

3D - Printing for Tissue Engineering

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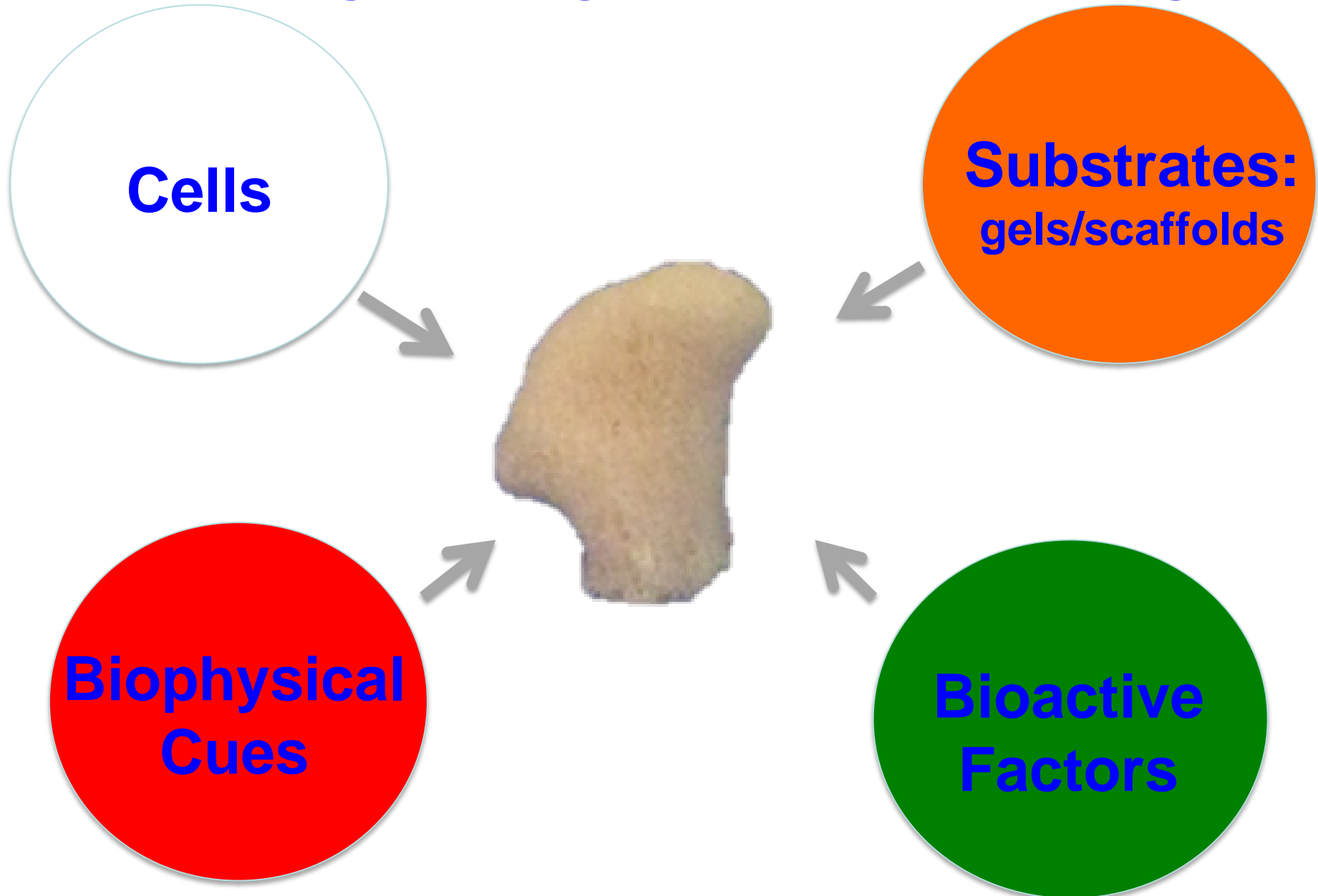
Department of Materials Science & Engineering

