

# Tutorial 4: Generating *in-silico* microscopy image with different optical axis and focus coordinate

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For this tutorial, PSF files generated in **Tutorial 1** is used.

## 1 Generate *in-silico* monochrome image intensities

The monochrome image intensities are generated using the script `gen_imgdat_xyz.sh`,

```
Tut2$ bash gen_imgdat_xyz.sh
```

The optical axis and focus coordinate in `parameter.dat` is changed using the replace function in `sed`,

```
1 #!/bin/bash
2 dir_name=(x y z)
3
4 for dir in 0 1 2
5 do
6     sed "s/opt_axis\s*=.*$/opt_axis = $dir/g" parameters.dat > foo.dat
7     for cor in 3 6 9
8     do
9         sed -i "s/focus_cor\s*=.*$/focus_cor = $cor/g" foo.dat
10        siliscopy gen_mono --file dp100.gro --paramfile foo.dat \
11                        --psf PSF_gandy \
12                        --output img_${dir_name[$dir]}${cor}_100
13    done
14 done
```

The variable `opt_axis` (optical axis) is changed to 0, 1, and 2 (corresponding to x, y and z) in the first for loop. In the second for loop the variable `focus_cor` (focus coordinate) is changed to 3, 6 and 9 nm. This uses the following variables from the temporary `foo.dat`,

- `fs` = 800
- `lam[i]` = 670, 518
- `Plmn` = 15, 15, 25
- `maxlen` = 25, 25, 25
- `pbc` = xyz
- `lam_names[i]`
- `dlnm` = 0.1, 0.1, 0.2
- `focus_cor` = 3 or 6 or 9
- `opt_axis` = 0 or 1 or 2

The bash script creates 18 image intensity files,

- `img_x3_100_lam518_fs800.dat`
- `img_x6_100_lam518_fs800.dat`
- `img_x9_100_lam518_fs800.dat`
- `img_y3_100_lam518_fs800.dat`
- `img_y6_100_lam518_fs800.dat`
- `img_y9_100_lam518_fs800.dat`
- `img_z3_100_lam518_fs800.dat`
- `img_z6_100_lam518_fs800.dat`
- `img_z9_100_lam518_fs800.dat`
- `img_x3_100_lam670_fs800.dat`
- `img_x6_100_lam670_fs800.dat`
- `img_x9_100_lam670_fs800.dat`
- `img_y3_100_lam670_fs800.dat`
- `img_y6_100_lam670_fs800.dat`
- `img_y9_100_lam670_fs800.dat`
- `img_z3_100_lam670_fs800.dat`
- `img_z6_100_lam670_fs800.dat`
- `img_z9_100_lam670_fs800.dat`

## 2 Generate colored *in-silico* microscopy images

The generation of colored microsocopy images is similar to **Tutorial 1**. It is achieved through the script `gen_jpeg_xyz.sh`,

```
Tut2$ bash gen_jpeg_xyz.sh
```

Similar to `gen_imgdat_xyz.sh`, `gen_jpeg_xyz.sh` uses replace functionality of `sed` to change the values of `opt_axis` and `focus_cor`. Specifically, images is generated by the command,

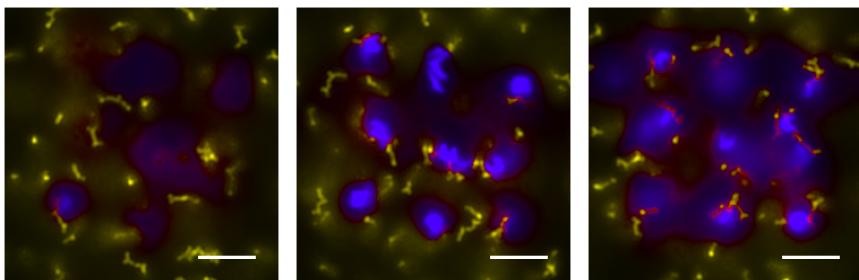
```
10      siliscopy plot --file img_${dir_name[$dir]}${cor}_ \
11          --paramfile foo.dat --method color \
12          --timestep 100 --calc specific
```

This uses the following variables from the temporary `foo.dat`,

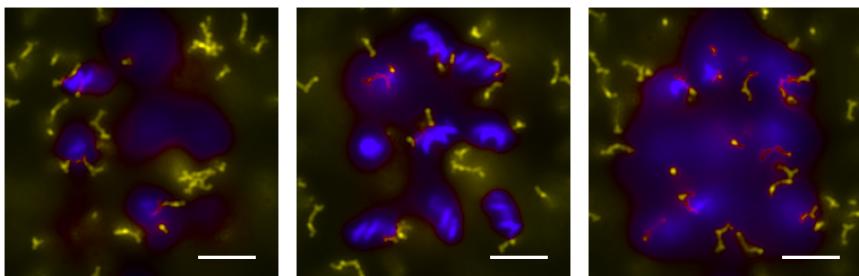
- `fs` = 800
- `lam[i]` = 670, 518
- `lam_I0_[i]` = 0.13, 0.25
- `lam_hue[i]` = 255, 60
- `dpi` = 600
- `dlmn` = 0.1, 0.1, 0.2
- `maxlen` = 0.25, 0.25, 0.25
- `T` = 1
- `scale` = 5

This creates the following 3 JPEG files for each direction x, y and z:

- `img_x3_100_fs800_T1_I_0.13_0.25.jpeg` (left)
- `img_x6_100_fs800_T1_I_0.13_0.25.jpeg` (middle)
- `img_x9_100_fs800_T1_I_0.13_0.25.jpeg` (right)



- `img_y3_100_fs800_T1_I_0.13_0.25.jpeg` (left)
- `img_y6_100_fs800_T1_I_0.13_0.25.jpeg` (middle)
- `img_y9_100_fs800_T1_I_0.13_0.25.jpeg` (right)



- `img_z3_100_fs800_T1_I_0.13_0.25.jpeg` (left)
- `img_z6_100_fs800_T1_I_0.13_0.25.jpeg` (middle)
- `img_z9_100_fs800_T1_I_0.13_0.25.jpeg` (right)

