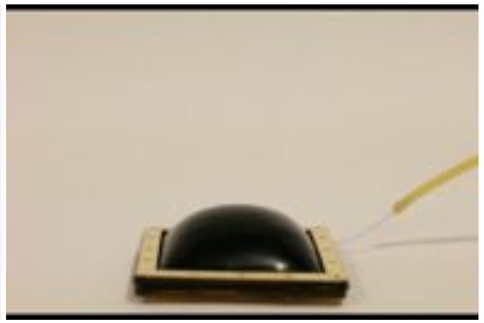
Lining Yao

PhD Candidate
Tangible Media Group, MIT Media Lab
2016-07-11

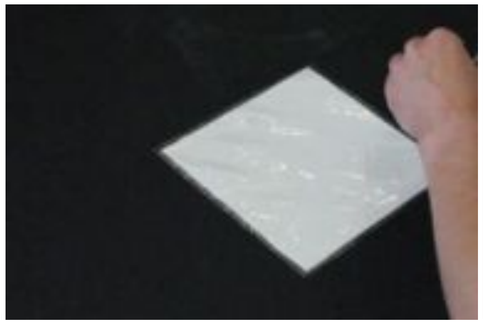
Transforming Materiality

Mechanical Properties

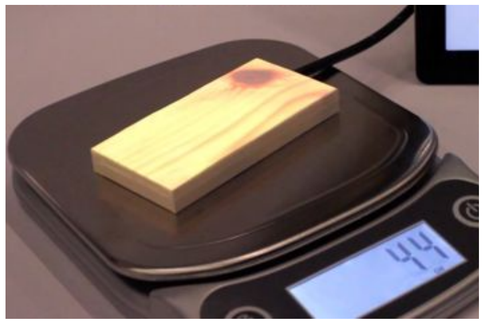
Elasticity | “PneUI"



Elasticity | “PneUI"

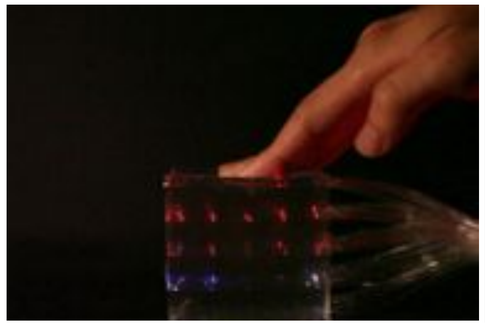


Stiffness | “jamSheets"



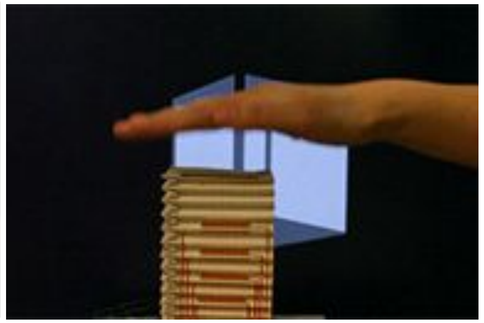
Density | “Weight UI"

Optical Properties

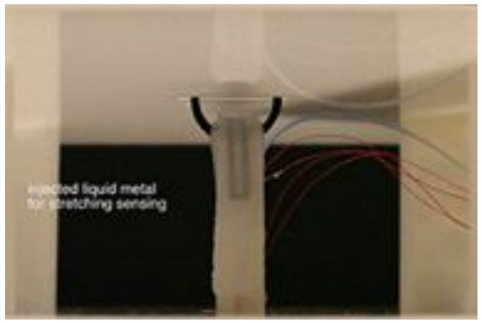


“optiElastic”

Electrical Properties



“PneUI”



“PneUI”

BioLogical Properties

“bioLogic”

Yao, L., Niiyama, R., Ou, J., Ishii, H. *Proc. of UIST ’13*

Yao, L., Ou, J., Cheng, C.Y., Steiner, H., Wang, W., Wang, G., Ishii, H. *Proc. of CHI ’15*

Yao, L., Ou, J., Tauber, D., Ishii, H. *Proc. of UIST ’14 Adjunct*

Ou., J., **Yao, L.**, Tauber, D., Steimle, J., Niiyama, R., Ishii, H. *Proc. of TEI ‘14*

Niiyama, R., **Yao, L.,** Ishii, H. *Proc. of UIST ’14 Adjunct*

Functional Aims

“jamSheets"

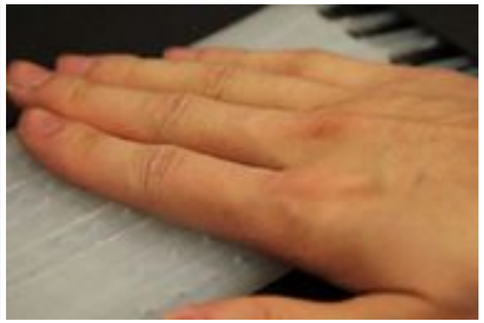
“PneUI"

“jamSheets"

