

Tools for 3D/4D interactive visualisation of cells and biological tissue

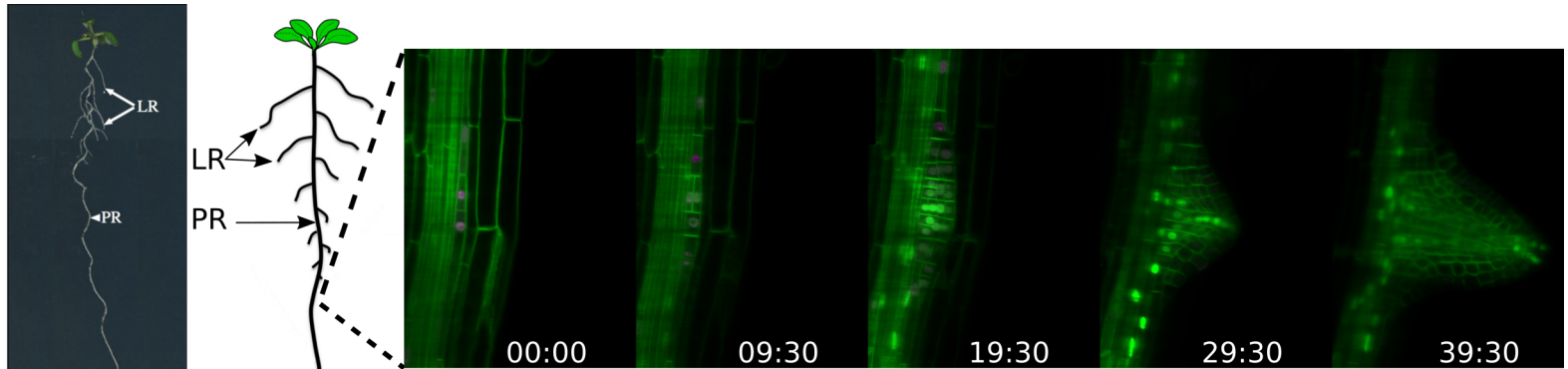
Marion Louveaux
Heidelberg University (Germany)

Twitter: [@MarionLouveaux](https://twitter.com/MarionLouveaux)
GitHub: <https://github.com/marionlouveaux>

useR!2019
July 9-12

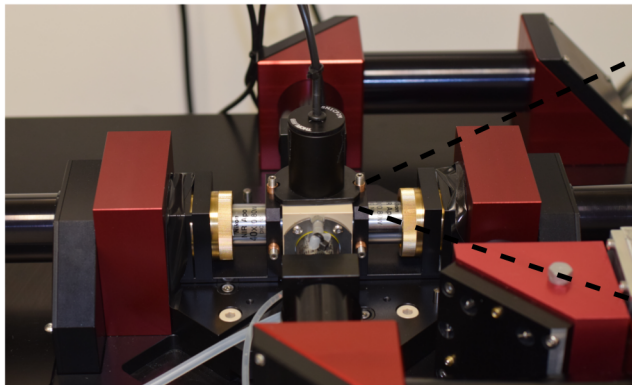
Capturing biological processes with images

3D microscopy images to capture biological processes at cell and organ scale.

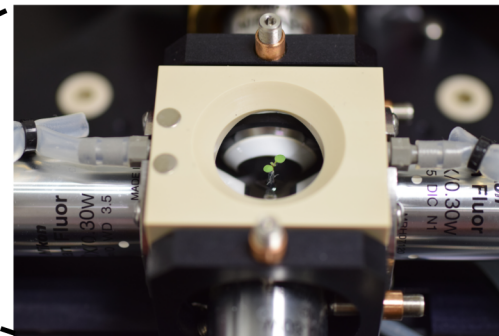


Arabidopsis thaliana
LR: lateral root ; PR: primary root

3D time serie of the development of a lateral root (time in HH:mm)



