HOLOGRAPH X™

CELLINK | POWERED BY PRELLIS BIOLOGICS

TAKING 3D CELL CULTURE WHERE IT'S NEVER GONE BEFORE

FASTEST HIGH-RESOLUTION BIOPRINTING ON THE PLANET, IN YOUR LAB.

The Holograph X is the first and only laser-based bioprinting system that can recreate human physiology at sub-micrometer resolutions within minutes.

The fully automated Holograph X accepts any user-designed structure and laser prints transplantable 3D tissue scaffolds for research and therapeutic development.

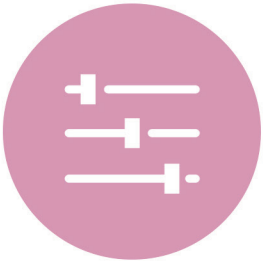
Holograph X-printed structures can grow cells at high densities (more than 25 per milliliter) for up to four weeks without hypoxia, in standard 96 well culture conditions.

Bioinks are fully oxygen- and nutrient-permeable, making it easy to grow and develop any type of tissue with the Holograph X.

HARDWARE HIGHLIGHTS

40W femtosecond pulsed laser with 24hr run times

Up to 250,000 voxels projected per second



Sub-micrometer 3-axis stage control

Automatic z-plane focusing

Reusable printing chips

Built-in laser safety features

Liquid Immersion safe print head

Multi-photon print mode

Proprietary 1-step hologram generation

Simple select and run printing set-up

Touch screen hologram generation and print set-up

Automated printing system

Real-time printing visualization and monitoring

Remote print-system access

Hologram generating software can be run independently

Advanced user controls

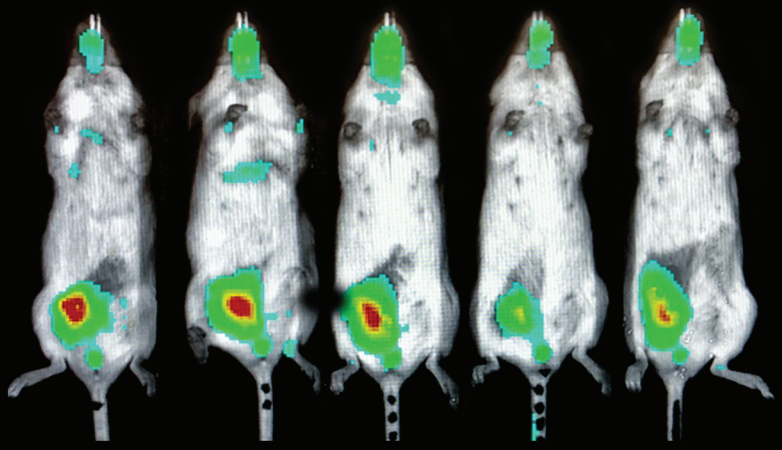
SOFTWARE HIGHLIGHTS

↑ *Large Vascular Bundle™*

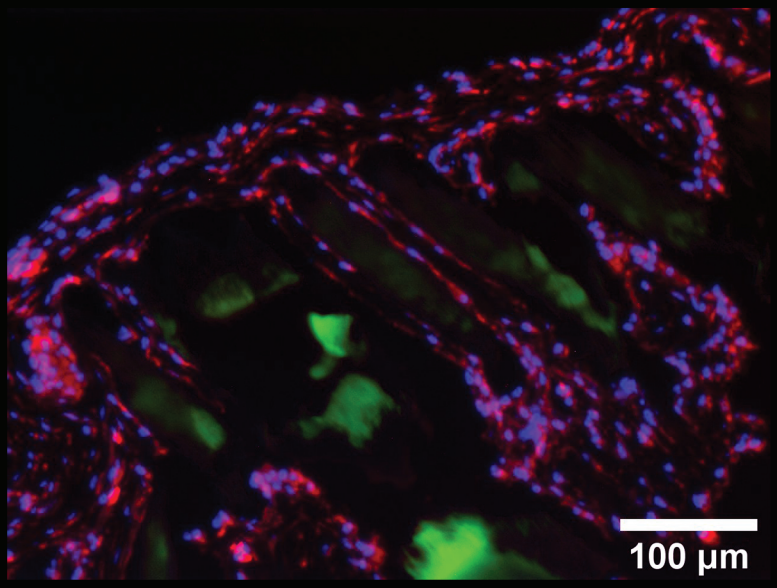
HOLOGRAPH X: The new standard in complex 3D cell culture

