Tutorial 1: First *in-silico* microscopy image

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1 Generate the the PSF

The point spread function $PSF(l', m', n')$ is generted using the following command

```
Tut1$ siliscopy gen_psf --method gandy --paramfile parameters.
   dat --calc all --output PSF_gandy --multiprocess
```

This reads the following variables from `parameters.dat`,

- `beta`= 1.037 rad, or `NA` = 1.3 and `meu` = 1.51.
- `dlmn` $0.1, 0.1, 0.2$
- `Plmn` $= 15, 15, 25$
- `fs` $= 800$
- `lam[i]` $= 670, 518$

If `beta` is absent in `parameters.dat`, it will look for `NA` and `meu`, and calculate `beta` using $\beta = \sin^{-1}(NA/\mu)$. The command above creates two PSF files for wavelength 670 nm and 518 nm.

- `PSF_gandy_lam670_fs800.dat`
- `PSF_gandy_lam518_fs800.dat`

2 Calculate *in-silico* monochrome image intensity

The *in-silico* monochrome image intensity $I(l', m')$ is calculated using,

```
Tut1$ siliscopy gen_mono --file dp100.gro --paramfile
   parameters.dat --psf PSF_gandy --output img100
Tut1$ siliscopy gen_mono --file dp2000.gro --paramfile
   parameters.dat --psf PSF_gandy --output img2000
```

This uses the PSF files generated in the previous step (`--psf PSF_gandy`), and reads the following variables from `parameters.dat`,

- `fs` $= 800$
- `lam[i]` $= 670, 518$
- `lam_names[i]`
- `dlmn` $= 0.1, 0.1, 0.2$
- `Plmn` $= 15, 15, 25$
- `maxlen` $= 25, 25, 25$
- `focus_cor` $= 12.5$
- `opt_axis` $= 2$
- `pbc` $=$ xyz

The command above generates image data files,

- `img100_lam670_fs800.dat`
- `img100_lam518_fs800.dat`
- `img2000_lam670_fs800.dat`
- `img2000_lam518_fs800.dat`

3 Generate monochrome *in-silico* microscopy images

Monochrome *In-silico* images can be generated using the following commands,

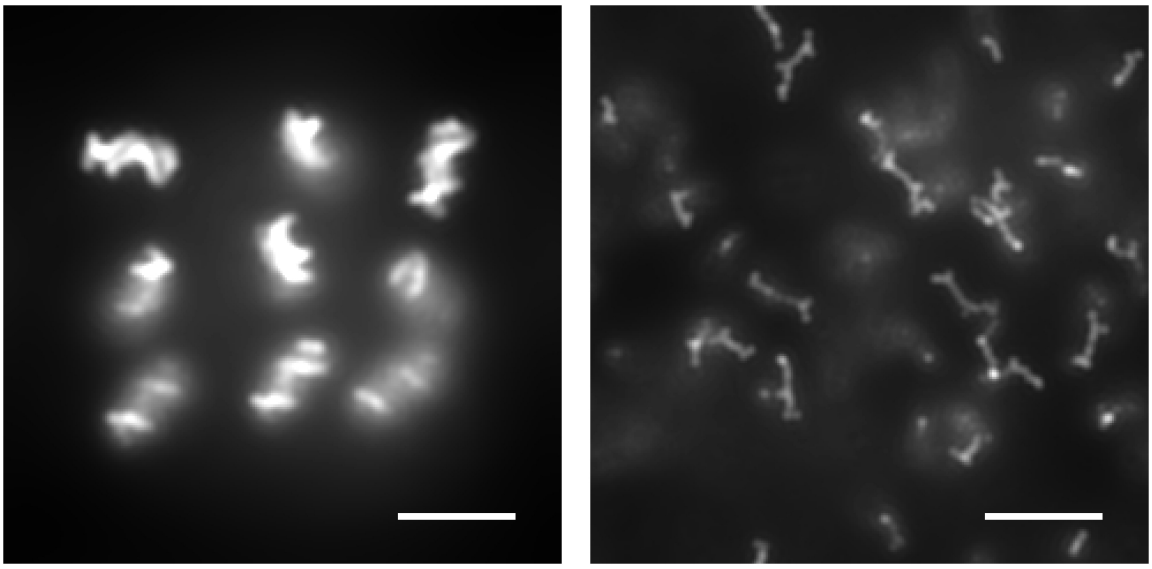
```
Tut1$ siliscopy plot --file img --paramfile parameters.dat --
    method mono --timestep 100 --calc specific
Tut1$ siliscopy plot --file img --paramfile parameters.dat --
    method mono --timestep 2000 --calc specific
```

