Tutorial 3: Generating *in-silico* microscopy image with different resolution (f_s) and brightness (I_0)

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1 Generate PSF

In this tutorial, we will create images for two different f_s 600 and 800, and three different I_0 $0.1, 0.2, 0.3$ for each f_s. Since we created the PSF for `fs = 800` in Tutorial 1, we can reuse those files. We generate the PSF files for $f_s = 600$ using the command,

```
Tut3$ siliscopy gen_psf --method gandy --paramfile param_600.dat
   --calc all --output PSF_gandy --multiprocess
```

This command reads the following variables from `param_600.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` $= 600$
- `lam[i]` $= 670, 518$

2 Generate *in-silico* monochrome image intensities

This step, is similar to **Tutorial 1**. Instead of `parameter.dat`, we have two parameter files `param_800.dat` and `param_600.dat`. The major difference between `param_600.dat` and `param_800.dat` is the value of `fs`. The monochrome image intensities for each f_s is calcualted using the commands,

```
Tut3$ siliscopy gen_mono --file dp100.gro --paramfile --param_800
   .dat --psf PSF_gandy --output img100
Tut3$ siliscopy gen_mono --file dp100.gro --paramfile --param_600
   .dat --psf PSF_gandy --output img100
```

These commands reads the following parameters from `param_800.dat` or `param_600.dat`.

- `fs` = 800 or 600
- `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

3 Generate colored *in-silico* microscopy images

To generate the images with different I_0 and f_s we use the script `gen_I0_fs.sh`,

```
Tut3$ bash gen_I0_fs.sh
```

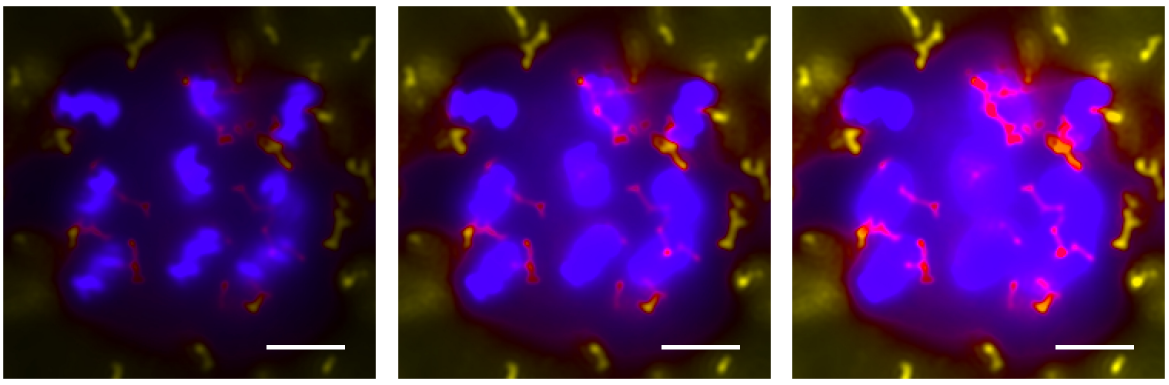
In the script, value of I_0 is changed using the replace funciton of `sed`, where `${fs}` takes the value of 600 and 800. The command in line 14, calculates the colored images.

```
11          sed "s/lam_I0_1\s*=.*/lam_I0_1=$I0/g" param_${fs}.dat > foo.dat
12          sed -i "s/lam_I0_2\s*=.*/lam_I0_2=$I0/g" foo.dat
13          siliscopy plot --file img --paramfile foo.dat --method color \
14                         --timestep 100 --calc specific
```

This creates six `JPEG` image files.

- `img100_fs600_T1_I_0.1_0.1.jpeg`
- `img100_fs600_T1_I_0.2_0.2.jpeg`
- `img100_fs600_T1_I_0.3_0.3.jpeg`
- `img100_fs800_T1_I_0.1_0.1.jpeg`
- `img100_fs800_T1_I_0.2_0.2.jpeg`
- `img100_fs800_T1_I_0.3_0.3.jpeg`

Images for $f_s = 600$: $I_0 = 0.1$ (left), 0.2 (middle), and 0.3 (right)



Images for $f_s = 800$: $I_0 = 0.1$ (left), 0.2 (middle), and 0.3 (right)