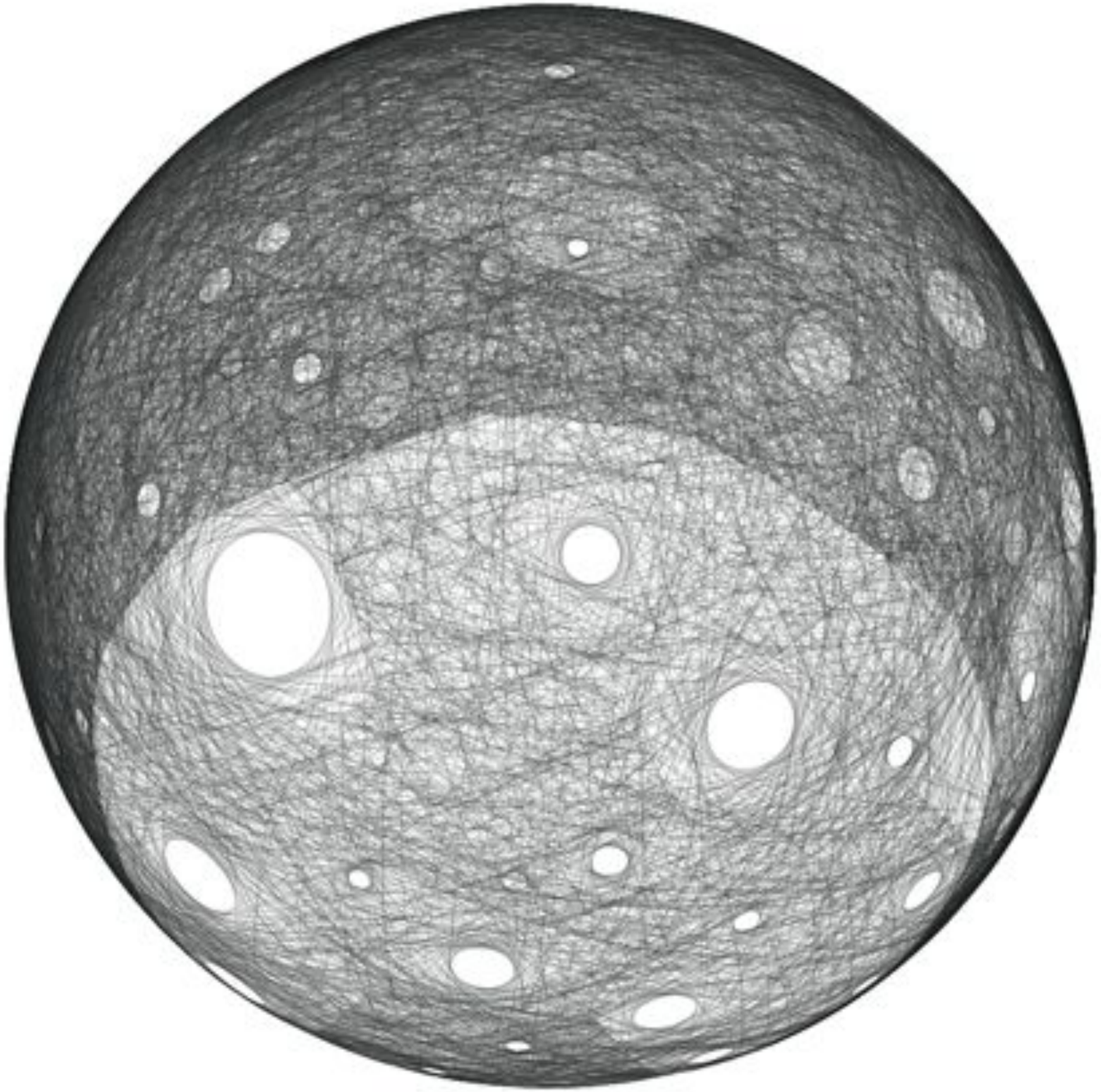
The design objective involves property gradients on different length-scales representing average quantities

