

Readily3D

Tomolite

For rapid, contactless, high-viability
tomographic bioprinting





What is volumetric bioprinting?

Volumetric tomographic 3D printing rapidly solidifies photosensitive inks in three dimensions, using shaped light beams from multiple angles. As the entire build volume is illuminated simultaneously, centimeter-scale biological systems are produced in just tens of seconds. After printing, the object is simply separated from the uncured ink and collected.

Our printing method is light-based, so it does not induce any shear stress on the printed cells. The remarkably low photoinitiator content (eg 1mg/mL LAP) and low light dose (<600 mJ/cm²) make tomographic bioprinting a cell-friendly technique.

Swiss-made bioprinters

We are Readily3D, we developed Tomolite and Apparite to make research in biosciences quicker and more efficient. Founded in 2020, Readily3D originates from a research work started in 2017 at EPFL in Lausanne, Switzerland.

The first generation of our 3D bioprinter, the Tomolite v1, was certified and commercialized in May 2021. The second generation, a modular volumetric bioprinter, the Tomolite v2 is certified and commercialized since September 2022.

Currently in use in dozens of laboratories around the world, our volumetric bioprinters led to ground-breaking research and publications in the Life Science community.

Tomolite Complex living constructs shaped by light



Tomolite 2.0



Readily bioprinted

Tomolite leverages our contactless tomographic illumination technology to shape sensitive cells and biomaterials into biological systems, without impairing their viability. Volumetric printing not only preserves cells but also makes research more efficient by simplifying design iterations and statistical studies.

Modularity and continuous upgrades

The Tomolite v2.0 can be readily used in any work environment since it is a class 1 laser product, accessible radiation is safe under all conditions of normal use. It accommodates different modules such as various laser sources and build volumes. Upgrades and new modules also fit onto this modular platform.

Benefits



Fast
Shape hydrogels in 30 seconds



Modular
Choose between a range of build volumes and wavelengths



Cell and organoid-friendly
Low light dose, high viability (>90%)



