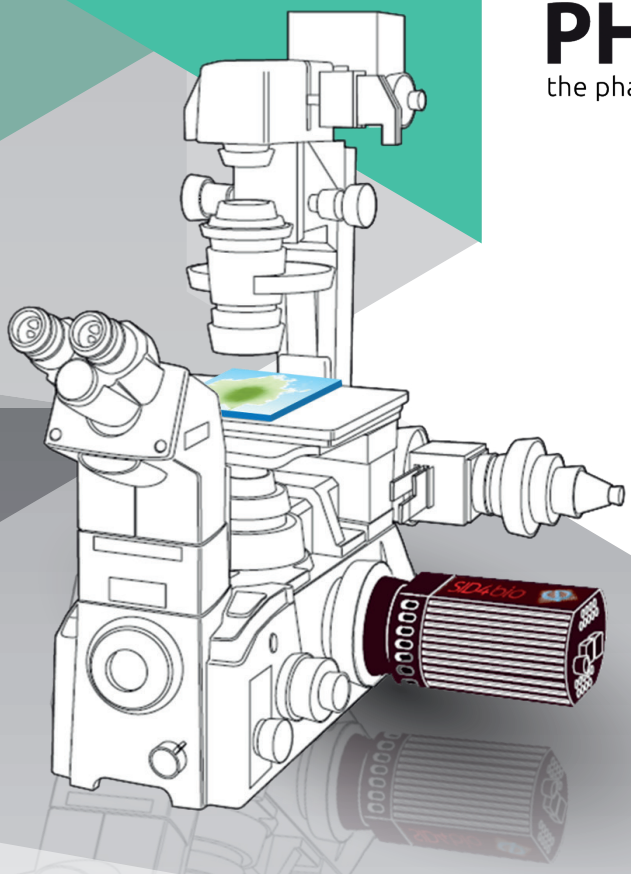
Quantitative phase imaging for microscopy

PHASICS
the phase control company

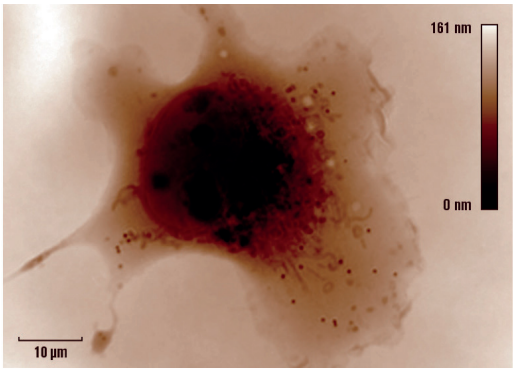


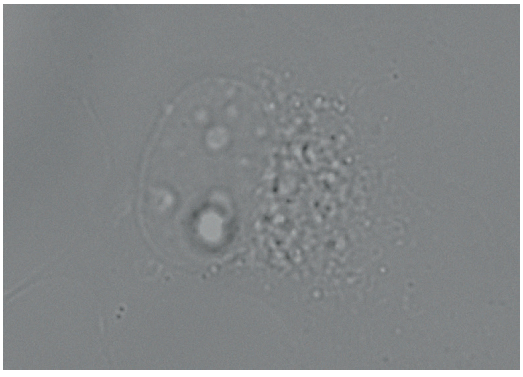
QUANTITATIVE CELL IMAGING

Our solution for fast and **label-free cell imaging** is based on our innovative quantitative phase imaging (QPI) technique. Our instrument directly **plugs in to any microscope**, and simultaneously and quantitatively measures the local phase shift and intensity within a biological sample.
We can **automatically obtain multiple parameters** on various cell types and tissues (dry mass, growth rate...). Because there is no change in the light path, it also enables multimodality such as phase and fluorescence merging.

LABEL-FREE QUANTITATIVE CELL IMAGING

Single-shot measurement with sub-nanometric OPD precision is achieved with a diffraction-limited lateral resolution and a true video rate permitting intracellular components detection and dynamic follow-up. In the following example, we can see the high contrast enhancement brought by QPI.