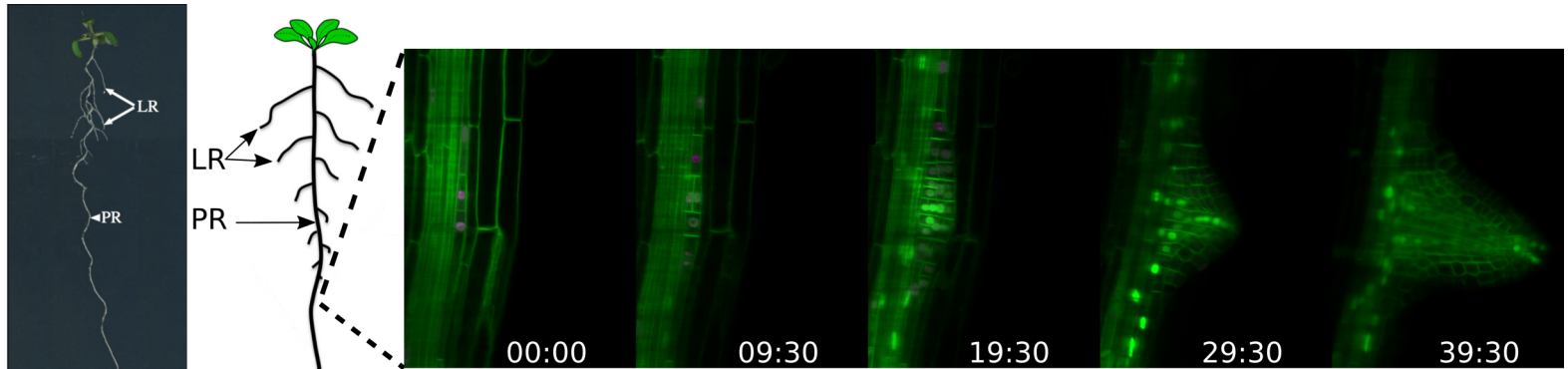
Light sheet microscope



Mounting: Root is lying on a gel cylinder hold by a glass capillary

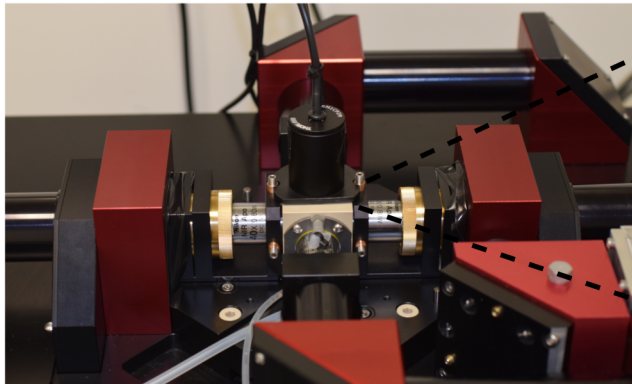
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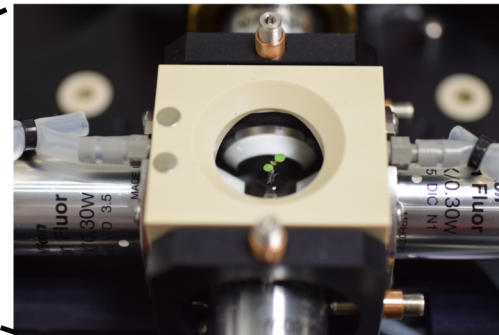


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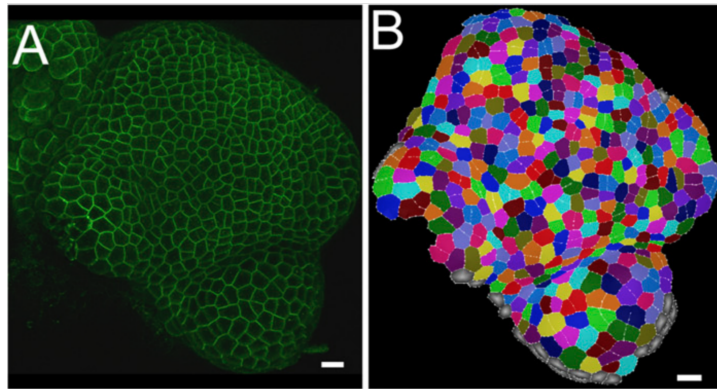
Light sheet microscope