Contamination-free
Print through sealed, autoclavable containers



Optical resolution
Pixel size of 28 microns



Design freedom
Easily print hollow, embedded or overhanging structures

Extrusion, DLP and Two-photon v.s. volumetric bioprinting



Extrusion

Shear stress
< 60% Viability

Limited design freedom

Low-throughput
< 0.1cm³/min



Volumetric bioprinting

No shear stress
Increased viability > 90%

Freeform, no support struts

High-throughput
> 10cm³/min



DLP

Slow (< 0.5cm³/min), large dose light
Low viability

Limited design freedom, supports struts

Limited viscosity



Volumetric bioprinting

30s to 60s to print
High viability > 90%

Organic shapes with tunable porosity and vasculatures

Can process gels



Two-photon

Limited depth (500µm), 2.5D

Low-throughput
< 10⁻⁷cm³/min

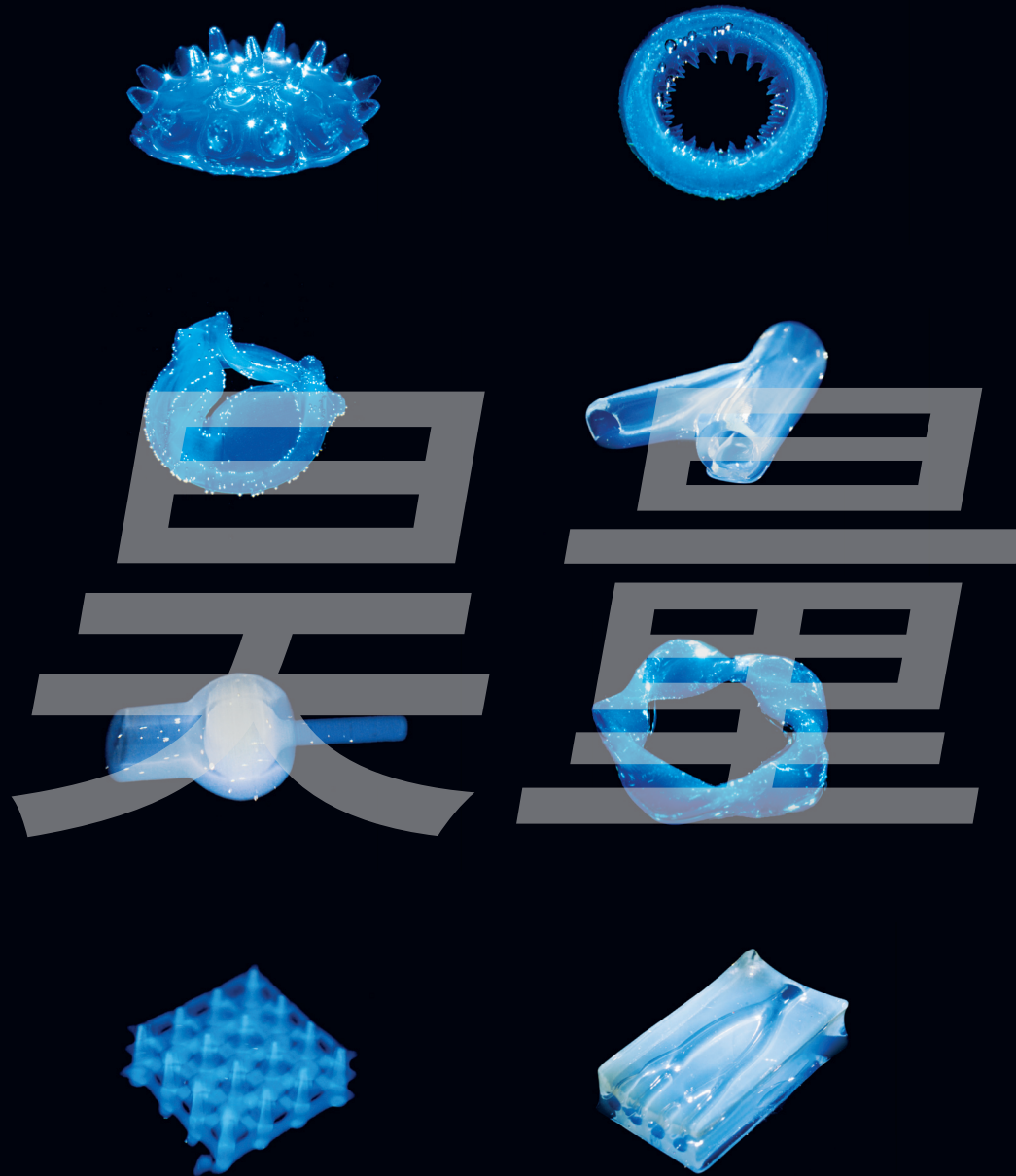


Volumetric bioprinting

True 3D

High-throughput
> 10cm³/min

Tomolite v2.0



Specifications & models	Standard	Performance
Pixel size	28μm	28μm
Build diameter	up to 6.3mm	up to 12.5mm
Build height	≥ 25mm	≥ 25mm
Container diameter range	5mm -10mm	5mm -22mm
Wavelength*	405nm ± 5 nm	400nm ± 1 nm
Light intensity	1 to 15mW/cm ² (average at container) ≥ 35mW/cm ² (maximum peak intensity)	1 to 20mW/cm ² (average at container) ≥ 45mW/cm ² (maximum peak intensity)
Indicative print time	20s -120s (depends on material)	20s -120s (depends on material)
Container materials	Autoclavable and reusable glass vials	Autoclavable and reusable glass vials
Max. rotation speed	≥ 60°/s	≥ 60°/s
Compatible materials	hydrogels, acrylics and silicones	hydrogels, acrylics and silicones
External footprint	27cm x 30cm x 67cm	27cm x 30cm x 67cm
Initial accessories kit	Precision chuck adaptor for vials Vial extraction tool	Precision chuck adaptor for vials Vial extraction tool
Laser class	Class 1 laser product: accessible laser radiation is safe under all conditions of normal use. (IEC/EN 60825:1-2014 certified)	Class 1 laser product: accessible laser radiation is safe under all conditions of normal use. (IEC/EN 60825:1-2014 certified)

* other wavelengths available upon request

An organoid and cell-friendly bioprinter

Examples of organoid and cell types printed to date

Type	Concentration	Viability	Construct size	Print time
1 Human hepatic organoids	5.10 ⁶ cells/ml	> 95% after 10 days	Ø 6 mm × h 17 mm	15.5s
2 Human embryonic kidney cells (HEK 293)	4.10 ⁶ cells/ml	—	Ø 8.1 mm × h 9 mm	36s
3 Mouse myoblasts (C2C12)	10 ⁶ cells/ml	> 90% after 7 days	Ø 7 mm × h 15 mm	10–11s
4 Normal human dermal fibroblasts (NHDF)	10 ⁶ cells/ml	> 90% after 7 days	13 mm × 6.0 mm × 2.6 mm	11.4s
5 Equine mesenchymal stromal cells (MSCs)	10 ⁶ cells/ml	—	Ø 8.5 mm × h 9.3 mm	12.5s
6 Equine articular chondroprogenitor cells (ACPCs)	10 ⁷ cells/ml	> 85% after 7 days	Ø 5.0 mm × h 1.0 mm	—