Quantitative phase (left) and brightfield (right) images of a living COS-7 cell observed with a conventional inverted microscope under white light illumination (x150 NA=1.3). Scale bar = 10µm

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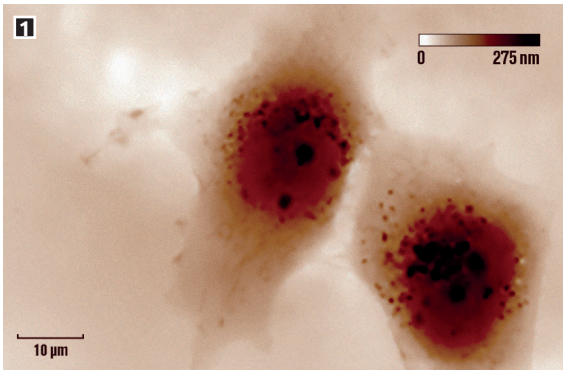
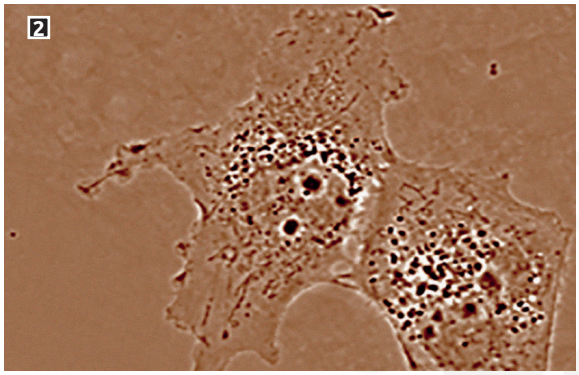
PHASE + FLUORESCENCE IMAGING

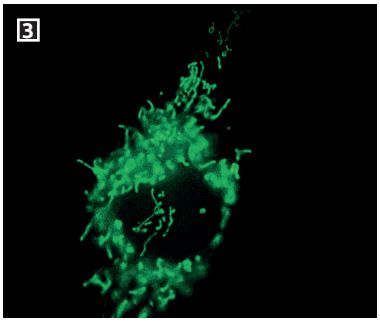
SID4 Bio or SID4 sC8 can be easily combined with other microscopic imaging techniques such as **fluorescence or polarization imaging.**
Co-localization of OPD and fluorescence signals measured from a single sample provides complementary information and thus enhances subcellular components identification.
While phase helps **morphological studies** and density or **refractive index quantification**, fluorescence signal is specifically related to targeted intracellular components.