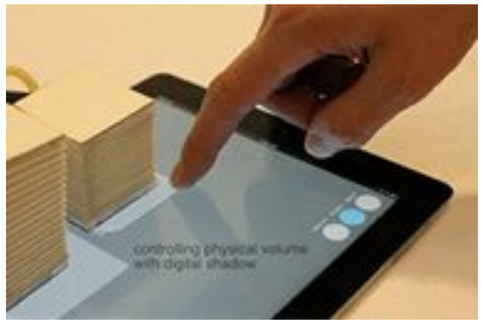
“jamSheets"

“jamSheets"

“bioLogic"



“PneUI"



“PneUI"

Emotional Experiences

“bioLogic"

“bioLogic"

“PneUI"

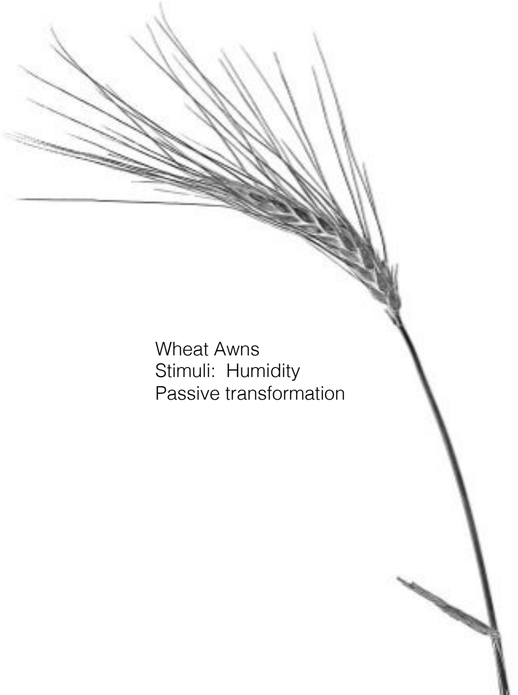
“bioLogic"

Yao, L., Niiyama, R., Ou, J., Ishii, H. *Proc. of UIST 2013*

Yao, L., Ou, J., Cheng, C.Y., Steiner, H., Wang, W., Wang, G., Ishii, H. *Proc. of CHI 2015*

Ou., J., **Yao, L.**, Tauber, D., Steimle, J., Niiyama, R., Ishii, H. *Proc. of TEI 2014*

