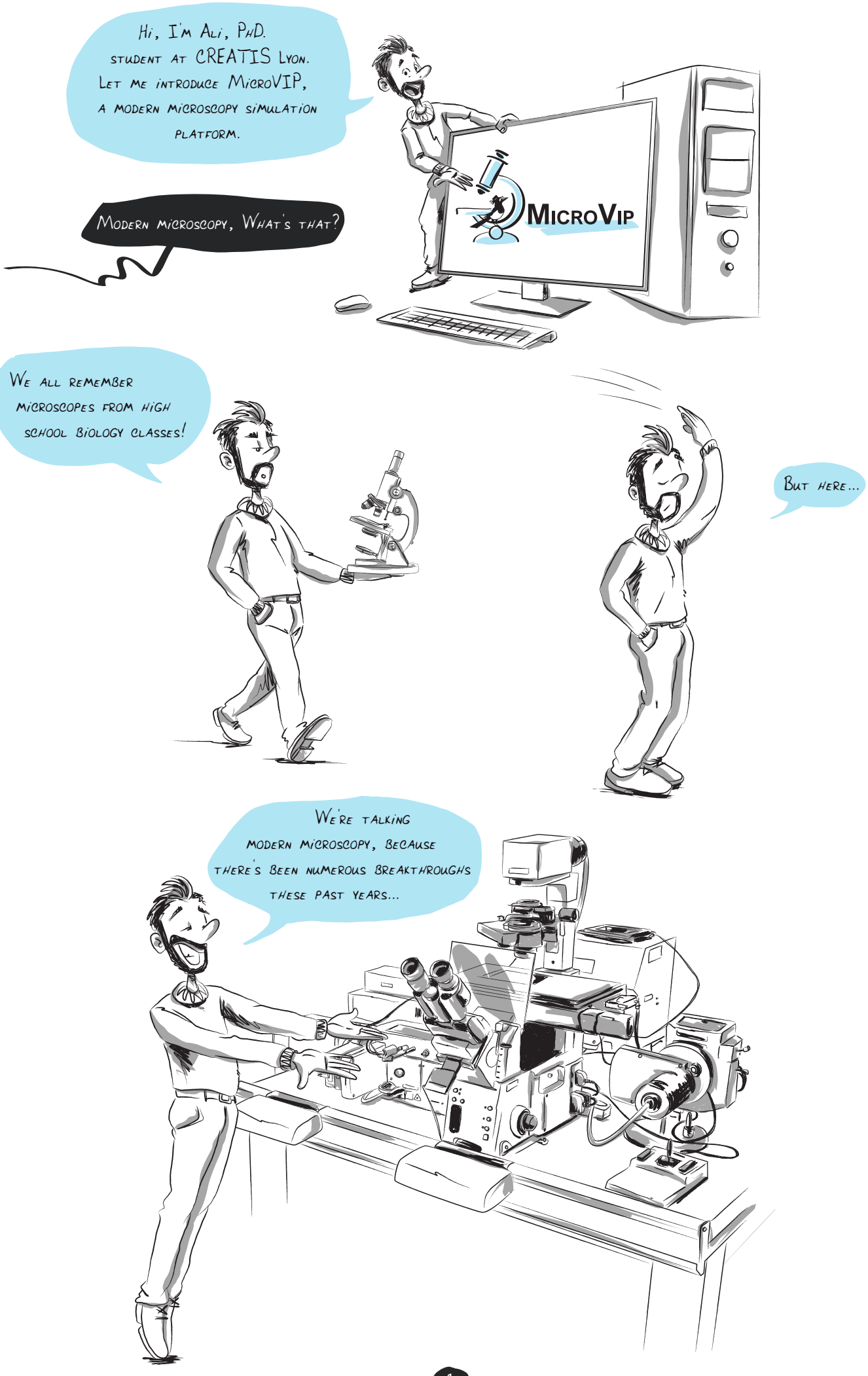
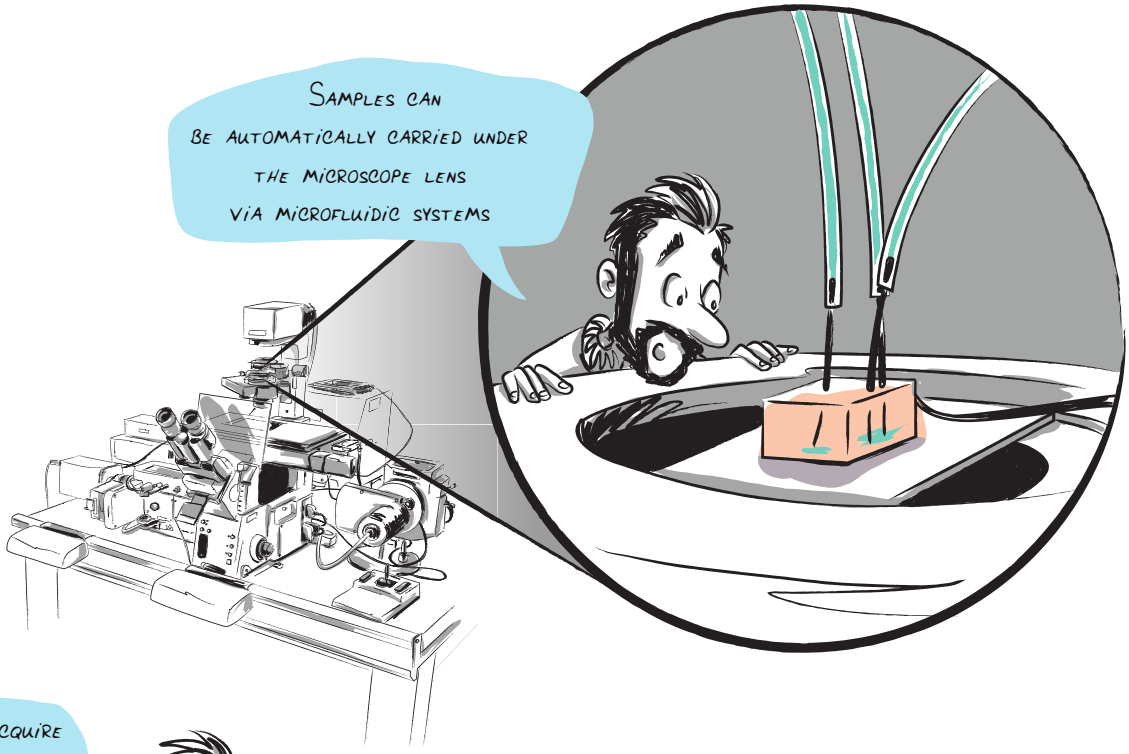
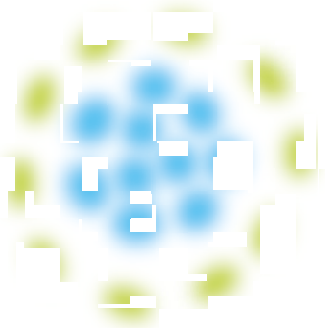
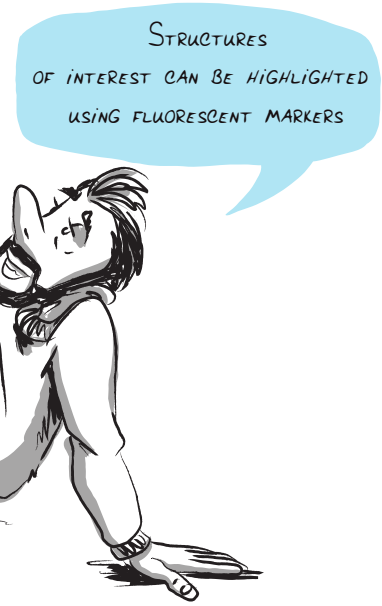