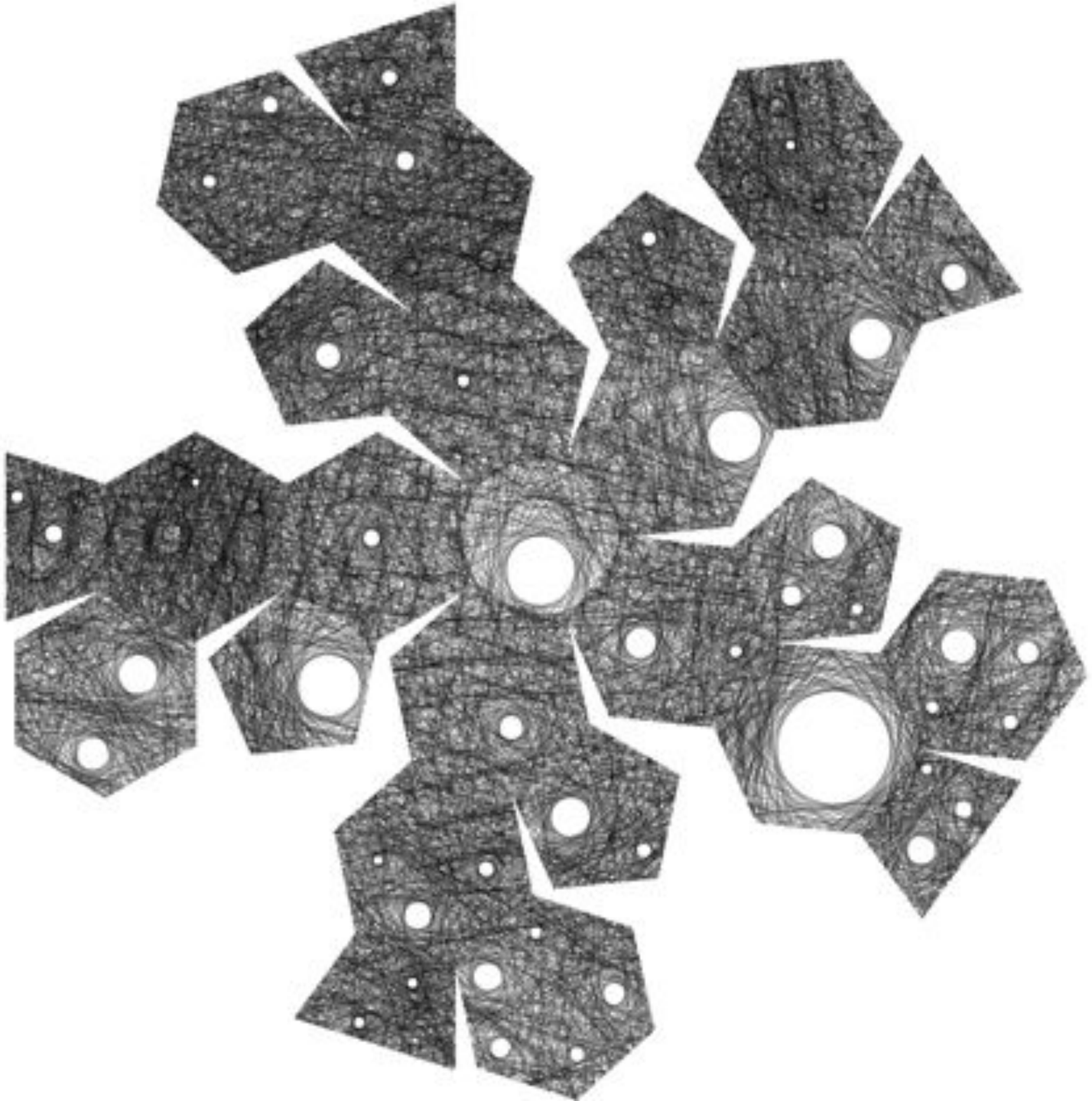


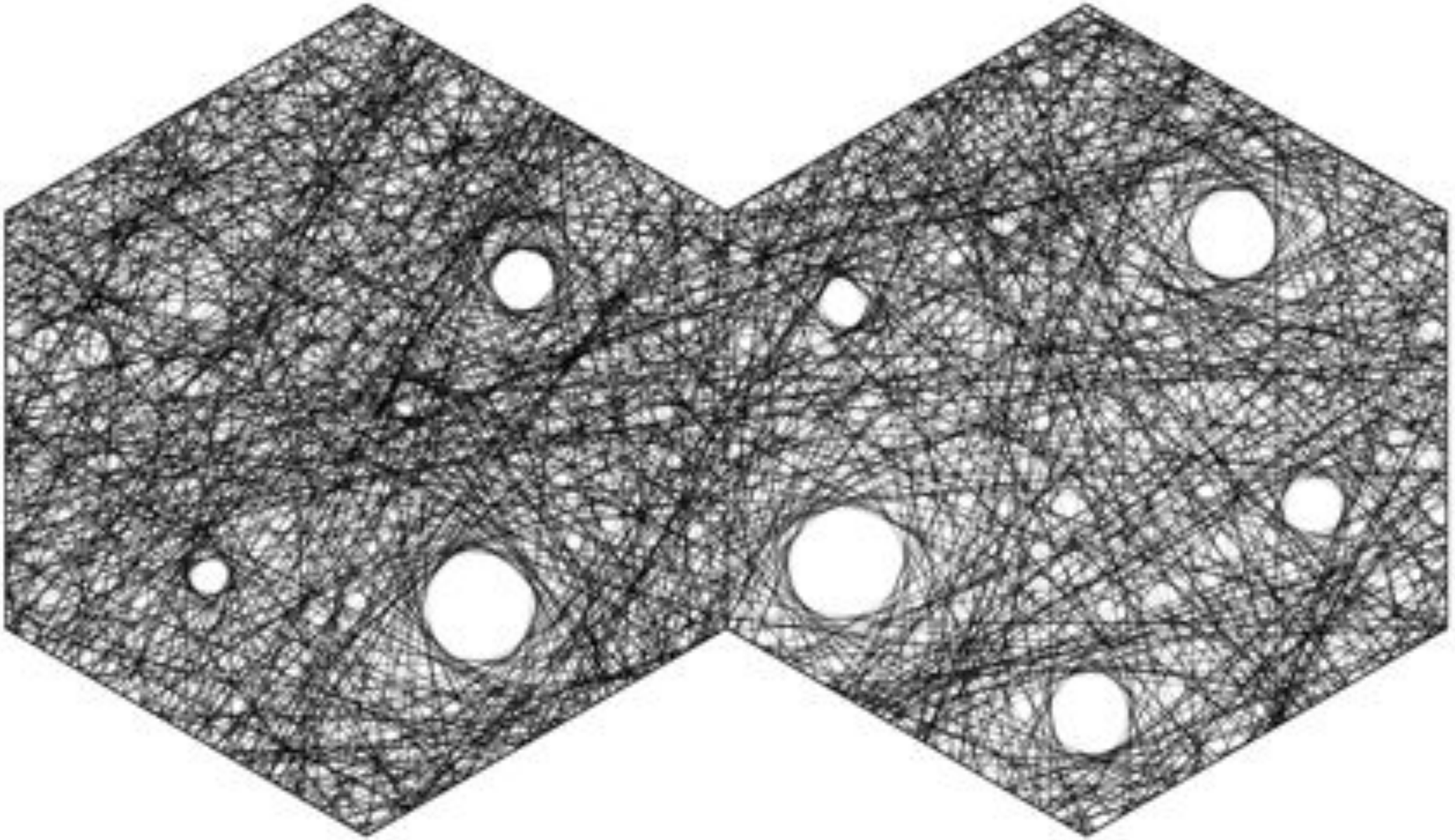
Projection of the physical phenomenon onto the object space as determined by the temporal evolution of the coupled differential equations subject to the IC, BC and CC.