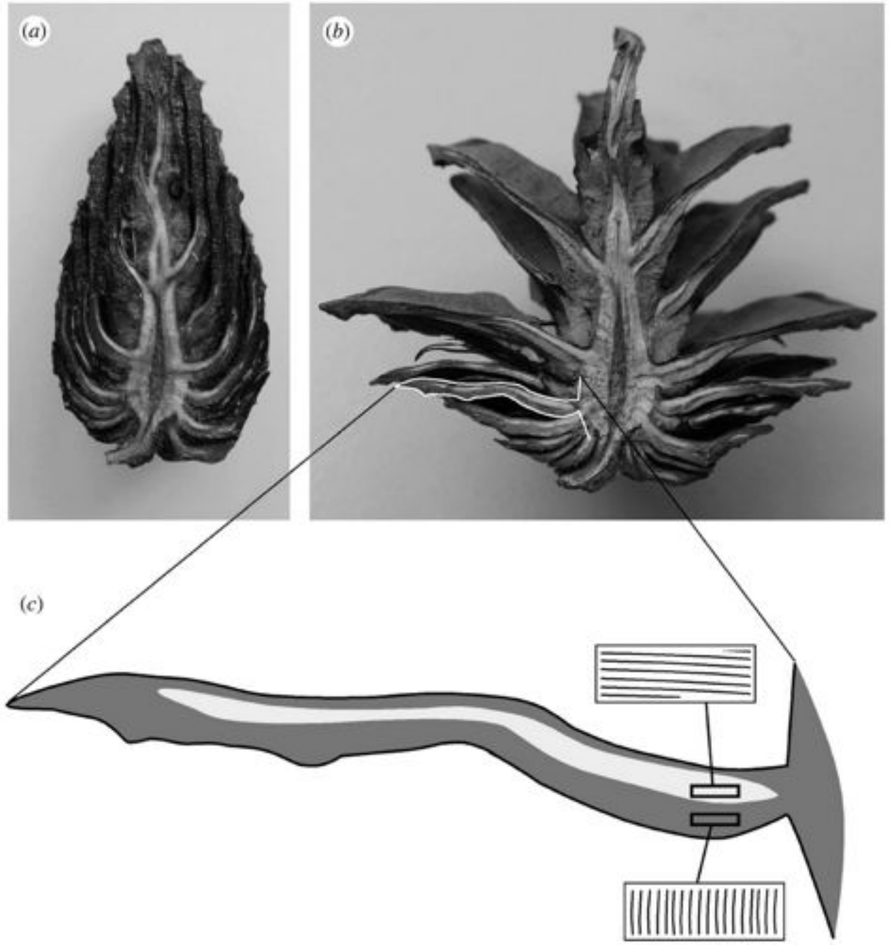
Mimosa
Active Transformation

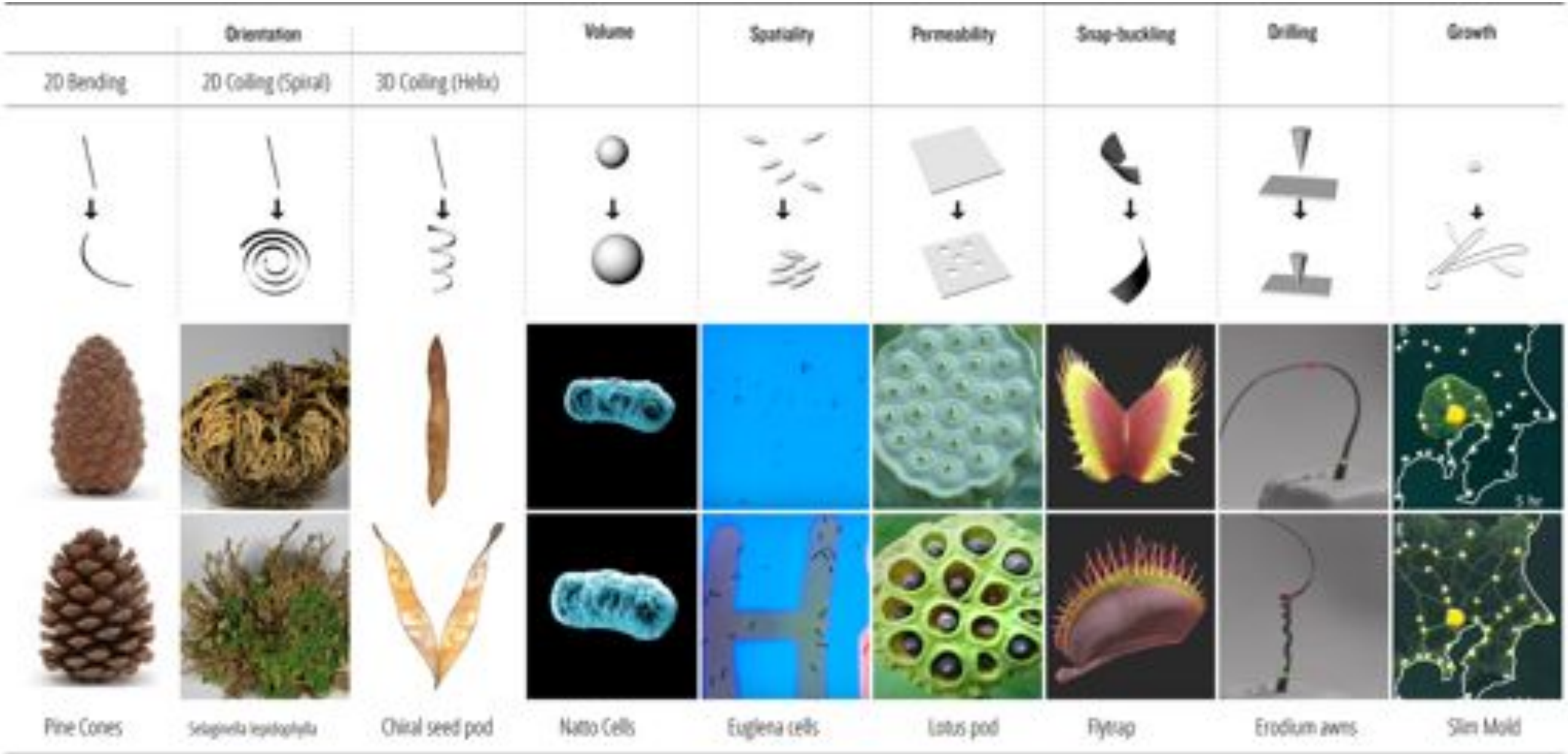


Wheat Awns
Stimuli: Humidity
Passive transformation

Venus flytrap leaf
Stimuli: active transformation

Sunflowers
Stimuli: Light
Active transformation


(a)
(b)
(c)