Hi, I'm Ali, PhD. student at CREATIS Lyon. Let me introduce MicroVIP, a modern microscopy simulation platform.
Modern microscopy, What's that?
MicroVip
We all remember microscopes from high school biology classes!
But here...
We're talking modern microscopy, because there's been numerous breakthroughs these past years...

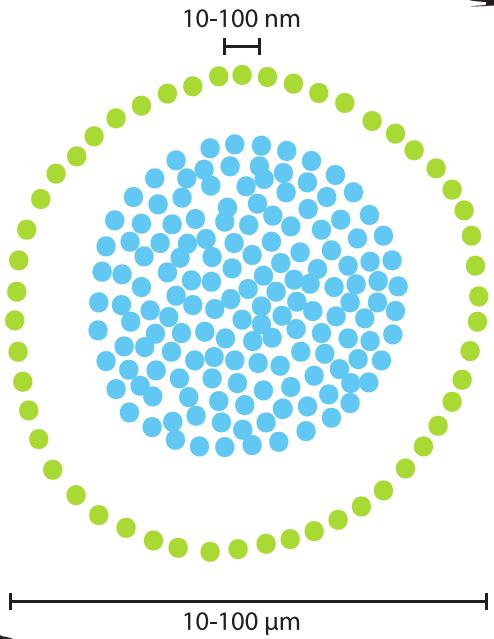

Samples can be automatically carried under the microscope lens via microfluidic systems


We can acquire 3D images




Structures of interest can be highlighted using fluorescent markers

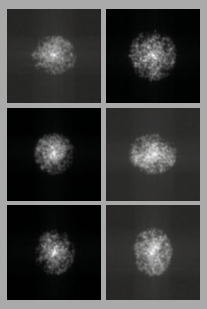

We can observe details with unrivaled resolution
SUPER-RESOLUTION!!


10-100 nm
10-100 µm

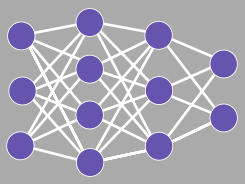
Impressive! What is it used for?

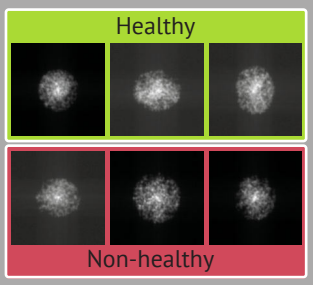
Understanding cells' metabolism, see what happens when they dysfunction...

Many things



Machine learning



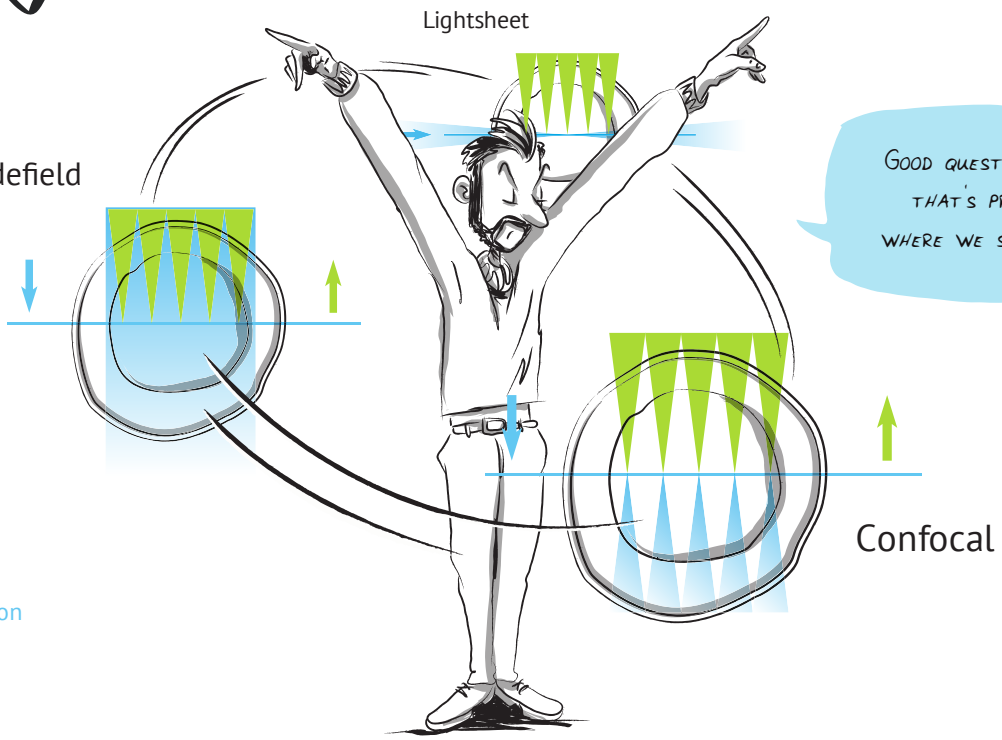


... due to sickness such as viruses or cancer

... it becomes possible to automatically analyse images and then automatically sort them by cell type.