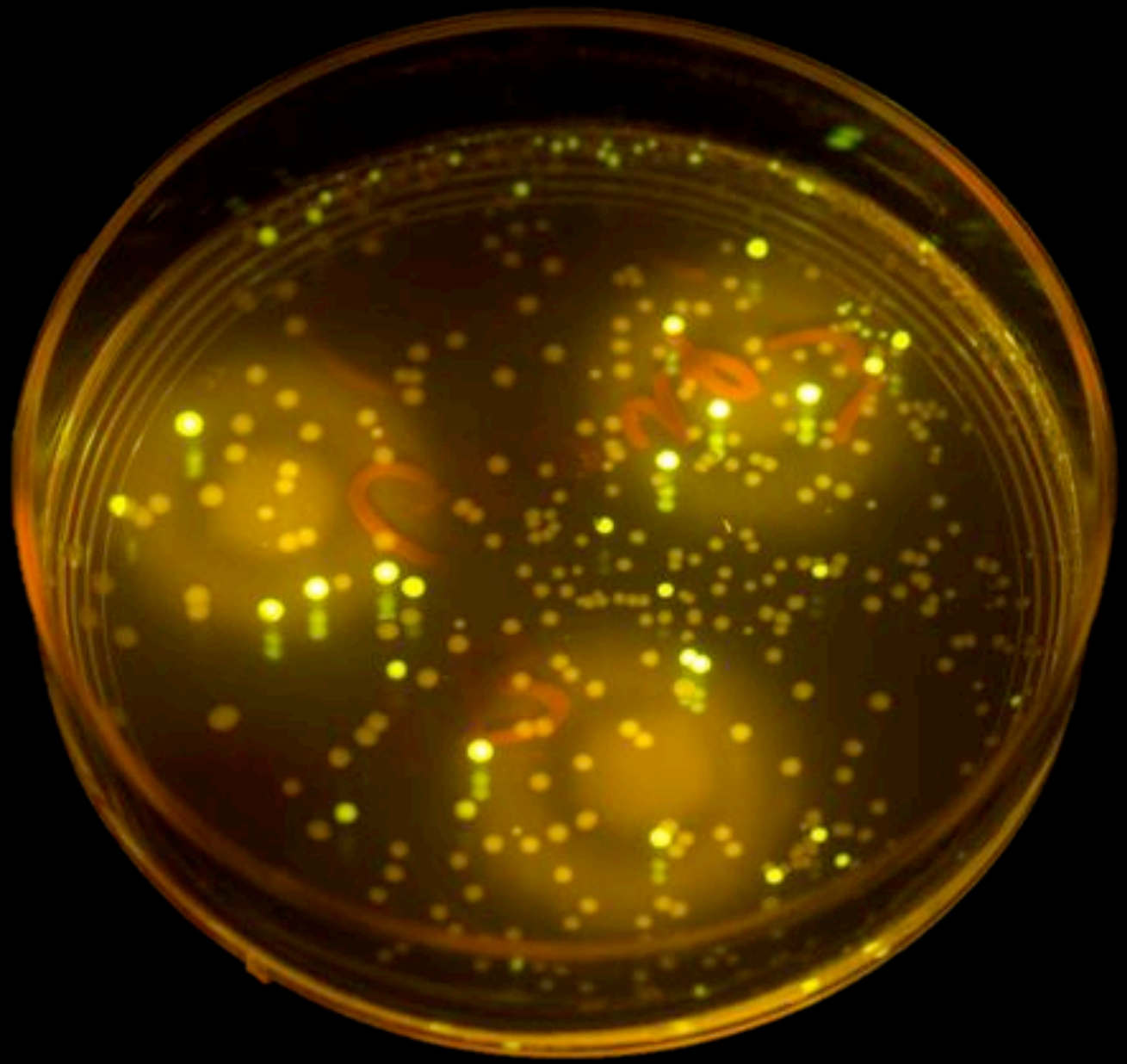
Target product/ environment which is a representation of the natural phenomenon and is designed to achieve a specific functional objective