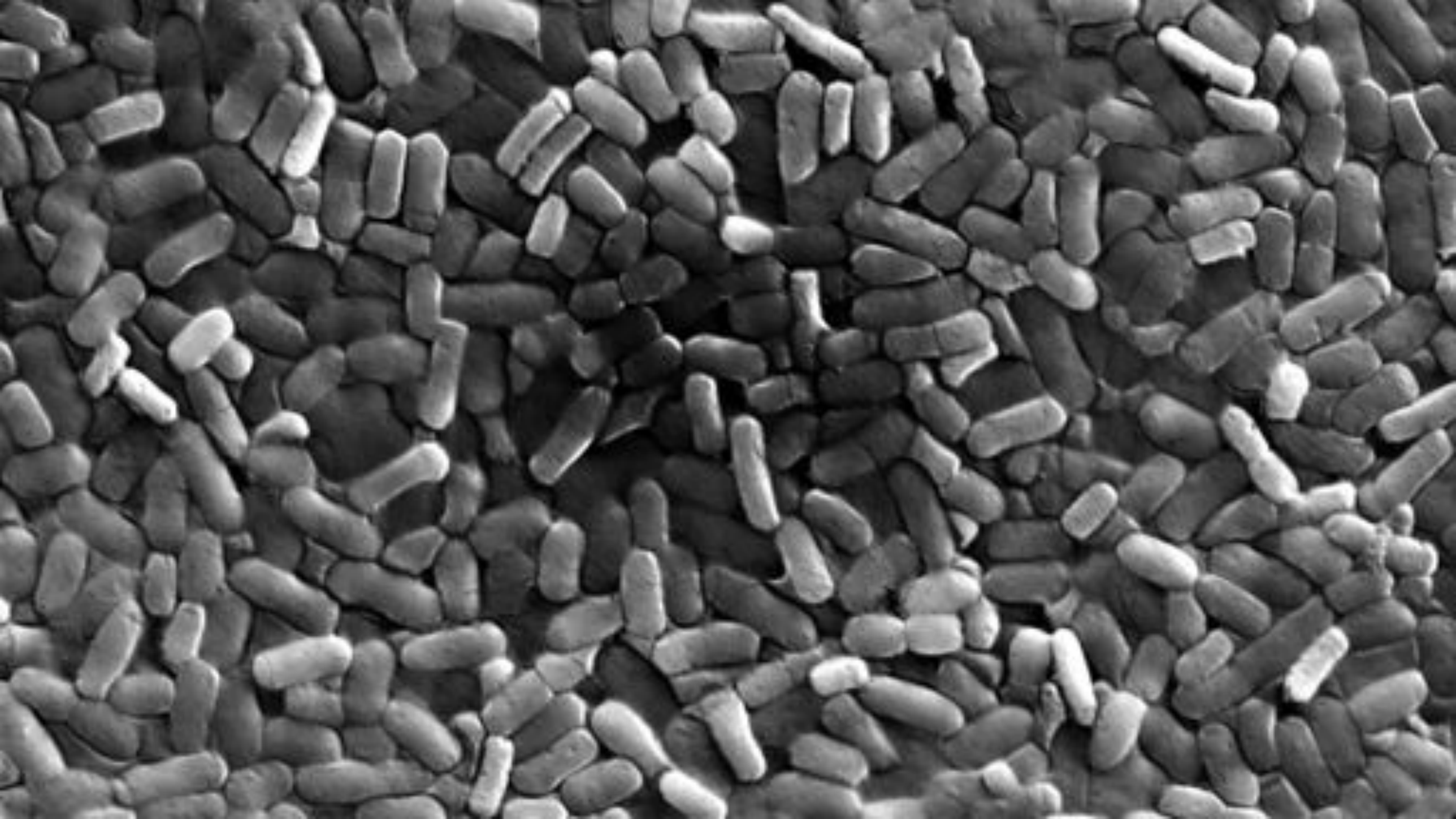

Orientation
Volume
Spatiality
Permeability
Snap-buckling
Drilling
Growth
2D Bending
2D Coiling (Spiral)
3D Coiling (Helix)
Pine Cones
Selaginella lepidophylla
Chiral seed pod
Natto Cells
Euglena cells
Lotus pod
Flytrap
Erodium awns
Slim Mold