Publications

- 1 Bernal et al., “Volumetric Bioprinting of Organoids and Optically Tuned Hydrogels to Build Liver-Like Metabolic Biofactories”, *Advanced Materials* (2022)
- 2 Madrid-Wolff et al., “Controlling Light in Scattering Materials for Volumetric Additive Manufacturing”, *Advanced Science* (2022)
- 3,4 Rizzo et al., “Optimized Photoclick (Bio)Resins for Fast Volumetric Bioprinting”, *Advanced Materials* (2021)
- 5,6 Bernal et al., “Volumetric Bioprinting of Complex Living-Tissue Constructs within Seconds”, *Advanced Materials* (2019)

Publications

Volumetric Bioprinting of Organoids and Optically Tuned Hydrogels to Build Liver-Like Metabolic Biofactories

Bernal, P. et al., 2022

DOI: 10.1002/adma.202110054

Tomographic volumetric bioprinting of heterocellular bone-like tissues in seconds

Gehlen, J. et al., 2022

DOI: 10.1016/j.actbio.2022.06.020

Optimized Photoclick (Bio)Resins for Fast Volumetric Bioprinting

Rizzo, R. et al., 2021

DOI: 10.1002/adma.202102900

Filamented Light (FLight) biofabrication of highly aligned tissue-engineered constructs

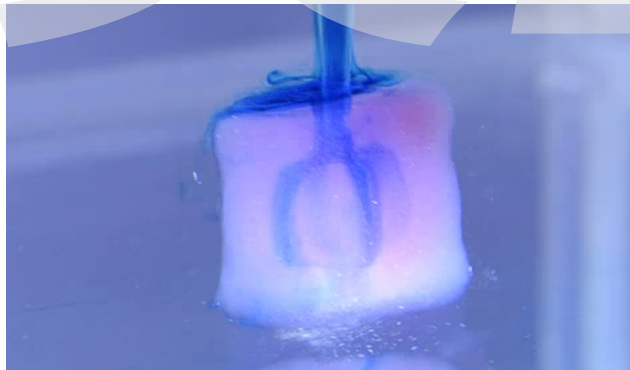
Liu, H. et al., 2022

DOI: 10.1002/adma.202204301

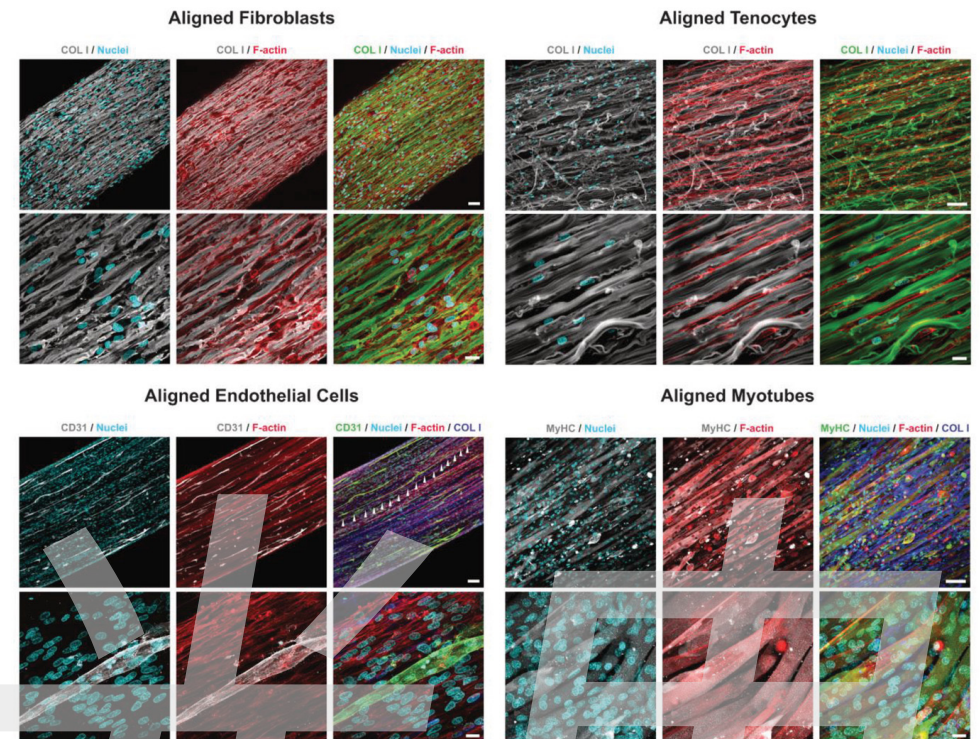
Volumetric Bioprinting of Complex Living-Tissue Constructs within Seconds