Drug discovery and screening in 3D tissue systems

- Holograph X reduces the time to test 3D tissues by 90% or more.
- Screen more than 500,000 cells per structure for primary immune, liver and tumor cell responses.
- Set up 3D tissue structures with any cell matrix and culture media rapidly and intuitively.
- Transplant (constructed) tissues for *in vitro* discovery testing.



← *A xenograft study of mice with implanted organoid scaffolds containing tumors, showing tumor neovascularization.*



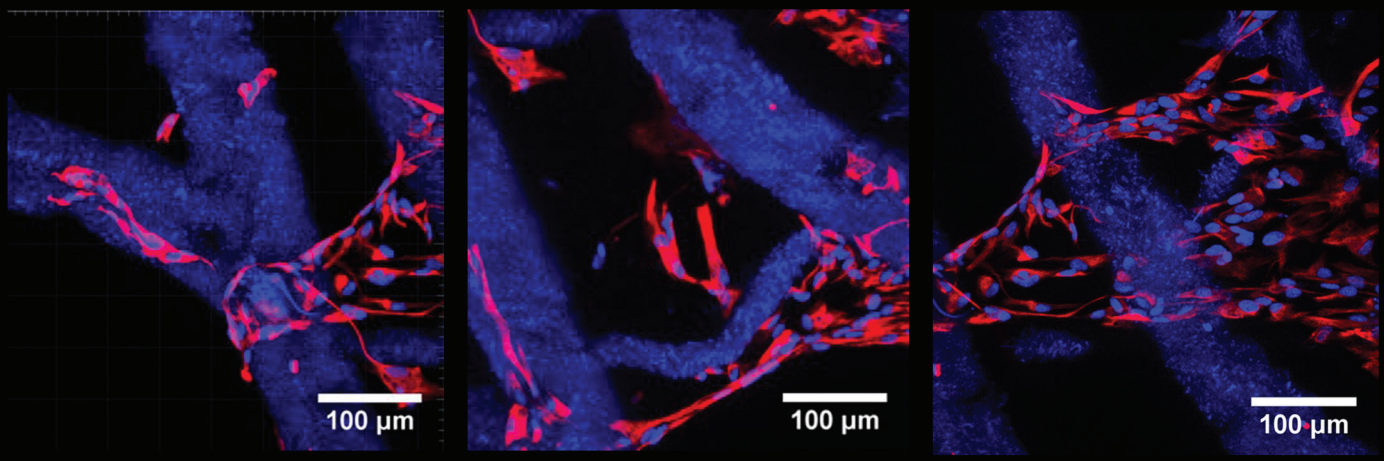
← *Prellis Biologics Organoid Scaffold (green) was implanted into a mouse for 8 weeks. The tissue slice is stained for vasculature (CD31, red) and cell nuclei (DAPI, blue). The image shows mouse vasculature growing around Prellis Bio Organoid scaffold.*