BioLogic

MIT Media Lab in Collaboration with MIT Department of Chemistry Engineering, Royal College of Art and *Bacillus Subtilis* Natto cells

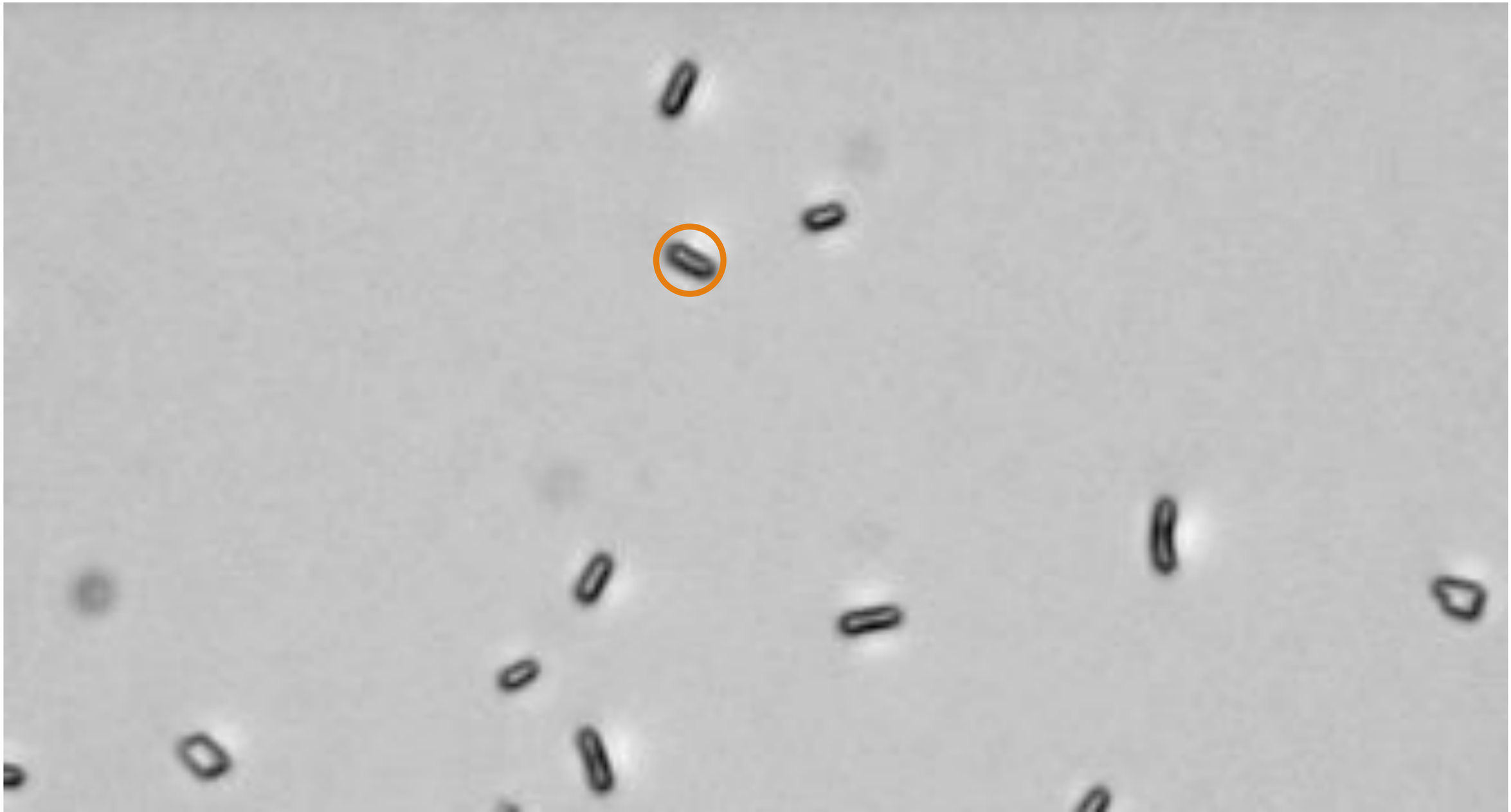
Lining Yao, Wen Wang, Guanyun Wang, Helene Steiner, Chin-Yi Cheng, Jifei Ou,Oksana Aniliote, Hiroshi Ishii