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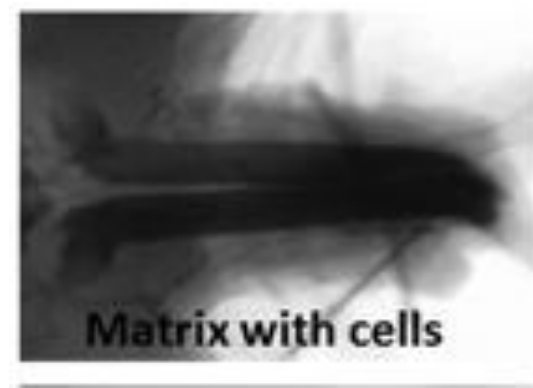
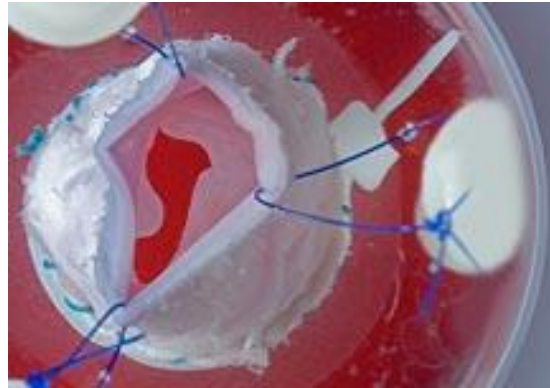


Grayson Lab
FOR CRANIOFACIAL & ORTHOPAEDIC TISSUE ENGINEERING

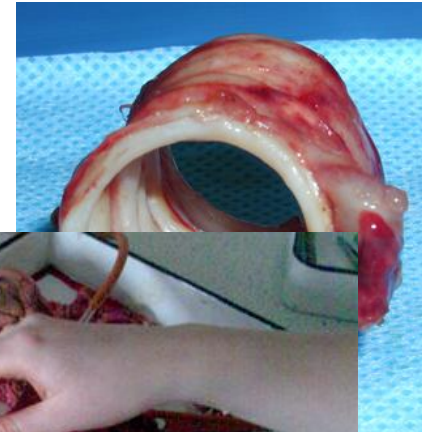
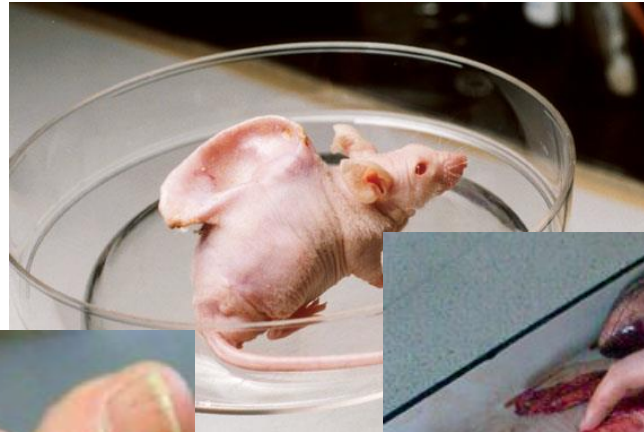
Tissue Engineering: Biomimetic Paradigm



Highlights of the last two decades



Anthony Atala – bladder, heart valve...



