



## HoloPhase 3D



### 3D label-free microscopy for time-lapse imaging of living organoids as they develop

#### What it is

HoloPhase 3D is a novel, label-free 3D microscope that works directly in a cell culture incubator. The technology is not only compact and easy to use, but also more than 10 times cheaper than standard optical microscopes.

#### How does it work?

A LED illumination array illuminates the sample at various angles and the resulting diffraction patterns (intensity-only measurements) are recorded using a CMOS sensor. The sample's optical properties (refractive index and absorption) are reconstructed in 3D thanks to interconnected layers of neural networks. AI algorithms perform segmentation and classification of the reconstructed samples.

#### What it can do

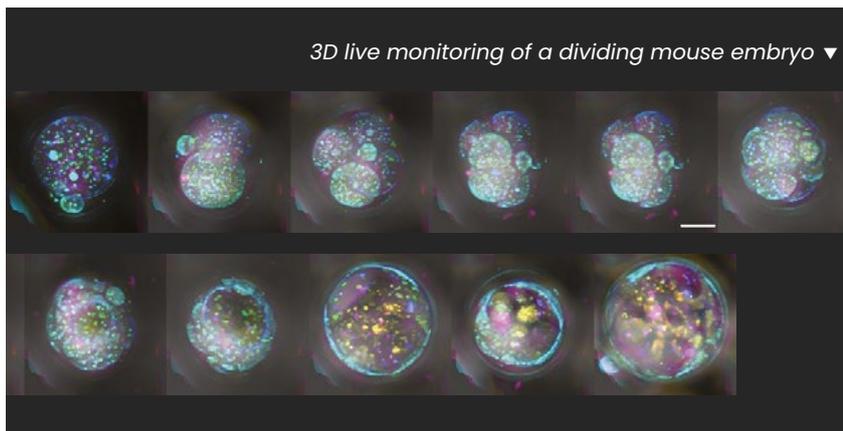
HoloPhase 3D combines a high-performance algorithm and state-of-the-art equipment. It can be adapted to a wide range of imaging applications for *in vitro* diagnostics or bio-production, including:

- 3D imaging for life-sciences
- Monitoring of organs-on-chips
- Imaging of human preimplantation embryos for *in vitro* fertilization laboratories
- Quantitative and systematic analysis of cell dynamics for *in vitro* 3D imaging
- Monitoring of 3D cell organization in bioreactors

## What makes it unique

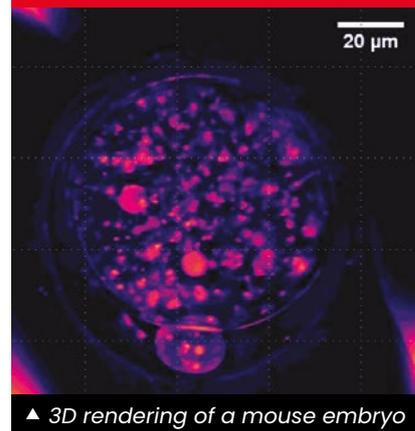
The CEA-Leti team built on its strong expertise in software and integration technologies in order to develop:

- A compact, robust, low-cost and easy-to-use label-free 3D microscope that can capture images of the development of living organisms.
- A novel and versatile algorithm for 3D sample reconstruction based on artificial intelligence algorithms.
- The possibility of long-term observations directly in a cell culture incubator without disturbing the biological sample.



## Key facts

- 2 patents and 7 publications
- "This is an exciting and innovative technique developed by a team that highlights the expertise of French research. The technique's possible benefits are important and I would really like to see it reach full potential. I will be closely following future developments and results." ANR Reviewer



## What's next?

The CEA-Leti team is currently developing:

- Correlative fluorescence and 3D refractive index imaging
- 3D real-time monitoring of cellular interaction and migration
- Coupling with microfluidics for organ-on-chip imaging

## Interested in this technology?

Contact:

**Jérémy Scelle**

[jeremy.scelle@cea.fr](mailto:jeremy.scelle@cea.fr)

+33 438 784 063



**CEA-Leti, technology research institute**

17 avenue des Martyrs, 38054 Grenoble Cedex 9, France

[cea-leti.com](http://cea-leti.com)

in   @CEA-Leti