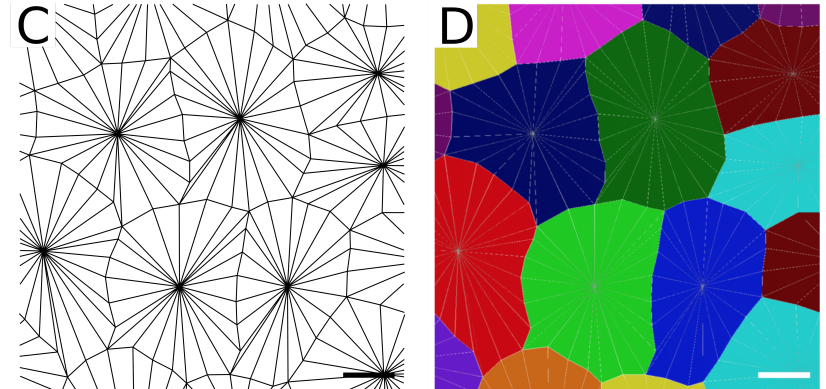
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Biological images are data

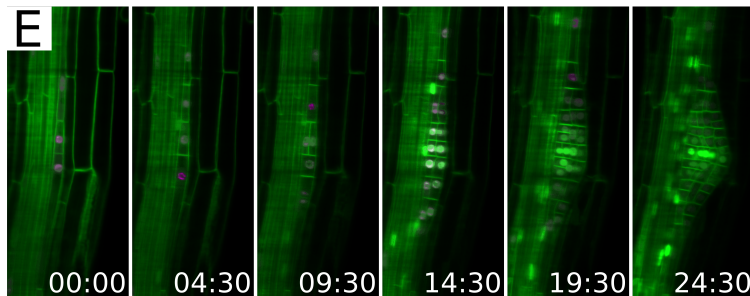
Image processing (**tracking** and **segmentation**) to extract biological information.



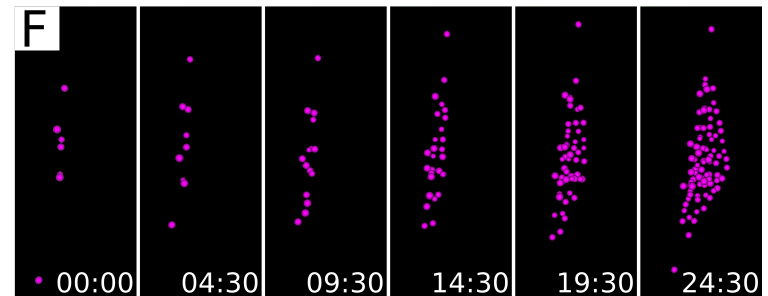
(A) Raw 3D image. (B) 3D surface segmentation.



(C-D) Close-ups on the segmented mesh.



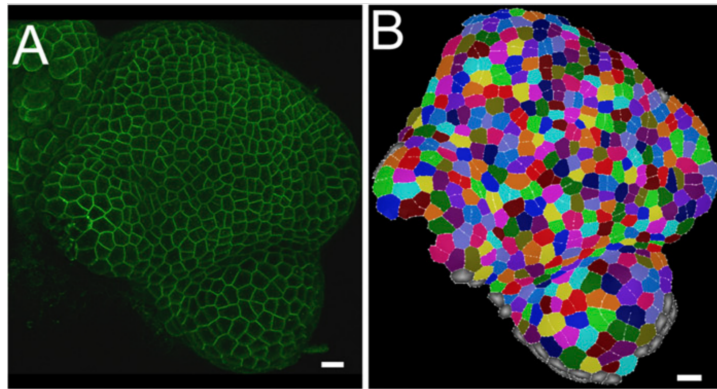
(E) Raw 3D time serie (in HH:mm).