Build large-format, high-density 3D tissue culture systems

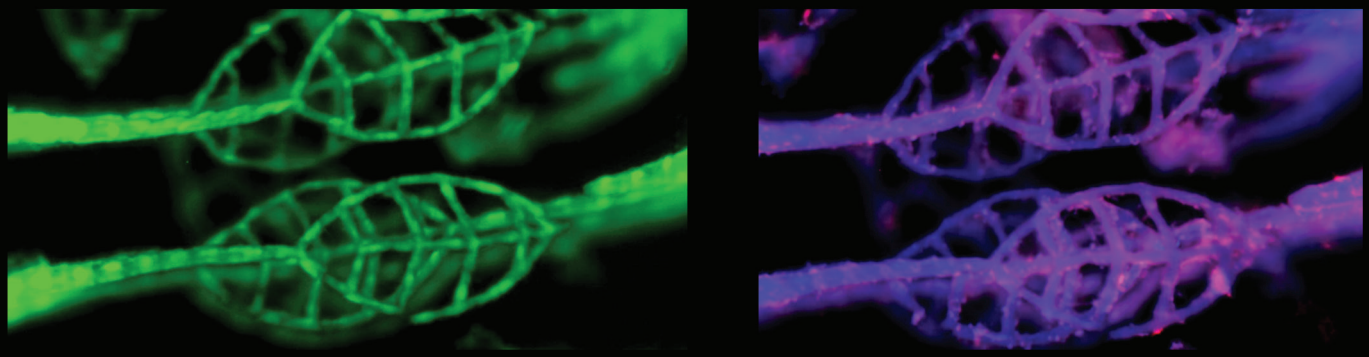
- Flow-free tissue culture in 96 well plates for up to 2.5 millimeter structures.
- Cells grow for at least four weeks under standard tissue culture conditions.
- Compatible with FACS, IHC, IP, western blot, confocal and multiphoton microscopy.

Print any tissue scaffold

- Print any high-resolution, user-designed tissue scaffold to query 3D cell development.
- Build and test microfluidic systems.
- Create transplantable tissues with one or more cell types.



↑ *Human astrocytes (a type of neural cell) grown on the Vascular Bundle structure (blue) for 6 days and stained for astrocyte marker (GFAP, red), cell nuclei (DAPI, blue).*



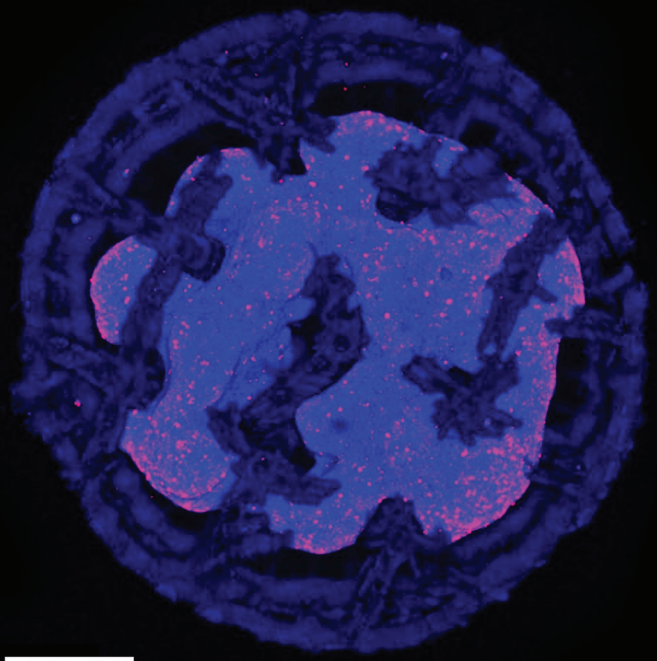
↑ *Leaflet chip produced by the Holograph X and coated with HUVEC cells stained with von Willebrand Factor (red).*