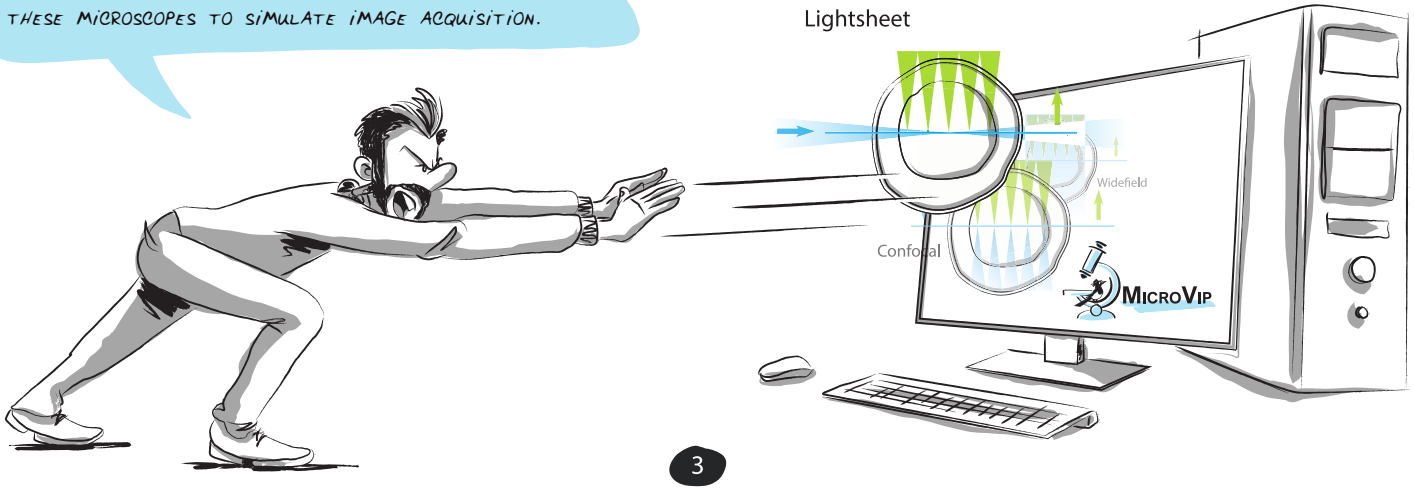
Moreover, using artificial intelligence...

But there are many microscope types, how does one know which one's appropriate?



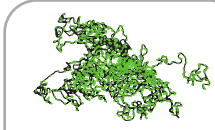
Good question, that's precisely where we step in!

We implemented a digital version of all these microscopes to simulate image acquisition.

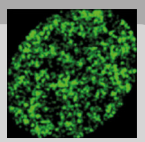


Tell me more about it!

First, we model the biological sample of interest.
In our case, it's chromatin chains
whose organisation depends on the cell's health state.
Afterwards, we simulate these chains' images through different microscopes
We finally train algorithms to sort generated cell images.
This allow us to choose the most appropriate
microscope.