Doris Taylor - heart

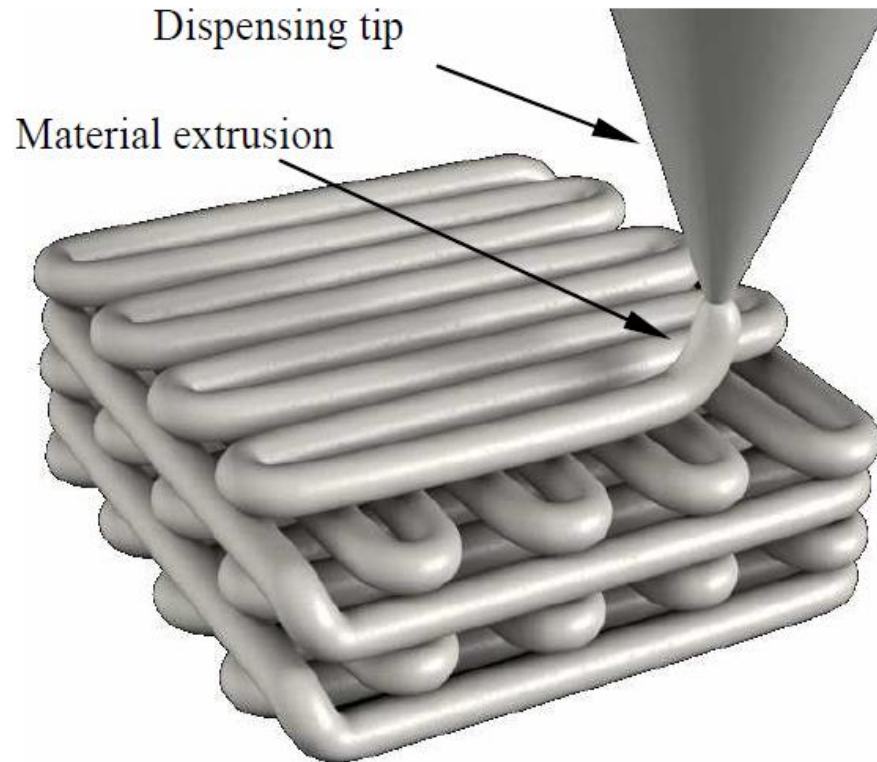


Charles Vacanti



Laura Niklason - lungs

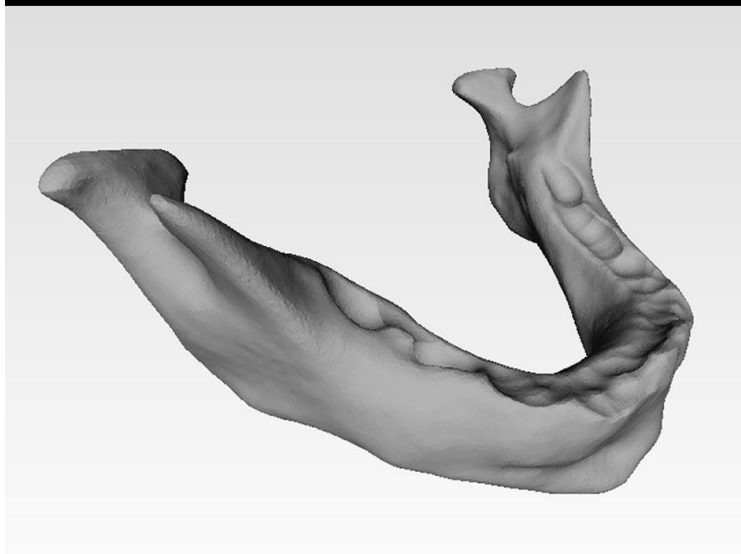
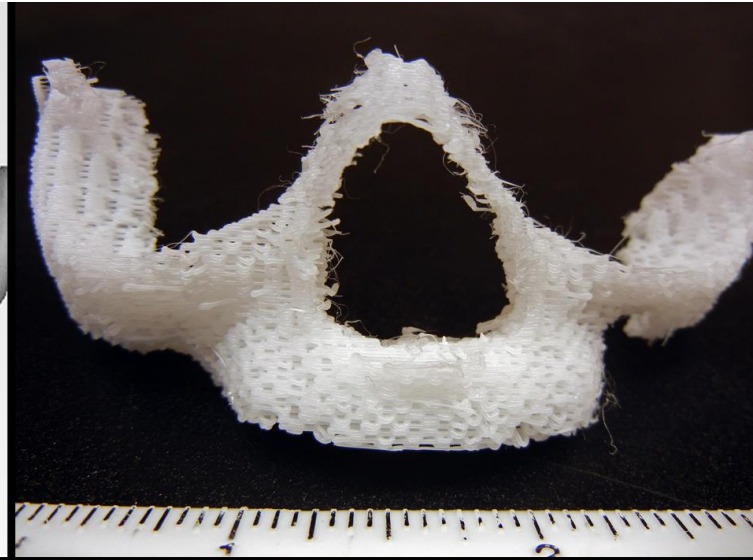
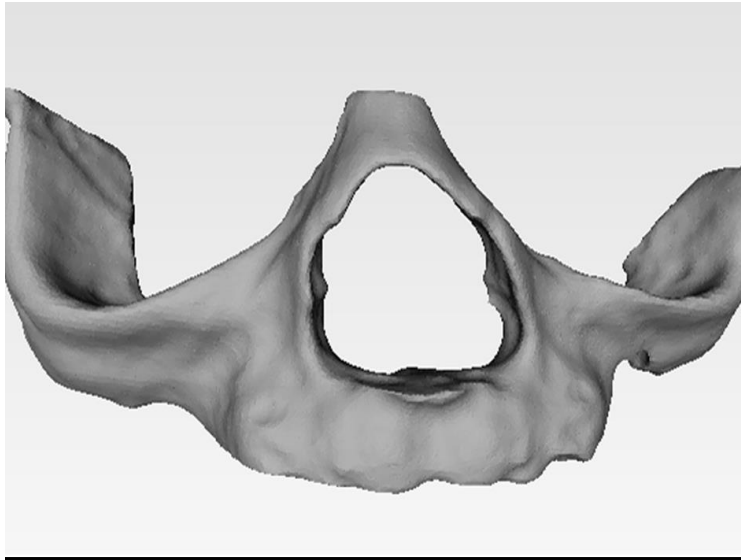
Stephen Badylak - finger