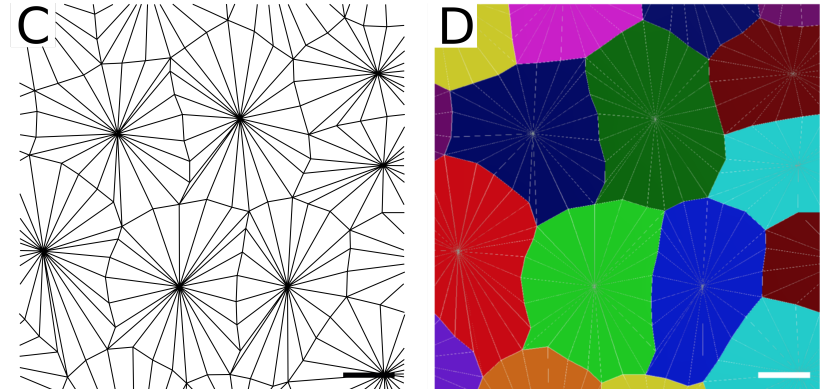
(F) Tracked time serie (in HH:mm).

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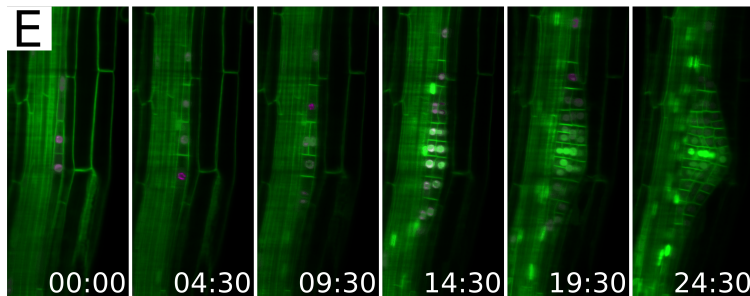
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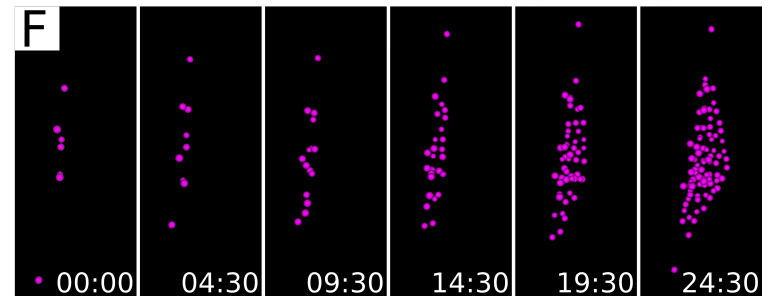
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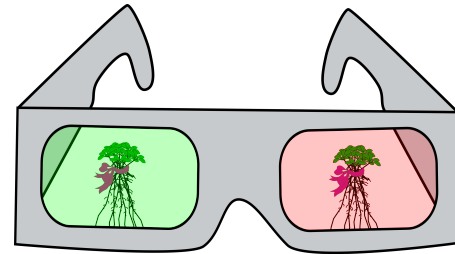


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Biological images are particular data

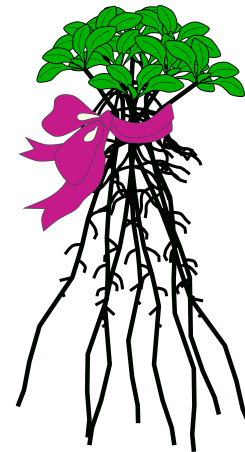
1. Visualise

- Spatio-temporal context



2. Gather

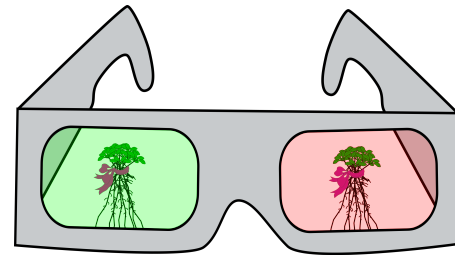
- Many images over time (movie)
- Many individuals to compare
- Many image processing softwares outputs