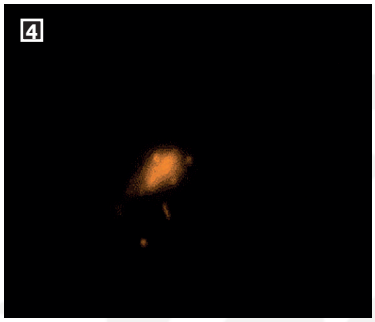
Phase

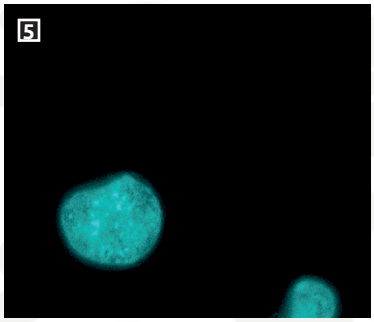




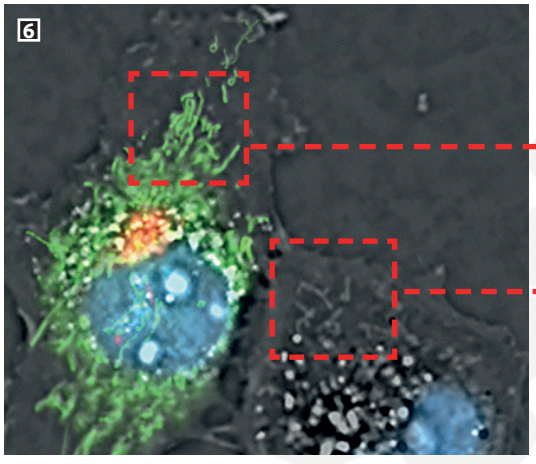
Fluorescence

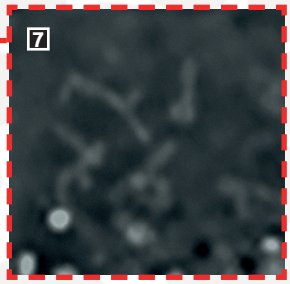


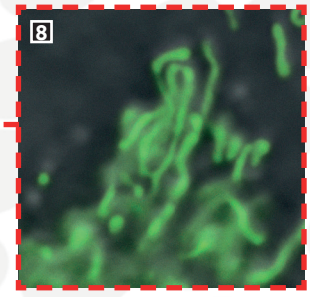




Phase + Fluo merging

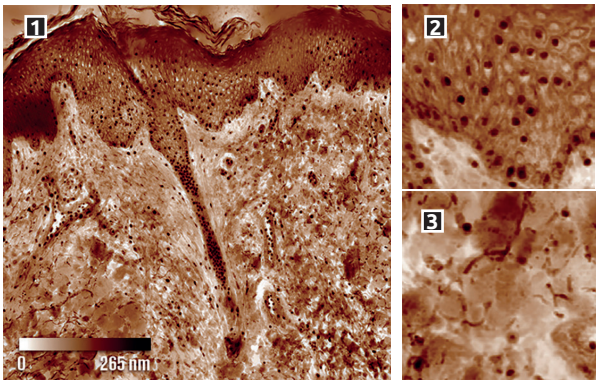






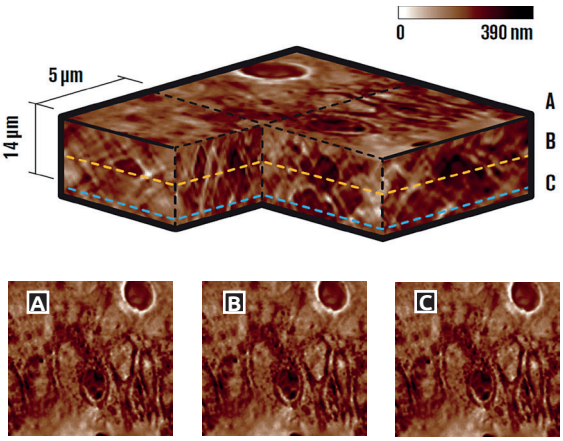
COS-7 cells (x100 NA= 1.3). [1] Phase, [2] High pass filtered phase image, [3, 4 & 5] fluorescence images with mitochondrion [3], Golgi apparatus [4] and nucleus [5]. [6, 7 & 8] Fluorescence & phase merged images.

2D Tissue imaging



[1] Phase image of a 10 µm thick mouse skin tissue resulting of image stitching (scan with 40x, NA=0.75). Bars scale = 0.01mm [2 & 3] Zooms of two different areas. [2] Epithelial cell [3] Adipocytes. Scale bars = 20µm.

3D Tissue imaging

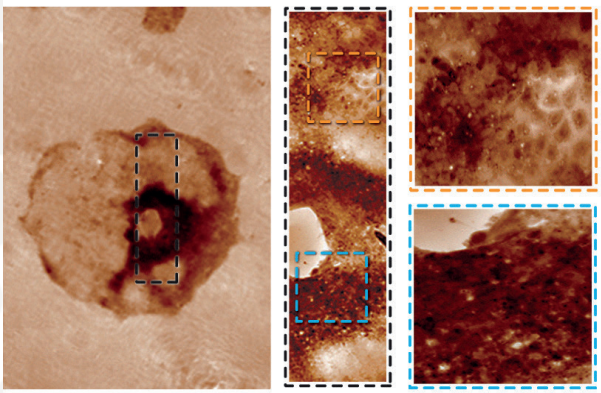


Reconstruction of a 14 µm thick mouse skin tissue, 100x magnification $NA_{coll} = NA_{ill} = 1.3$

TISSUE IMAGING

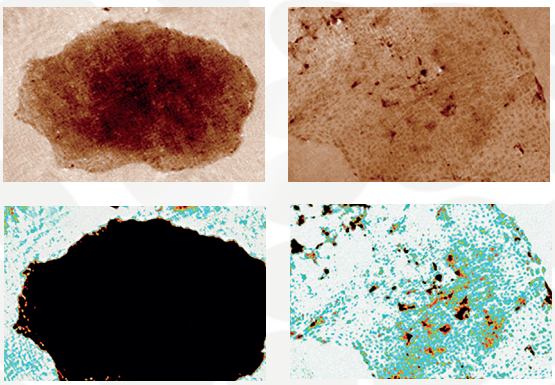
Tissue imaging with a QPI camera enables visualizing cells and other tissue components such as fibers without labelling. The high contrast created allows **tissue study without any coloration.**
The principle can be transposed on thicker samples of several dozens of microns to make **tomographic reconstruction** thanks to a single z-stack scanning with a subcellular axial resolution.

Stem cells colonies imaging...