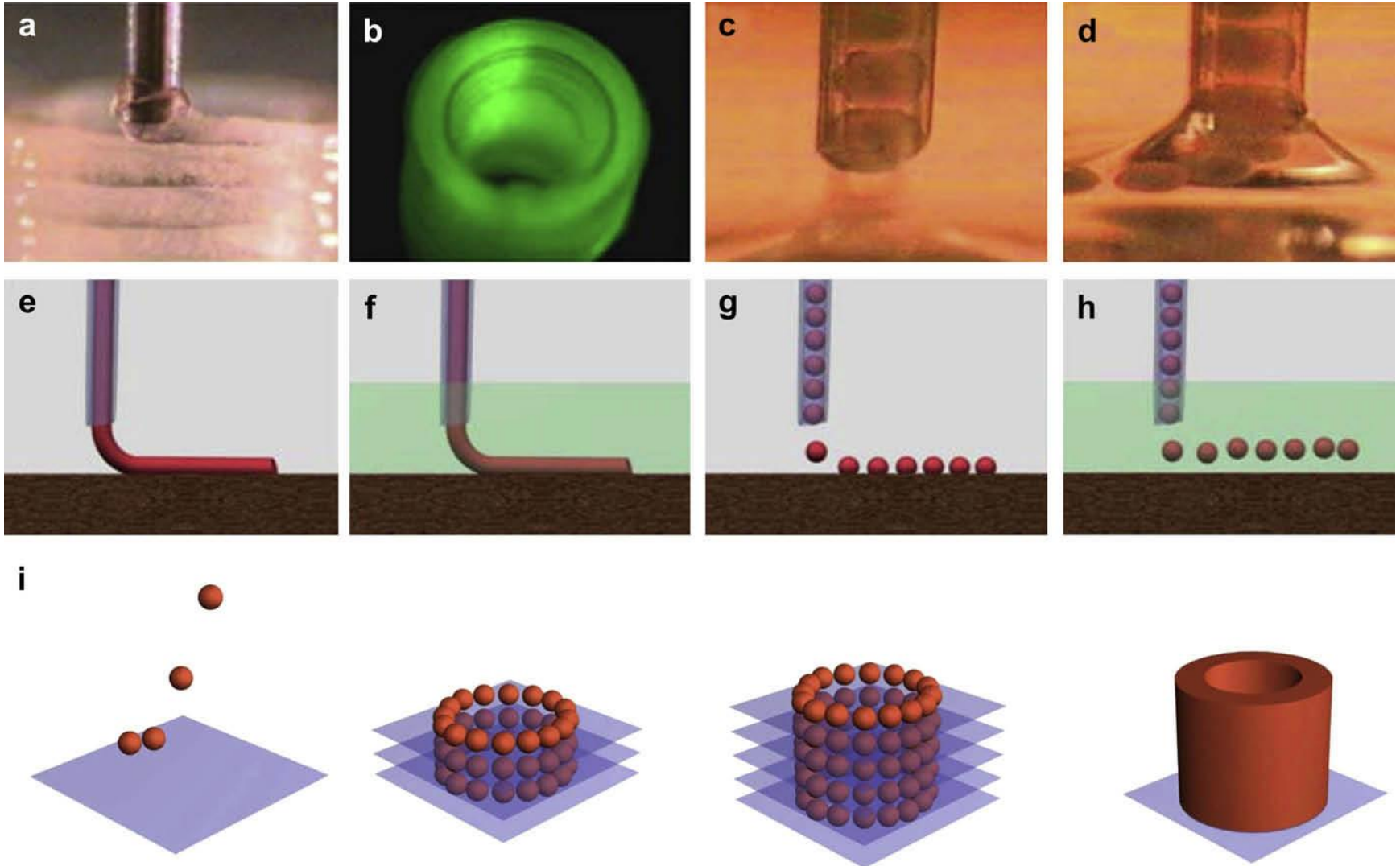
3D Printing (Fused Deposition Modeling)