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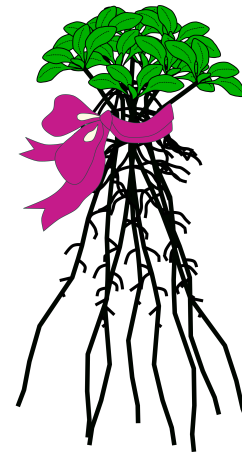
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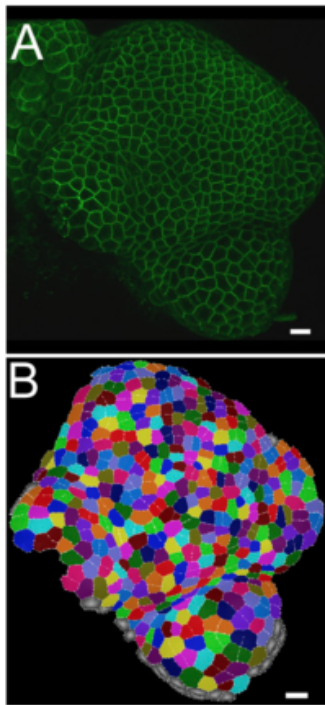
{cellviz3d}: visualisation and gathering of bioimage data

- Available on **GitHub**: [marionlouveaux/cellviz3d](https://github.com/marionlouveaux/cellviz3d)
- Wrapper on the **{plotly}** package
- Meshes and points structures
- 2D, 3D and **3D+time**
- One or several individuals

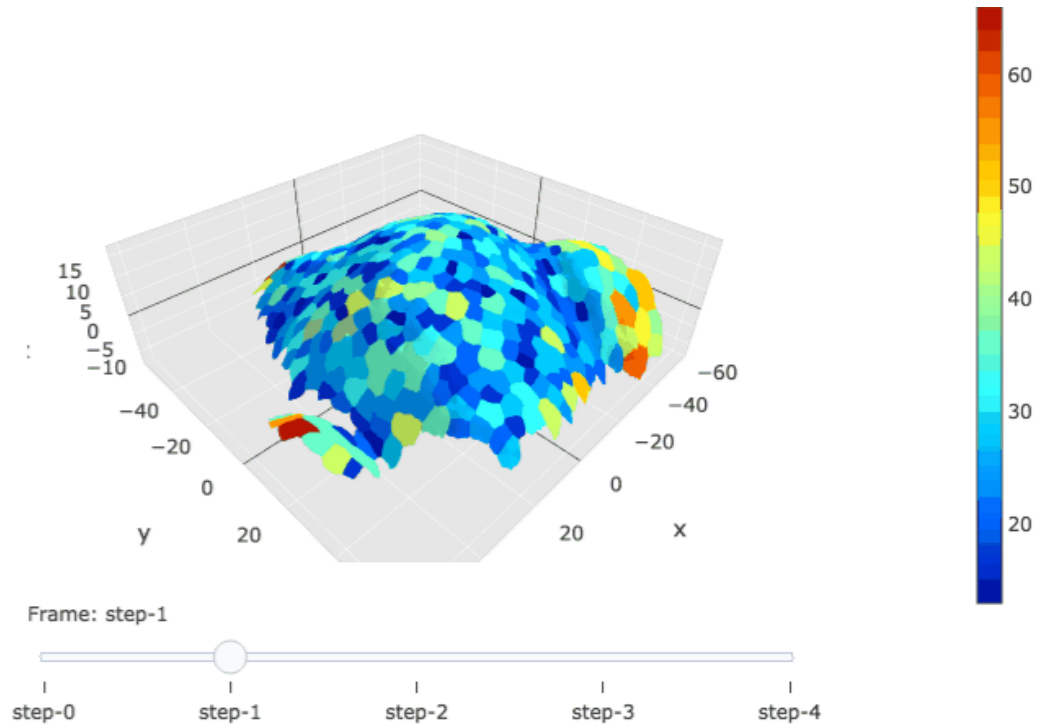
```
install.packages("devtools") # if not yet installed  
  
devtools::install_github("marionlouveaux/cellviz3d",  
  build_vignettes = TRUE)
```