Biological parameters



Simulated image

Image analysis

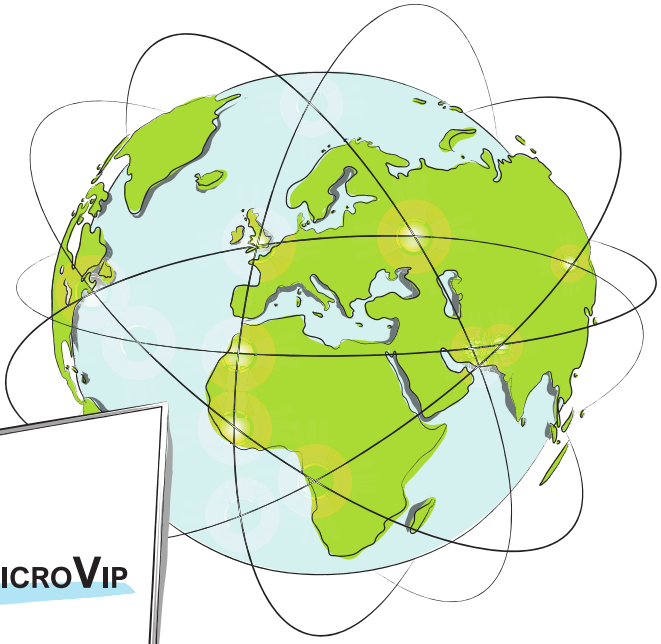
Optical parameters

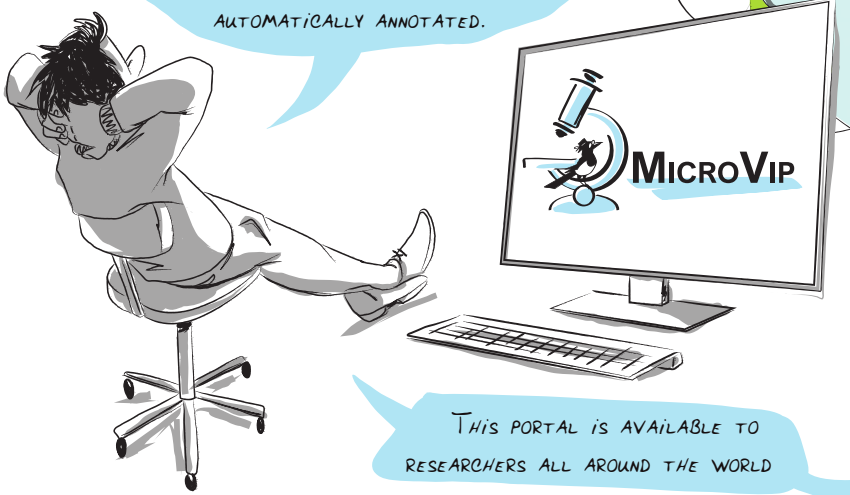
But why don't you perform real microscopy experiments rather than going through all these simulation steps?

Actually, it's a huge time gain because
artificial intelligence needs annotated images
In other words, we need to indicate wheter each cell is healthy
or not. This is very time-consuming!
With simulated samples we automatically have this annotation,
no need to perform it manually.

I see. Then, what does MicroVIP look like?

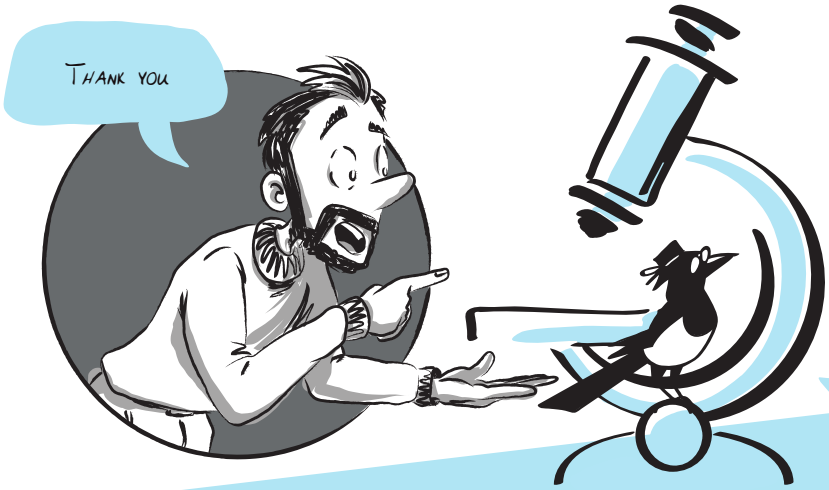
It simply is a web portal
running on a large computation grid
scattered all around Europe.
It allows rapid generation of
a high number of simulated images,
automatically annotated.





This portal is available to
researchers all around the world

During my PhD.
for instance, we collaborated
whith Imperial College London,
Plitecnico Milano, LARIS in Angers,
and even the company Elvesys.



MicroVip

Present work is part of European project PROCHIP "Chromatin organization PROfiling with high-throughput super-resolution microscope on a CHIP".

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PRO Chip

CREATIS

LARIS

CNR IFN
Istituto di Fotonica e Nanotecnologie

UNIVERSITÀ DI TRENTO

Imperial College London

ELVESYS
MICROFLUIDICS INNOVATION CENTER

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

European Commission