Example Applications

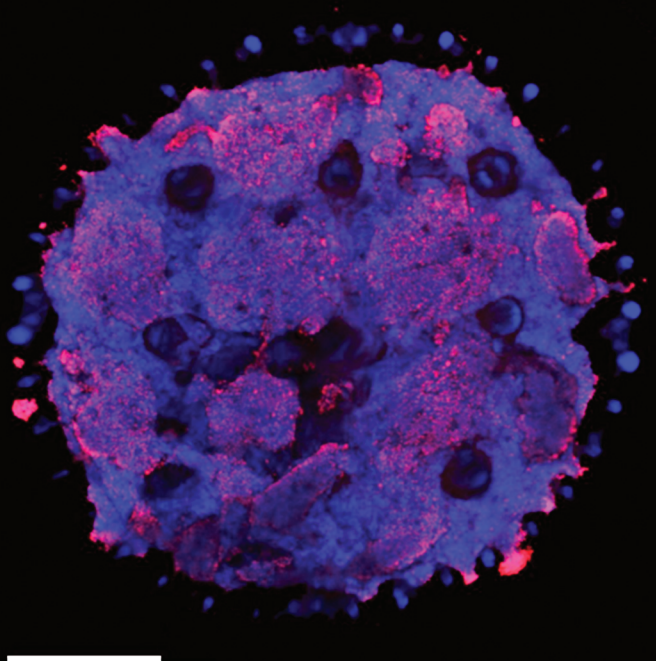
- Design and print any 3D microfluidic system.
- Develop and test microfluidic flow systems with or without cells.
- Transplant cell-laden user-designed scaffolds

Study rare cells in a user-designed 3D scaffold

- Rapid Tumor and tissue screening.
- Study single-cell and multicellular organism motility in 3D.
- Build complex neuronal networks to observe *ex vivo* cell-to-cell interactions.
- Alter the densities of structural components to precisely control cellular development.



↑ *24 hour growth of cancer cell line HCT116 seeded in collagen I and grown in a 96 well plate without flow showing significant tumor growth in a Holograph X-printed organoid. (Ki67 = red cells, DAPI = blue cells).*



↑ *72 hour growth of cancer cell line HCT116 seeded in collagen I and grown in a 96 well plate without flow showing significant tumor growth in a Holograph X-printed organoid. (Ki67 = red cells, DAPI = blue cells).*

Tissues grown in Holograph X structures can be handled like any tissue sample of the same size, and are suitable for analysis by imaging, FACS, metabolic assays, IHC, western blot and DNA and RNA sequencing.

Holograph X bioinks are compatible with all mammalian cells and multicellular organisms.

Tested cell types and applications include: IPSC differentiation, multicellular development and spontaneous cell organization of liver cells, HUVEC tube formation in 3D structures, neuronal cell culture differentiation, co-culture of tumor and accessory cells and muscle cell development.

SPECIFICATIONS

PRINTING

- Laser-based holographic projection printing.
- Ultra-fine resolution: 1 x 1 x 3 µm (x, y, z).
- Capillary resolution printing.
- High-fidelity reproducible 3D structures.
- Can print with cells present for up to one hour with 80% viability.

SIZE

- Mini-standard: 12.5 x 12.5 cm printfield (x, y) 2.7 mm z depth.
- LARGE standard 3 mm z depth with up to 10 mm z depth

SOFTWARE

- Automatic stage movement.
- Remote print monitoring.
- Repeat and multiple structure print mode.
- 3D STL file to hologram generation.
- Print time estimates.
- Intuitive print workflow.
- Hologram-generating software available separately.

MATERIALS

- Biocompatible, transplantable materials.
- Bioinks are liquid until polymerized.
- Printed structures have six-month shelf-life.
- Printed structures can be sterilized with light bleach or ethanol treament.
- Tested with 15 human cell types including primary cells and IPSCs.

TIME

- Print speed: Up to 250,000 voxels/second.
- Example of printing times:
  - 10% infill factor for 1mm^3 model = 20 min
  - Standard Organoid structure = 30 min
  - 1.3 x 2.1 mm 60 micron vascular bundle: 15 min

PRINTING FLEXIBILITY

- Fully automated system.
- Adjustable laser powers.
- Tunable printing modes.
- Hologram tested 3D cell culture structures included.
- Muti-structure print mode.

ADD-ON FEATURES

- Chilled stage for printing with cells.
- Targeting grid for cell encapsulation.
- Reusable sterile print chambers.

SYSTEM REQUIREMENTS

- Standard power requirements: 220 VAC, 50/60Hz.
- Operating temperature range: 0 to 60°C.
- Operating humidity range: 45 to 85% RH.
- 3D models file format: STL.

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