This reads the image intensity files calculated in the previous step, and reads the following variables from `parameters.dat`

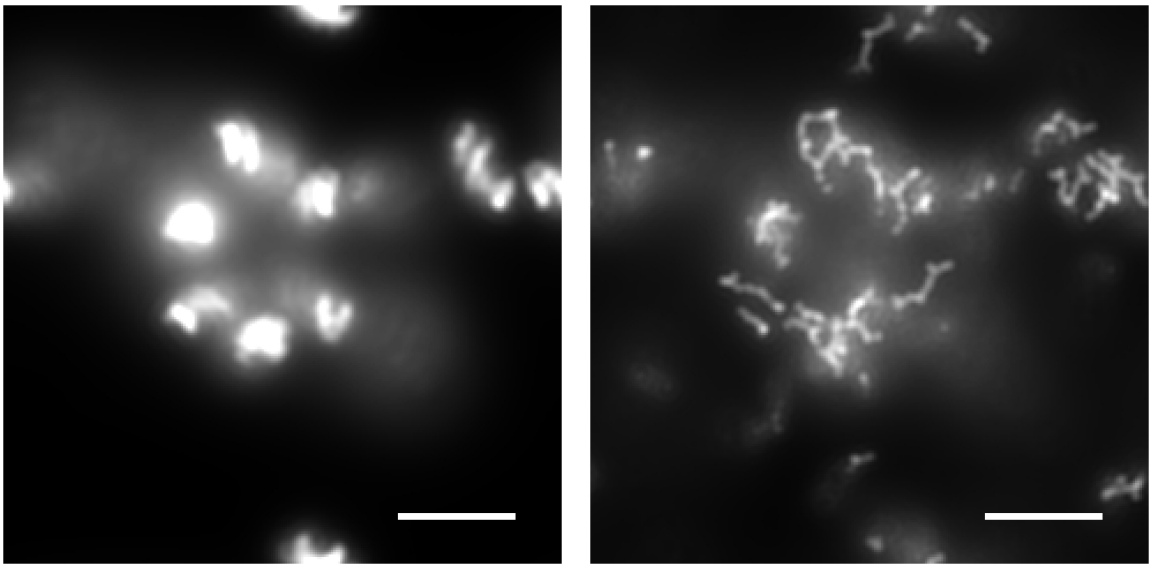
- `fs` $= 800$
- `T` $= 1$
- `scale` $= 5$
- `dpi` $= 600$
- `lam[i]` $= 670, 518$
- `lam_I0_[i]` $= 0.13, 0.25$
- `dlmn` $= 0.1, 0.1, 0.2$
- `maxlen` $= 25, 25, 25$

The above command generates the following images:

- `img100_lam670_fs800_T1_I0.13.jpeg`, `img100_lam518_fs800_T1_I0.25.jpeg`



- `img2000_lam670_fs800_T1_I0.13.jpeg`, `img2000_lam518_fs800_T1_I0.25.jpeg`



4 Generate colored *in-silico* microsocpy image.

Coloured *In-silico* images can be generated using the following commands,

```
Tut1$ siliscopy plot --file img --paramfile parameters.dat --
    method color--timestep 100 --calc specific
Tut1$ siliscopy plot --file img --paramfile parameters.dat --
    method color --timestep 2000 --calc specific
```

This reads the image intensity files calculated in the previous step, and reads the following variables from `parameters.dat`

- `fs` $= 800$
- `T` $= 1$
- `scale` $= 5$
- `dpi` $= 600$
- `lam[i]` $= 670, 518$
- `lam_I0_[i]` $= 0.13, 0.25$
- `lam_hue[i]` $= 255, 60$
- `dlmn` $= 0.1, 0.1, 0.2$
- `maxlen` $= 25, 25, 25$

The above command generates the following images:

- `img100_fs800_T1_I_0.13_0.25.jpeg`, `img2000_fs800_T1_I_0.13_0.25.jpeg`