Bernal, P. et al., 2019

DOI: 10.1002/adma.201904209



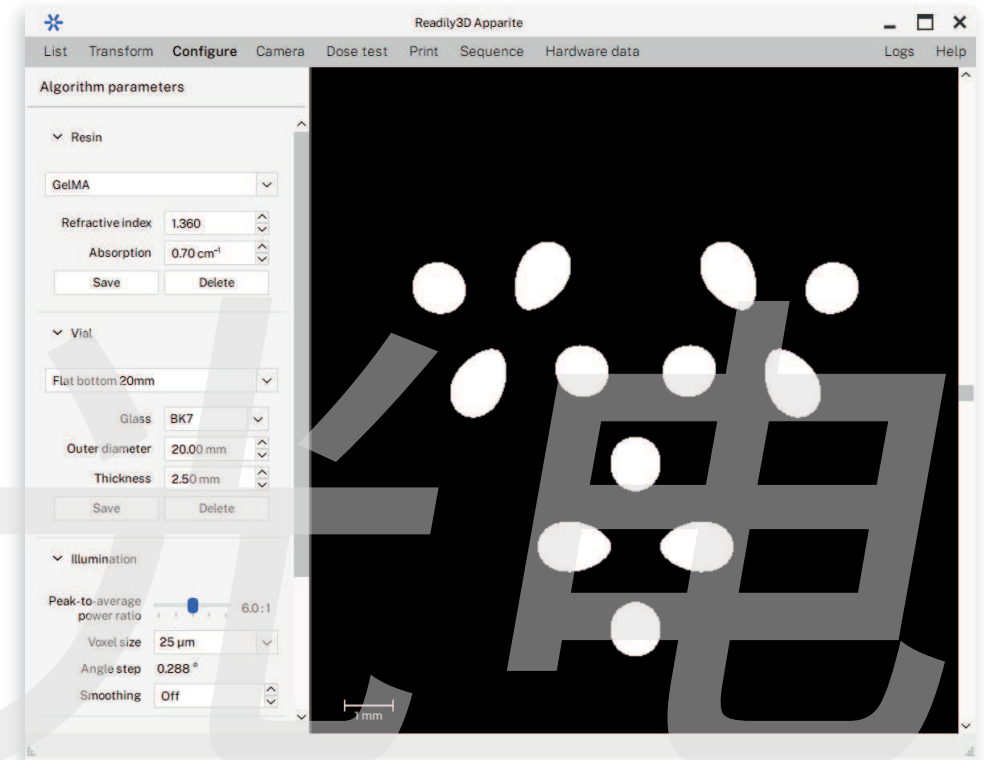
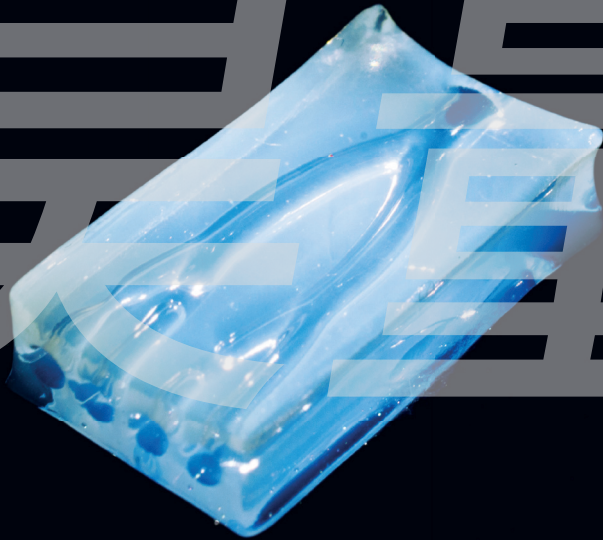
Adapted from Madrid-Wolff et al., Controlling Light in Scattering Materials for Volumetric Additive Manufacturing, Adv. Sci., 2022” puis “License: CC BY 4.0 -<https://creativecommons.org/licenses/by/4.0>



Adapted from Liu et al., Filamented Light (FLight) Biofabrication of Highly Aligned Tissue-Engineered Constructs, Adv. Mat., 2022”, puis “License: CC BY 4.0 -<https://creativecommons.org/licenses/by/4.0>

Apparite

Rapidly configure
and launch
your 3D bioprint



Load,
Preview,
Print.

Apparite facilitates the preparation of a print while giving users full control over the process parameters. In a few clicks, import the STL geometry of your constructs, configure the material properties and preview the computed light dose distribution.

Specifications

3D object format	STL
Multi-object printing	Supported
Transformations	Position Rotation Scaling
Beam computation time	Approximately 30s-90s (cloud-accelerated)
Print parameters	Dose Intensity Exposure time Print speed Number of rotations Projection rate
Computation parameters	Voxel size Angular step Dose contrast Resin compensation
Build volume monitoring	Live camera feed
Print log	Automatic
Dose estimation	Preview of dose distribution before printing Dose test procedure (with small volume of ink)
Supported operating system	Windows 10 and 11