[1] Weakly differentiated hiPSC lines PFX#9 colony, 5x [2] 40x magnification. Zooms of outlined areas: differentiated [3] and undifferentiated [4] cells.

...and differentiation detection



Phase and density images of hiPSC lines PFX#9. 2.5x imaging. Scale bars = 0.45 mm

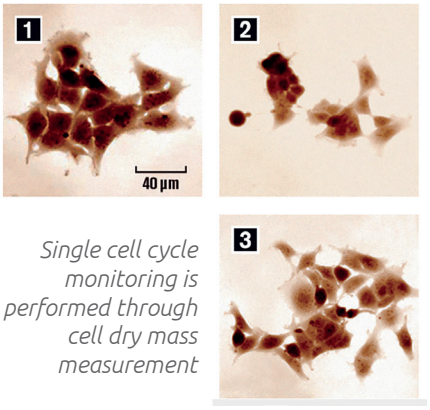
STEM CELL COLONIES IMAGING

Phase and matter density are relevant indicators for stem cells colonies differentiation studies to determine the **differentiation state without any labelling.**

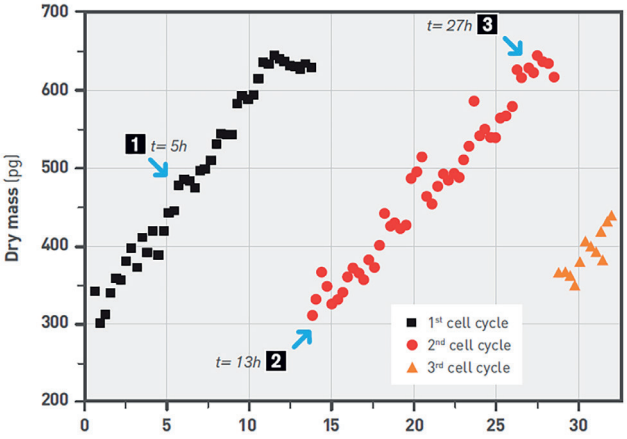
QUANTITATIVE CELL IMAGING

Our solution enables fast and label-free cell imaging. From our artifact-free phase images, we can automatically obtain multiple parameters (morphological parameters, dry mass, growth rate…) on various cell types.

Single cell monitoring



Single cell cycle monitoring is performed through cell dry mass measurement



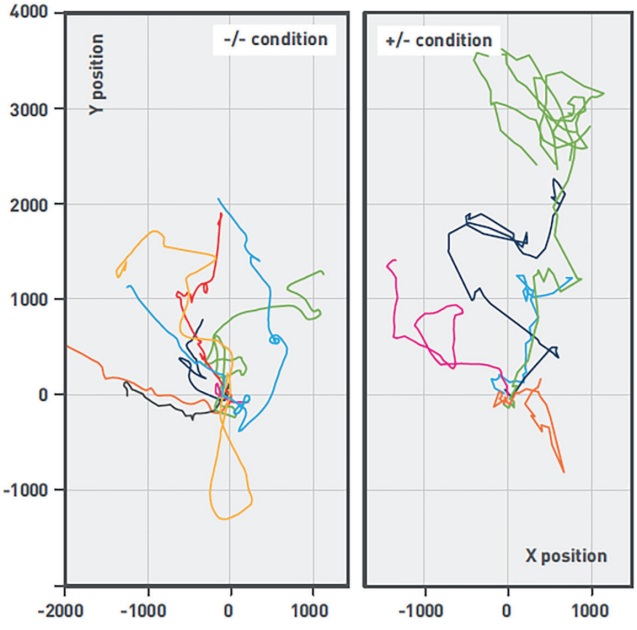
ADVANTAGES

- **Single shot** phase and intensity measurement
- **Non-invasive** label-free modality (enables long experiment durations)
- Achromatic measurements with any type of illumination (white light, LED, Laser)
- **Automated segmentation** & multi-parametric measurements
- Easy fluorescence merging

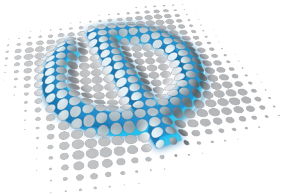
→**For:**

- Cell culture monitoring, cell-based assays
- **Drug screening** & testing
- Cell proliferation study

Single cell tracking / Cell motility



Cell line HT-1080 : human Fibrosarcoma in a µ-slide chemotaxis 3D from IBIDI place into an incubator time lapse (11hours), 20x, 0.5 NA Courtesy of IBIDI Germany



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