PCL: Biocompatible, biodegradable, and FDA approved

Anatomically-shaped 3D-printed scaffolds



3D-printing spheroids in bio-ink



How Close We Are To A 3-D-Printed Human Heart

Scientists announced that for the first time ever, they were able to 3-D print an organ, successfully transplant it into an animal and get it to work.

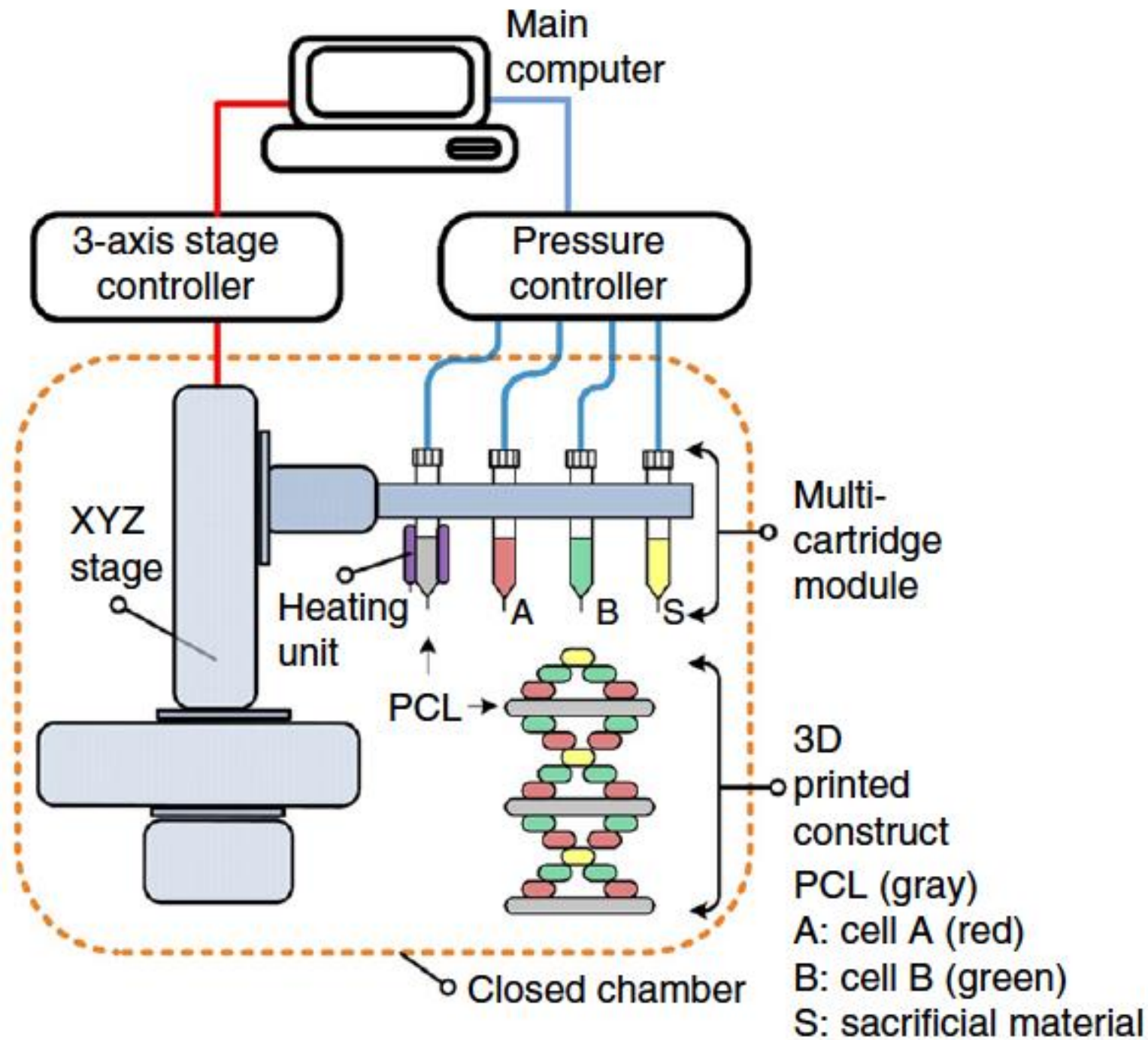
Huffington Post, Feb 27th,
2016

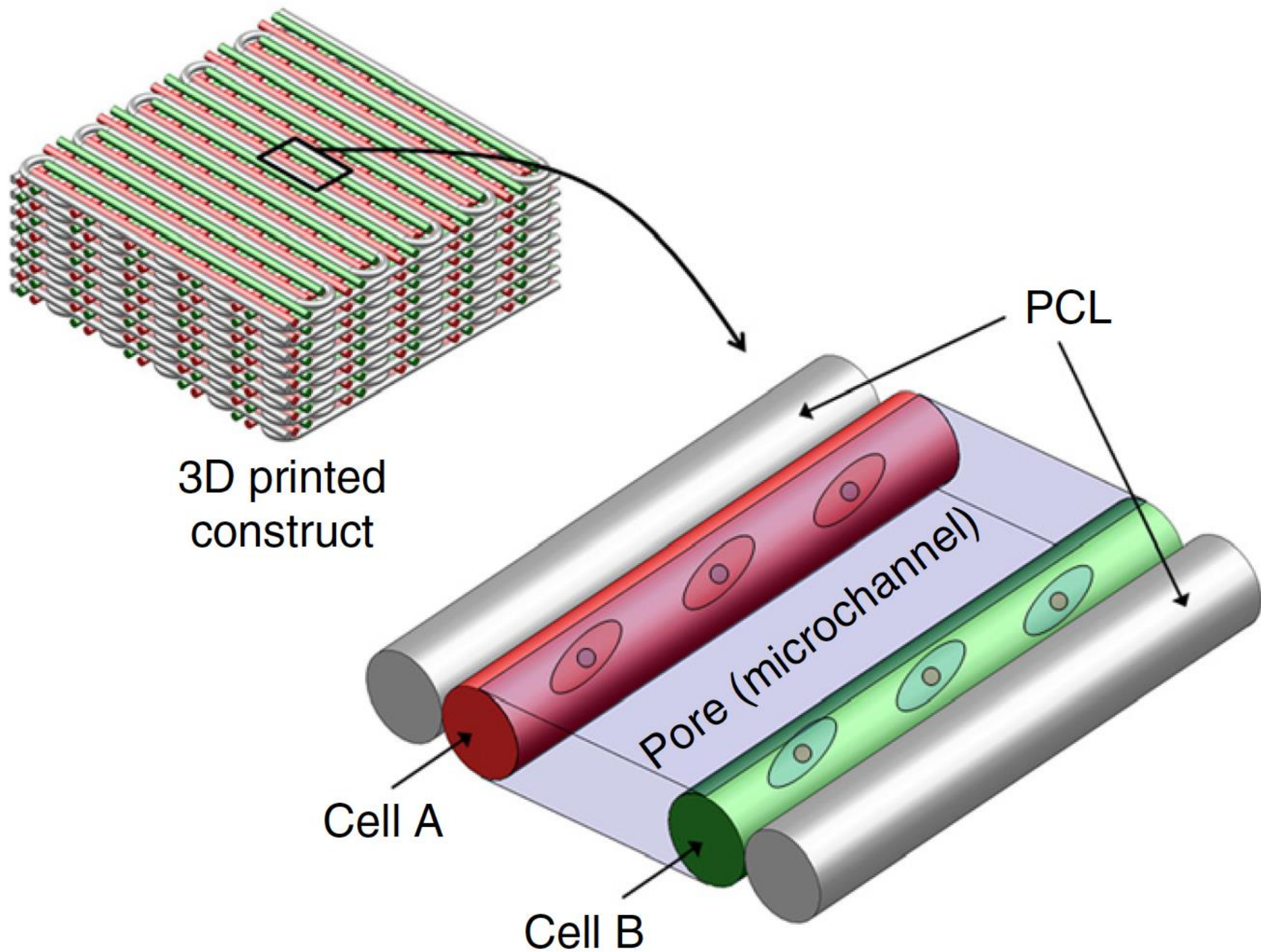