Visualisation of meshes

- **3D mesh:** {rgl} "mesh3d" object & "mesh3d" type for {plotly} traces
- **Color** = biological properties (area, number of neighbours...)
- 2D/3D: plotlyMesh() & **3D+time** (with a slider): plotlyMesh_all()

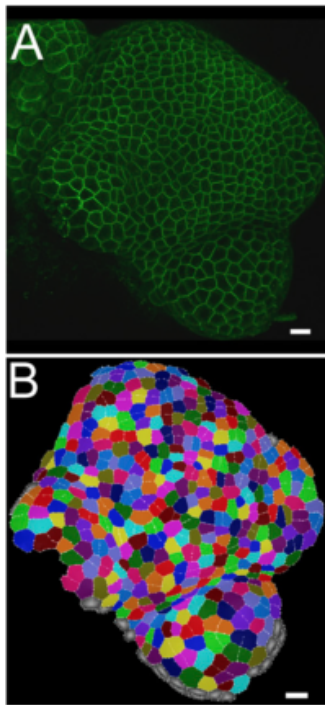


Raw and segmented image

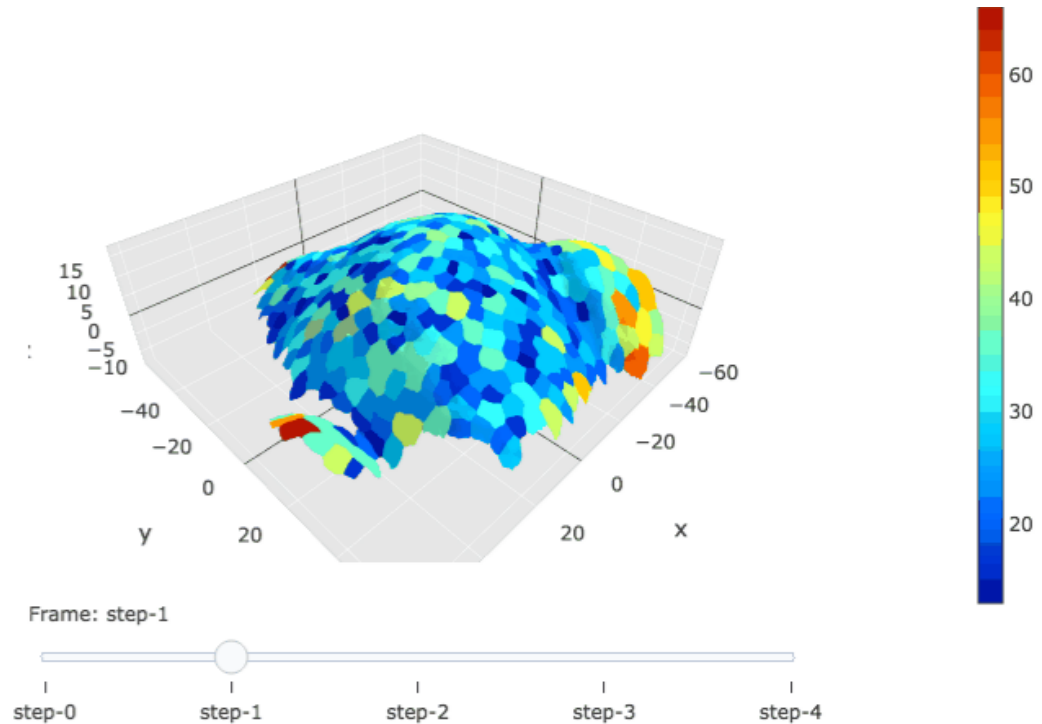


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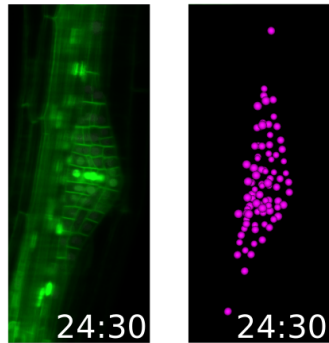