Templating design with biology

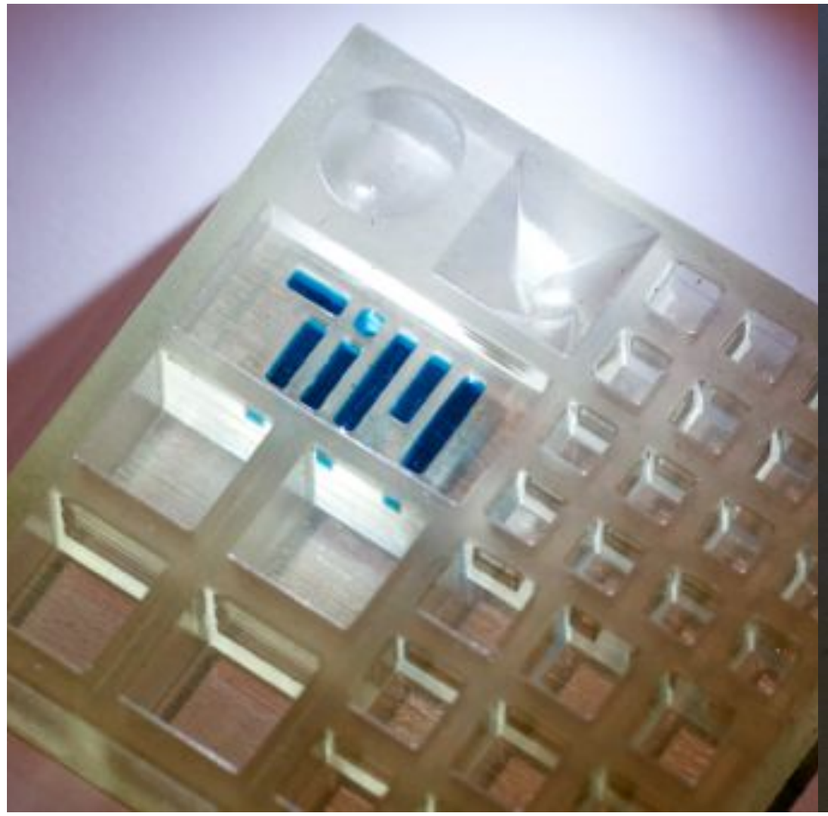


Printing living materials

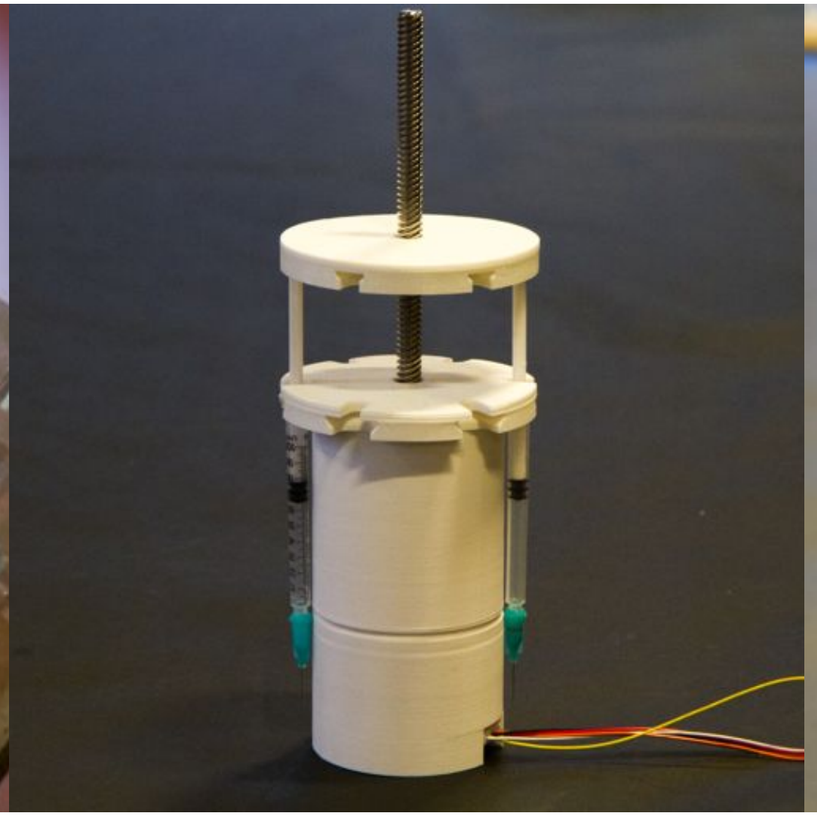
Additive 3D cell scaffolding of modified cell lines - 2014