A 3D bioprinting system to produce human-scale tissue constructs with structural integrity

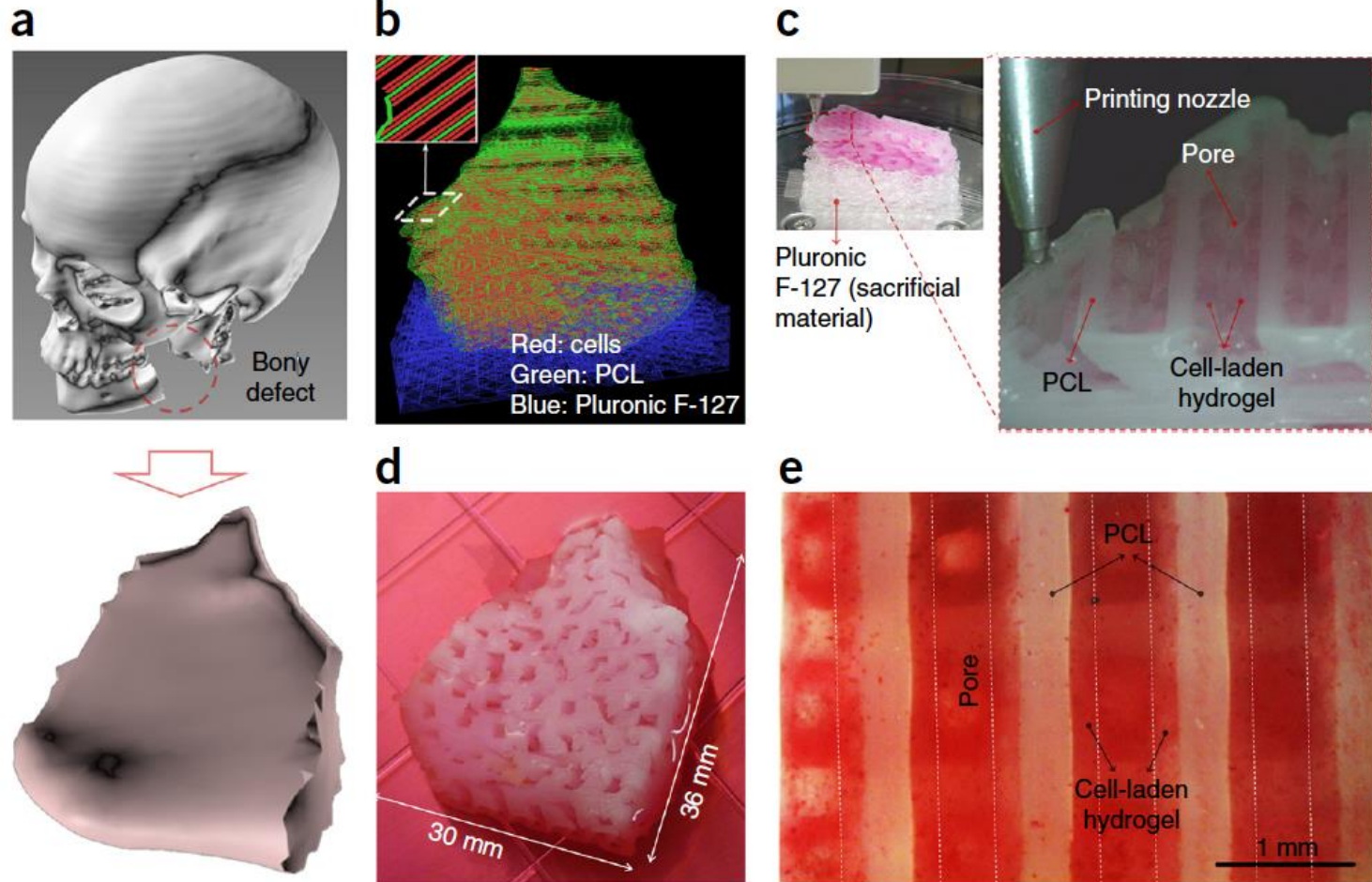
Hyun-Wook Kang, Sang Jin Lee, In Kap Ko, Carlos Kengla, James J Yoo & Anthony Atala