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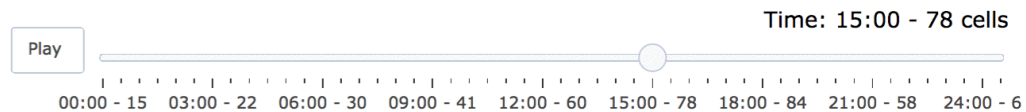
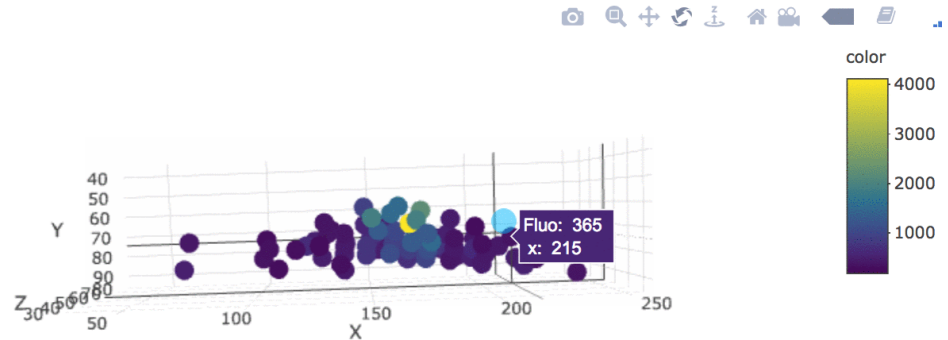


Visualisation of points

- **3D scatterplot**: scatter3d type in {plotly}
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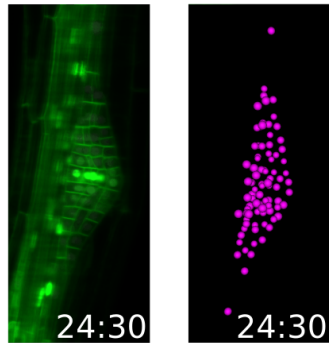


Raw and tracked data

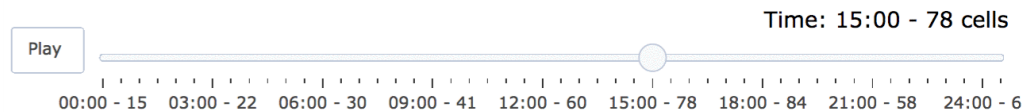
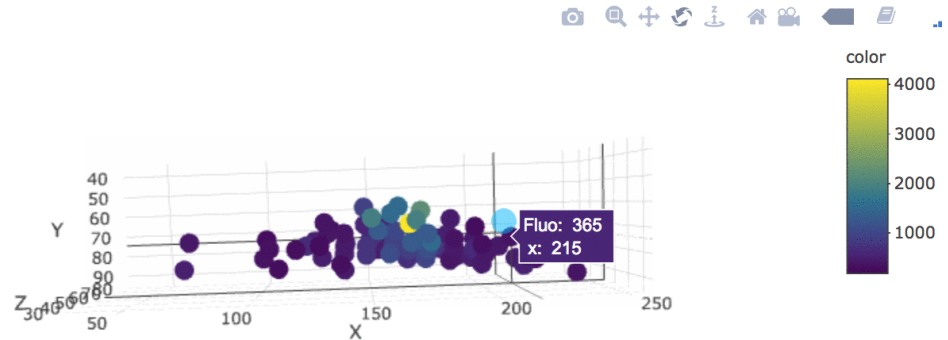