Bacillus Subtilis Natto



Hygromorphic nanosensor and nanoactuator;
Ancient bacteria, new application

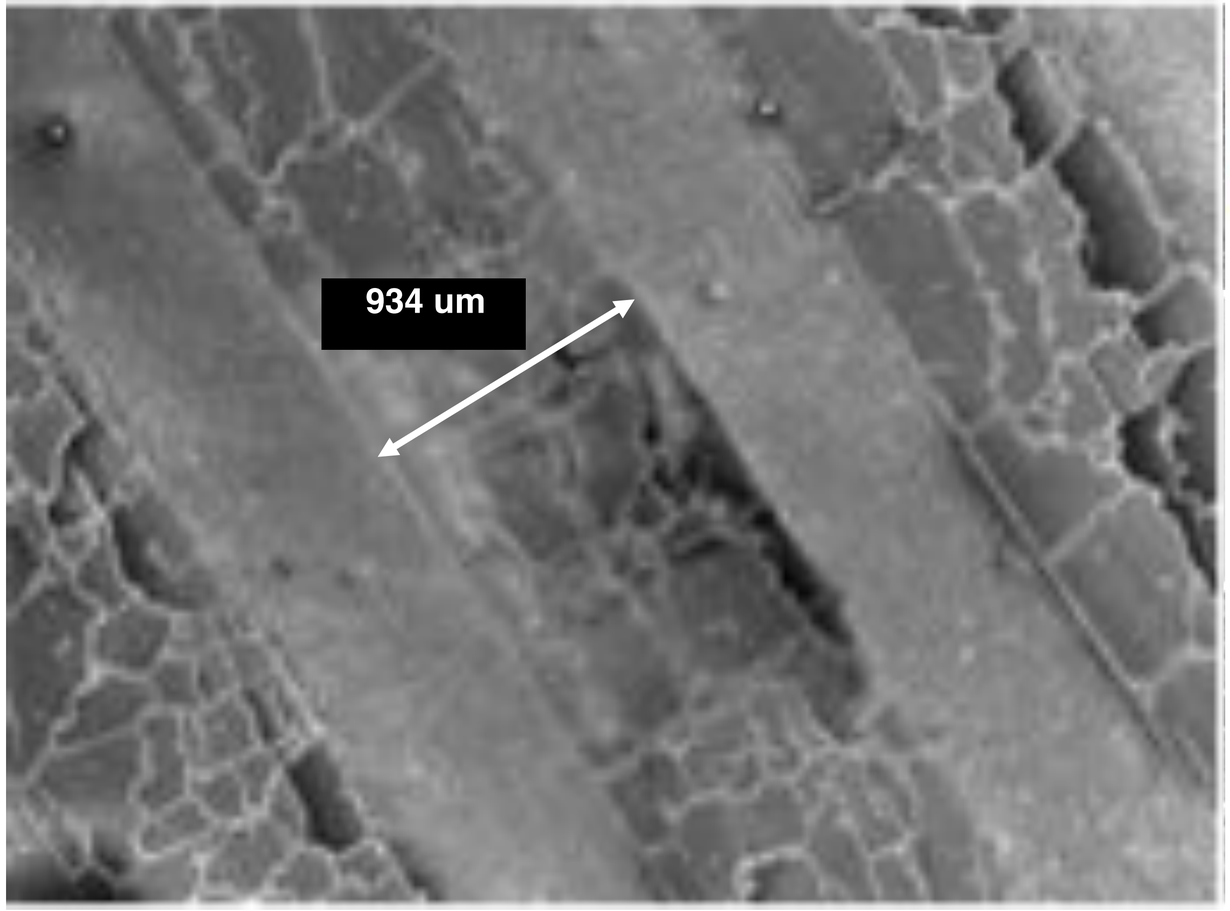
Study at the Cellular Level

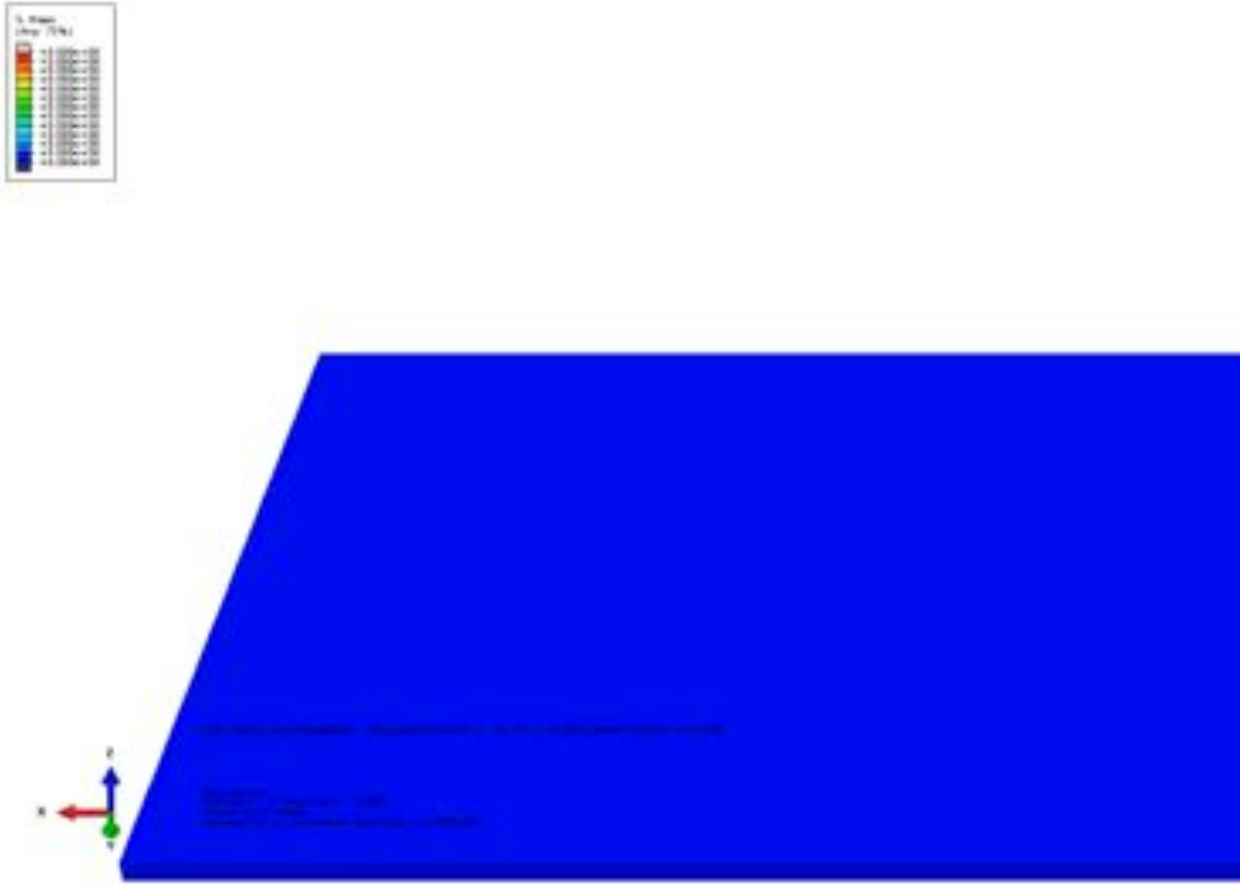


Cheng, C; Yao, L


3D
3D Printing and Additive Manufacturing
Vol. 2. Nº 3 — 2015
bioPrint: An Open Liquid Deposition Printer for Living Cell Actuators
P
+
Mary Ann Liebert, Inc. publishers
www.liebertpub.com/3dp

SEM Imaging of the Printed Film





Sample 1: Cell printing path

Sample 1 (RH = 100)

Sample 1 (RH = 0)

Sample 2: Cell printing path

Sample 2 (RH = 100)

Sample 2 (RH = 0)

Sample 3: Cell printing path

Sample 3 (RH = 100)

Sample 3 (RH = 0)

Sample 4: Cell printing path

Sample 4 (RH = 100)

Sample 4 (RH = 0)

Sample 5: Cell printing path

Sample 5 (RH = 100)

Sample 5 (RH = 0)

Sample 6: Cell printing path

Sample 6 (RH = 100)

Sample 6 (RH = 0)

Sample 7: Cell printing path

Sample 7 (RH = 100)

Sample 7 (RH = 0)

Sample 8: Cell printing path

Sample 8 (RH = 100)