Nature Biotechnology, Feb 15th, 2016





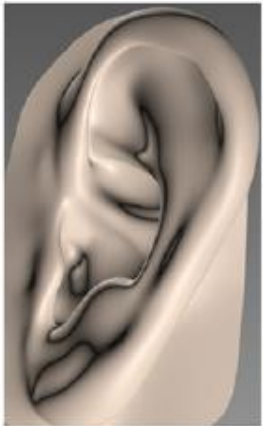
Bone regeneration



How does the use of sacrificial material aid in scale-up considerations?¹¹

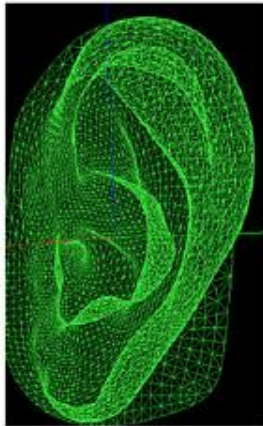
Tissue Engineered Auricle

Medical imaging
(CT, MRI)



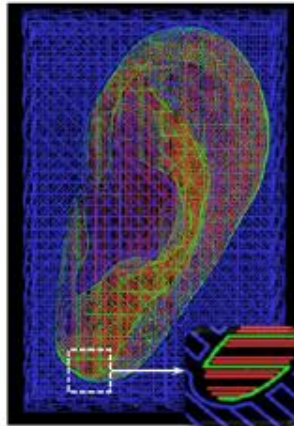
DICOM format

3D CAD model



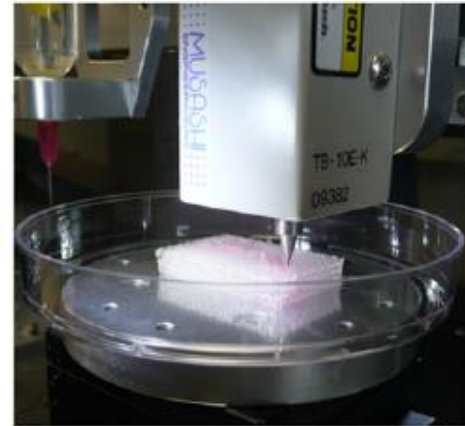
STL format

Visualized motion
program



Text-based
command list

3D printing process



3D bioprinted
tissue product