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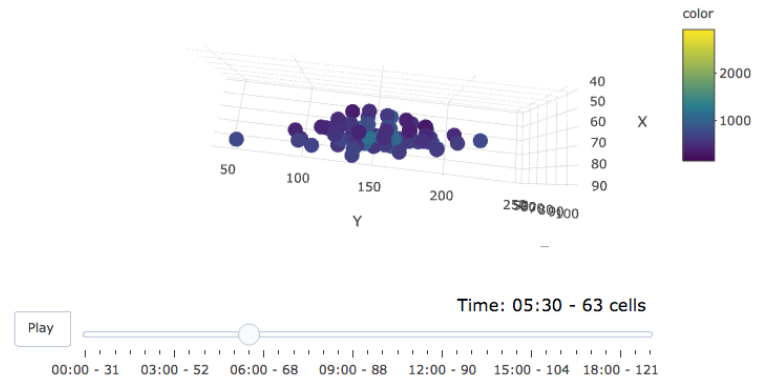
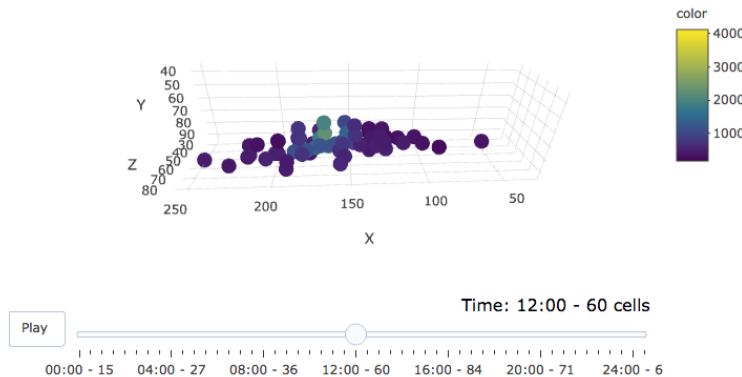
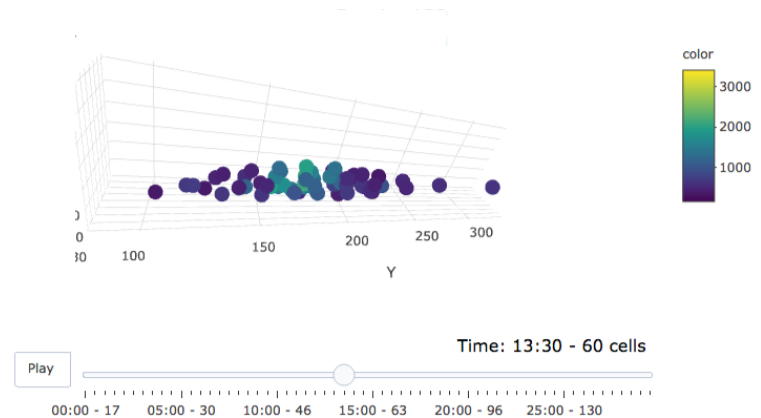
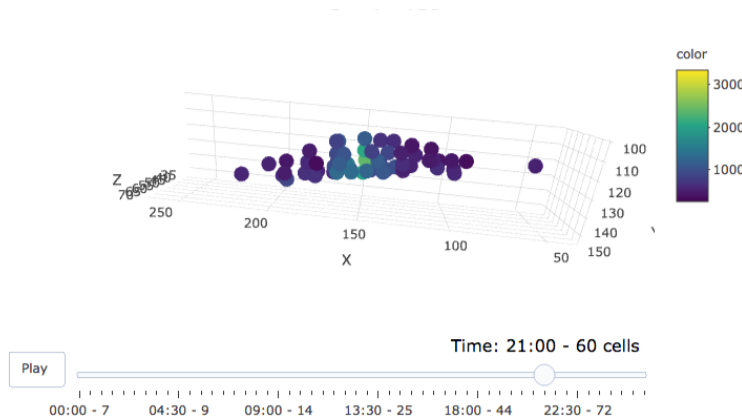


Raw and tracked data



Gathering several individuals

Several plotly animations in a **{shiny}** application with `plotlyOutput()` in ui and `renderPlotly()` in server



{cellviz3d}: visualisation and gathering of bioimage data

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Discussion starters

- Feedbacks? Questions?
- **{plotly}** and/or **{rgl}** enthusiasts?
=> *See you at the coffee break!*

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