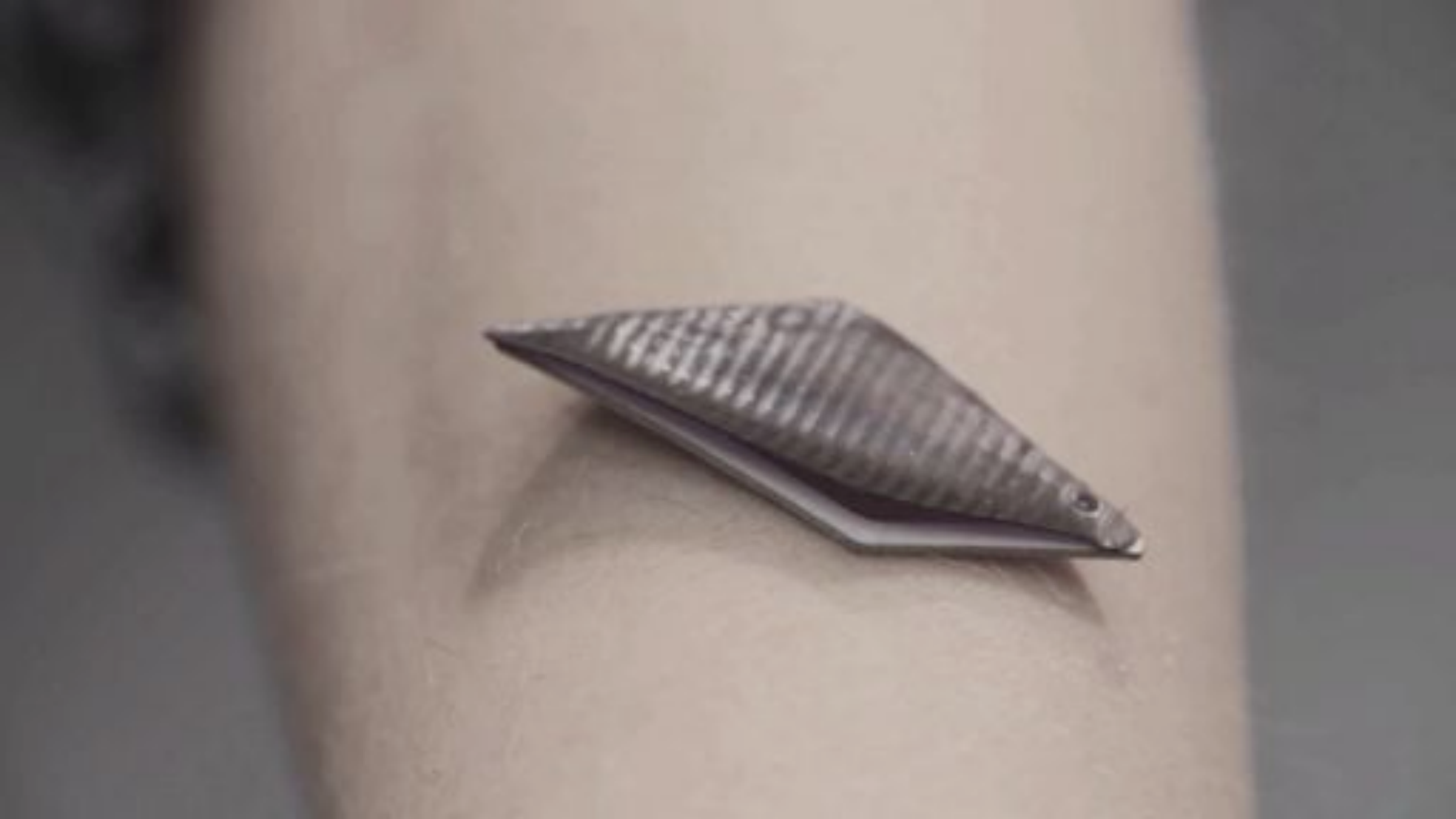
Sample 8 (RH = 0)