In collaboration with Chamille Lescott and the labs of Dr. Timothy Lu, Dr. Chris Voigt, and Dr. Ron Weiss

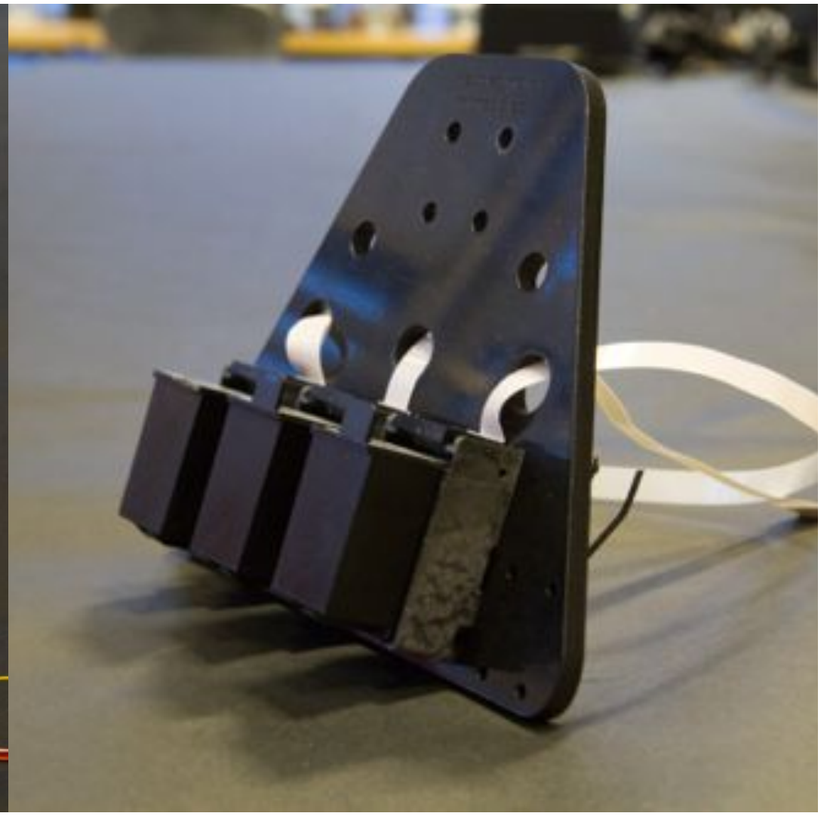
Tools for spatial templating modified E.coli



