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 400 and 530, and three different I_0 $0.1, 0.2, 0.3$ for each f_s. Since we created the PSF for `fs = 530` in Tutorial 1, we can reuse those files. We generate the PSF files for $f_s = 400$ using the command,

```
Tut3$ siliscopy gen_psf --method gandy --paramfile param_400.dat
   --calc all --output PSF_gandy --multiprocess
```

This command reads the following variables from `param_400.dat`,

- `NA` $= 1.3$
- `meu` $= 1.51$.
- `dlmn` $0.1, 0.1, 0.2$
- `Plmn` $= 15, 15, 25$
- `fs` $= 400$
- `lam1`, `lam2` $= 670, 518$

2 Generate *in-silico* monochrome image intensities

This step, is similar to **Tutorial 1**. Instead of `parameter.dat`, we have two parameter files `param_530.dat` and `param_400.dat`. The only difference between `param_400.dat` and `param_530.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_530
   .dat --psf PSF_gandy --output img100 --method slice
Tut3$ siliscopy gen_mono --file dp100.gro --paramfile --param_400
   .dat --psf PSF_gandy --output img100 --method slice
```

These commands reads the following parameters from `param_530.dat` or `param_400.dat`.

- `fs` = 530 or 400
- `lam1`, `lam2` = 670, 518
- `lam_names1` , `lam_names2`
- `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 400 and 530. The command in line 13-14, 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 --type jpeg
```

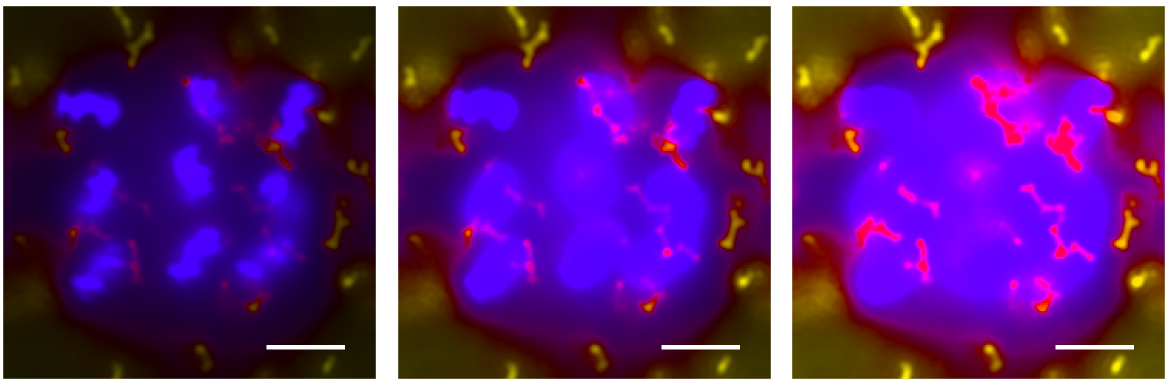
This command uses the image intensities generated in the previous step, and reads the following variables from `parameters.dat`

- `fs` = 530
- `lam1`, `lam2` = 670, 518
- `lam_I0_1`, `lam_I0_2` = 0.13, 0.25
- `lam_hue1`, `lam_hue2` = 255, 60
- `dlmn` = 0.1, 0.1, 0.2
- `maxlen` = 25, 25, 25
- `T` = 1
- `scale` = 5
- `dpi` = 400
- `opt_axis` = 2

This creates six `JPEG` image files:

- `img100_fs400_T1_I_0.1_0.1.jpeg`
- `img100_fs400_T1_I_0.2_0.2.jpeg`
- `img100_fs400_T1_I_0.3_0.3.jpeg`
- `img100_fs530_T1_I_0.1_0.1.jpeg`
- `img100_fs530_T1_I_0.2_0.2.jpeg`
- `img100_fs530_T1_I_0.3_0.3.jpeg`

Images for $f_s = 400$: $I_0 = 0.1$ (left), 0.2 (middle), and 0.3 (right)



Images for $f_s = 530$: $I_0 = 0.1$ (left), 0.2 (middle), and 0.3 (right)