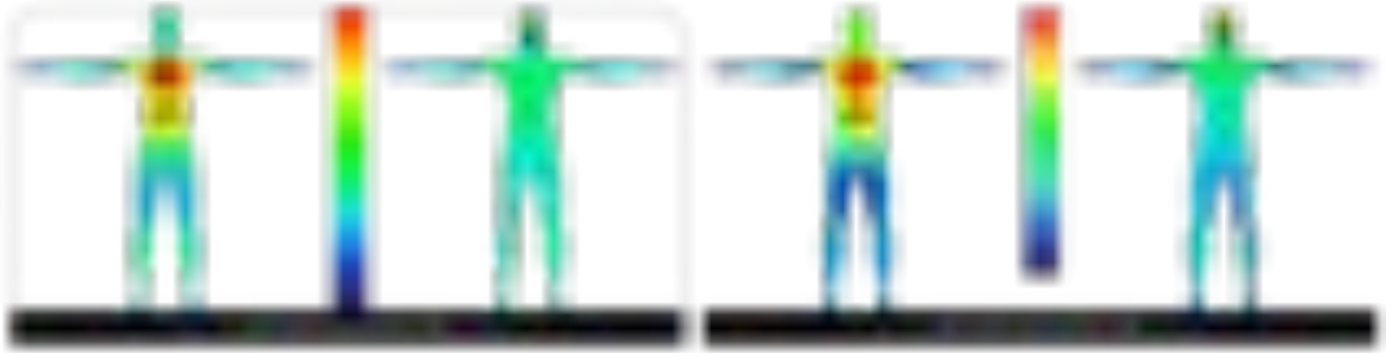


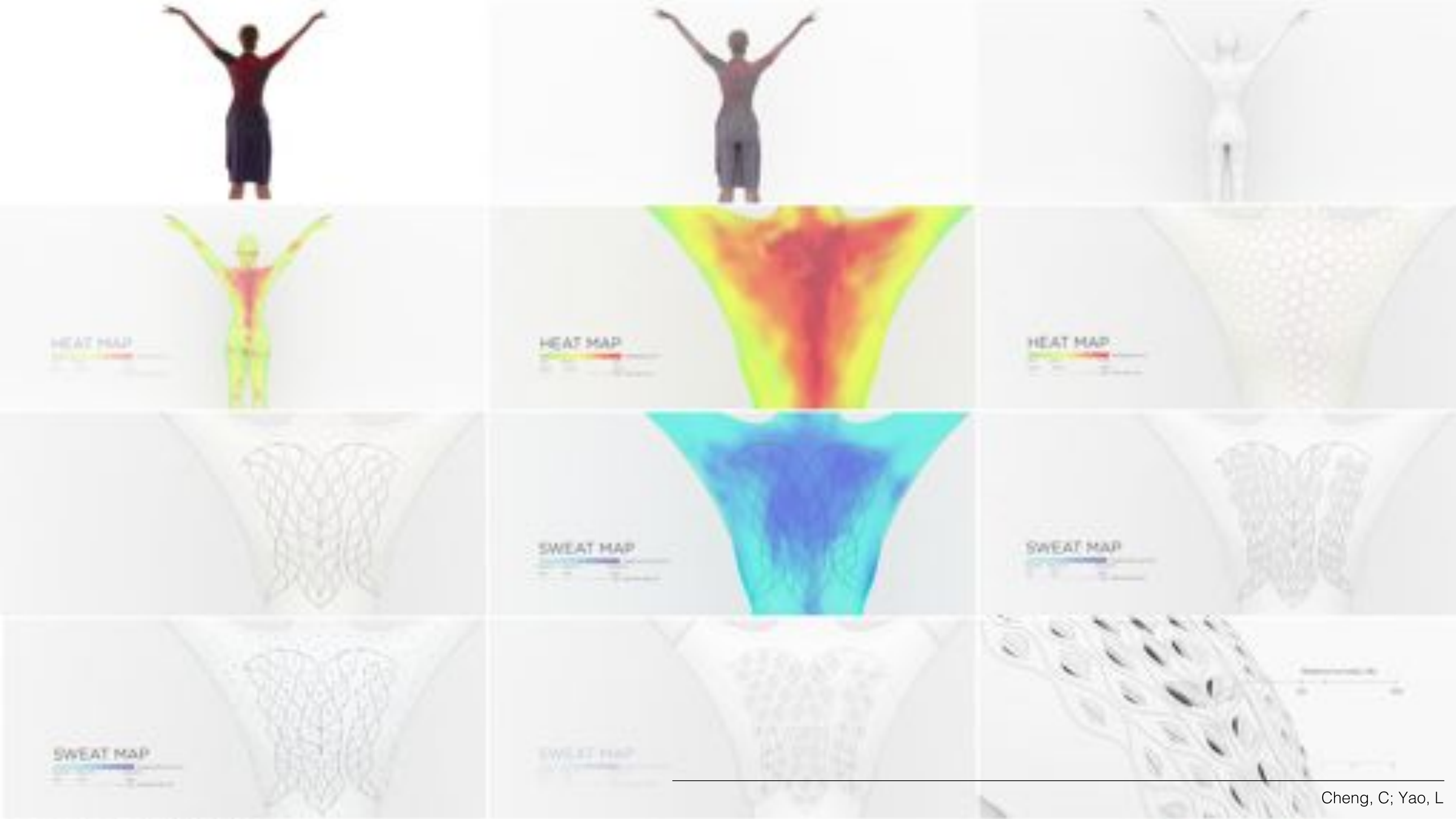






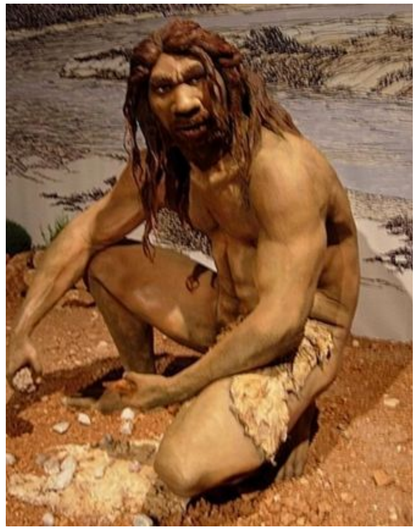






Cheng, C; Yao, L

Material



The Born

The Made

Evolution of material

Evolution of manufacturing

The Born **The Made**