Printed molds for casting



Computer controlled extrusion

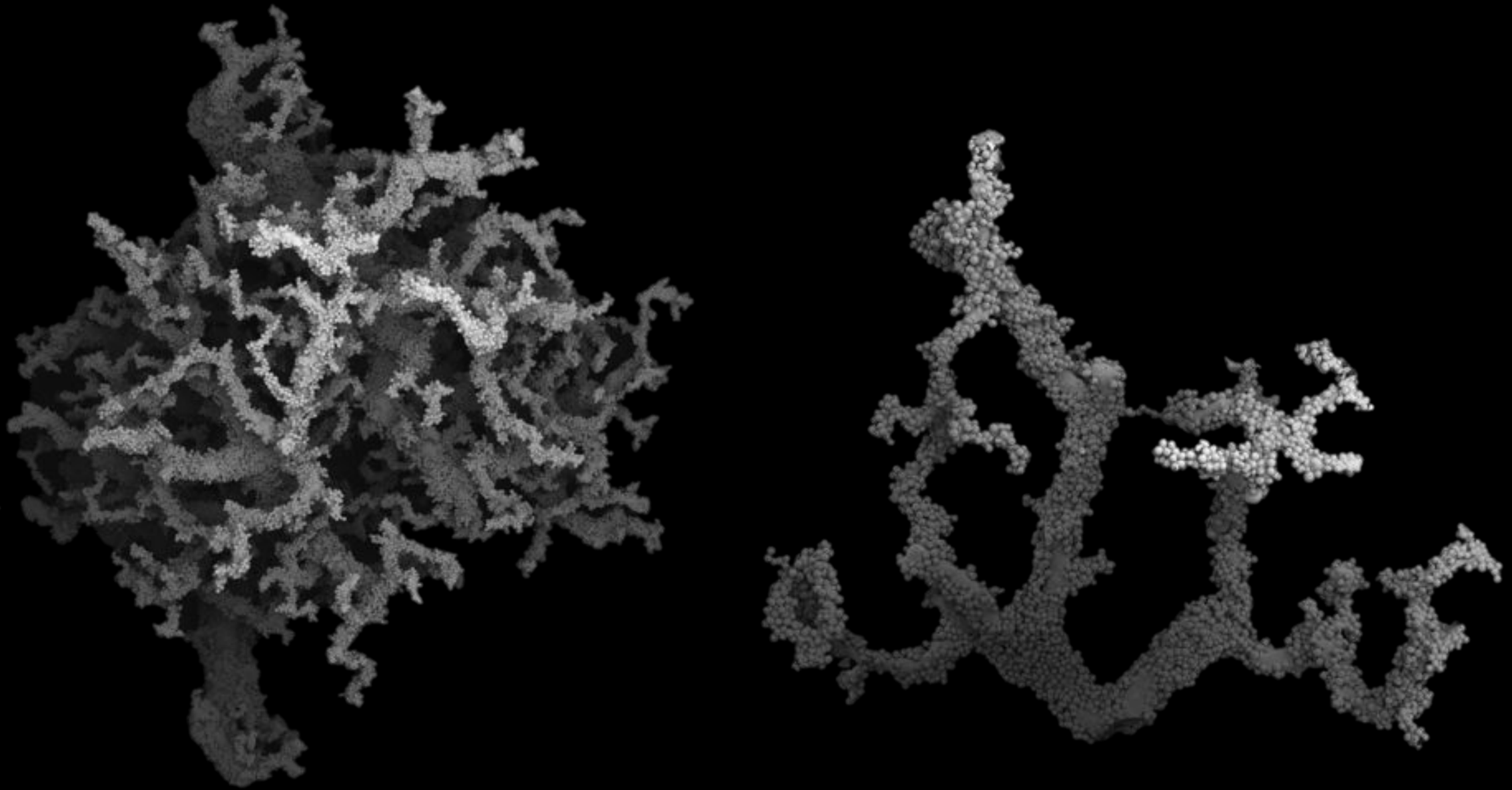


Multi-material inkjet head for the robotic arm

Multi-nozzle inkjet cell printer
April 2014

Ceramic Lichtenberg Sintering

Investigations into electrosintering for vascular networks - 2014

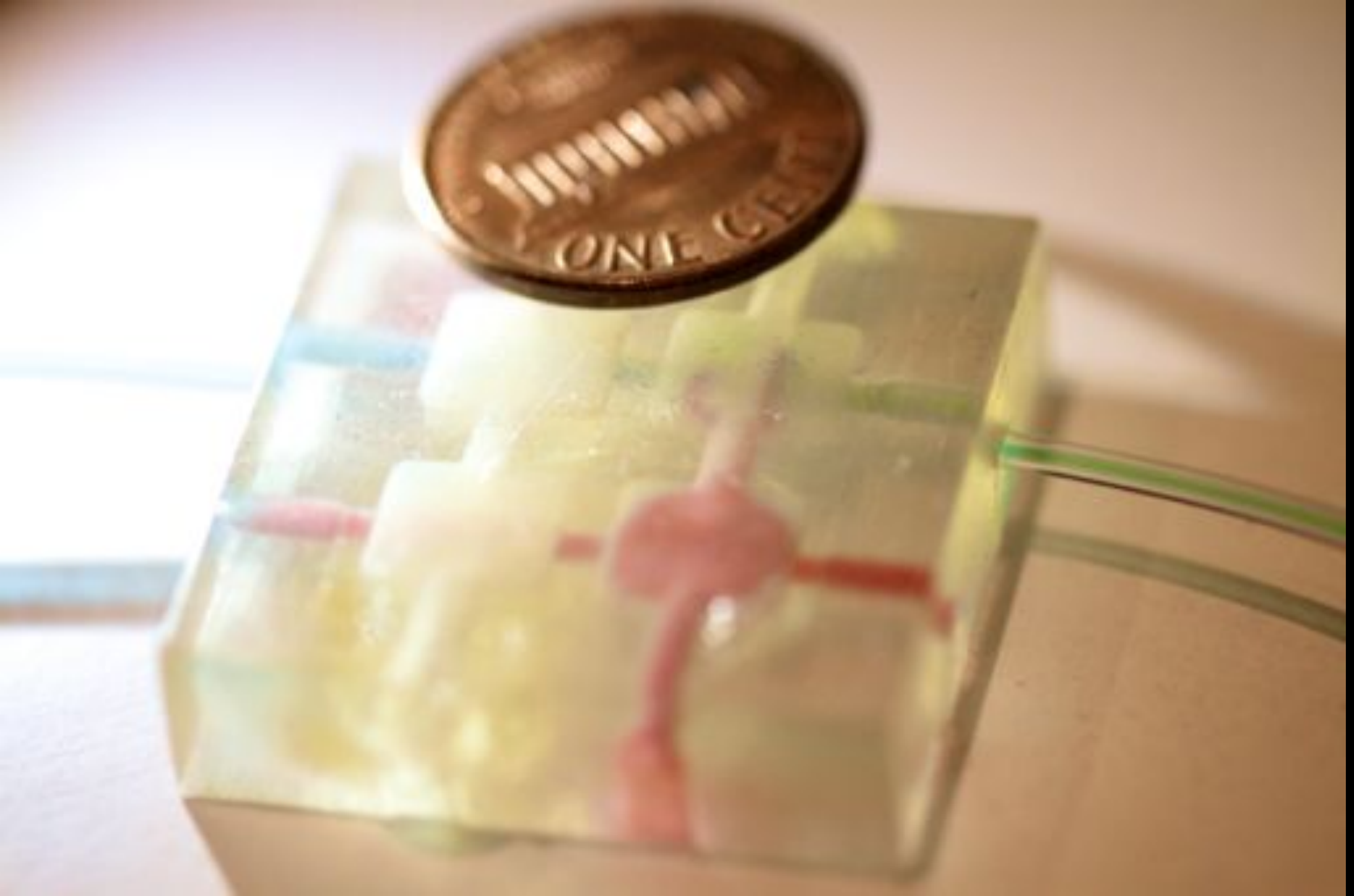


Electron microscopy images of 50 um bead diameter structures by Dr. James Weaver.

Multi-material Microfluidics

Devices and products – 2014

In collaboration with Isabella Gariboldi and Dr. David Sun Kong (MIT Lincoln Laboratory)



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Thank you.