PRIMO
Custom Micropatterning for Cell Control
Take Control of the Cell Microenvironment

Control the chemistry and topography of the cell microenvironment and study their impacts on cell development using an innovative contactless and maskless quantitative photopatterning solution.

PRIMO was developed to enable you to design and conduct all the micropatterning experiments you can imagine, both in 2D and 3D.

Benefits

- **Time saving & independence**: Design and conduct your own experiment!

- **High Flexibility**: Draw, download and project a new image according to your needs!

- **Versatility**: Use your regular cell culture substrates (flat or microstructured, stiff or soft) without constraints.

We are currently particularly interested in determining the role of the biophysical environment in the establishment of apico-basal polarity in mammary gland cells and in liver cells. The use of PRIMO in this context proved absolutely essential since it allowed us to create artificial microniches in 3D where we could control up to 150 combinations of environmental cues.

Virgile Viasnoff
Associate Professor at Mechanobiology Institute - National University of Singapore, and Director of Research at CNRS

Embryonic fibroblast from vimentin Knockout mice on a fibronectin + fibrinogen-A647 (blue) pattern, actin labelled with phalloidin-A555 (red) and focal adhesions revealed via Anti-Paxillin Antibodies + secondary Antibodies coupled to A488 (green). Courtesy of A.J. Jimenez and B. Vianay, Physics of cytoskeleton & Morphogenesis lab.
Micropatterning made easy
discover the key steps of PRIMO’s photopatterning process

01 PATTERN DESIGN
An image file is uploaded in Leonardo Software which sends it to the PRIMO module.

02 UV ILLUMINATION
PRIMO projects the image onto the substrate (UV light, λ=375nm). The pattern results from the combined action of UV and PLPP (photoactivatable reagent).

03 PROTEIN MICROPATTERNING
Proteins are added (fibronectin for example) and bind to the illuminated areas only.

04 CELL ADHESION
Cells are seeded and adhere to the protein micropattern only.
Unrivalled performance

**GRADIENTS**
- 256 gray levels

**MULTI-PROTEIN**
- 3 depending on experimental conditions
  - Range of 10+ proteins used daily by our users

**HIGH RESOLUTION**
- 1.2µm over the entire illuminated field*
  - *Approximately 500x500µm, 20x objective

**FAST**
- 20 sec for a full field pattern*
  - *Approximately 500x500µm, 20x objective

**COMPATIBLE**
- Standard substrates for cell culture**
  - **Stiff or soft, flat or microstructured

**MULTI-PROTEIN:**
- Sequential photopatterning of Fibrinogen-A488 in green and Protein A-A647 in red onto PDMS micropillars microfabricated with PRIMO.

**HIGH RESOLUTION:**
- Epifluorescence microscopy image of 1.5µm dots spaced by 1.5µm of ProteinA-488 on PDMS.
  - Epifluorescence microscopy image of 2 µm horizontal lines of ProteinA-488 on glass.
  - Epifluorescence microscopy image of a gradient of Fibrinogen-A488 on a glass coverslip.
Applications in cell biology

Cell Adhesion

Embryonic fibroblasts from vimentin knockout mice on fibronectin + fibrinogen-A647 (blue) patterns, actin labelled with phallolidin-A555 (red) and focal adhesions revealed via Anti-Paxillin Antibodies + secondary Antibodies coupled to A488 (green).

Courtesy of A.J. Jimenez and B. Vianey, Physics of cytoskeleton & Morphogenesis lab.

Chicken brain explant positioned in the center of a wheel pattern of laminin labelled with Alexa488 (green).


3 hepatocytes HepG2 adhering on patterns of fibronectin on the sides and the bottom of a micro-well. Courtesy of C. Stoecklin and V. Viasnoff

Micro-pillars of 5 µm diameter spaced by 5 µm made by the replica molding of a primary SU8 photoresist master obtained by photolithography with PRIMO.

Cell Migration

Phase contract imaging of MDCK cells on a complex micropattern of fibronectin.

Microfabrication

3D confinement

3 hepatocytes HepG2 adhering on patterns of fibronectin on the sides and the bottom of a micro-well. Courtesy of C. Stoecklin and V. Viasnoff
For a complete micropatterning solution, we have developed complementary products to give you optimized and personalized control over your experimental conditions.

Leonardo
Photopatterning software
- Preview
- Replication
- Realignment
and many more functionalities...

PLPP
Exclusive photoactivatable reagent
- Photo-initiator
- Accelerator
- Ready-to-use solution

PDMS Stencil
Flexible multi-well solution
- Multiple experimental conditions
- Localized experiments
- Savings of reagents