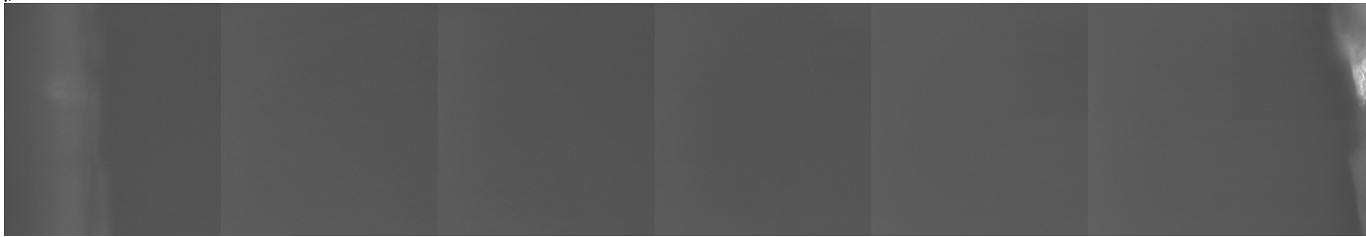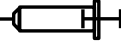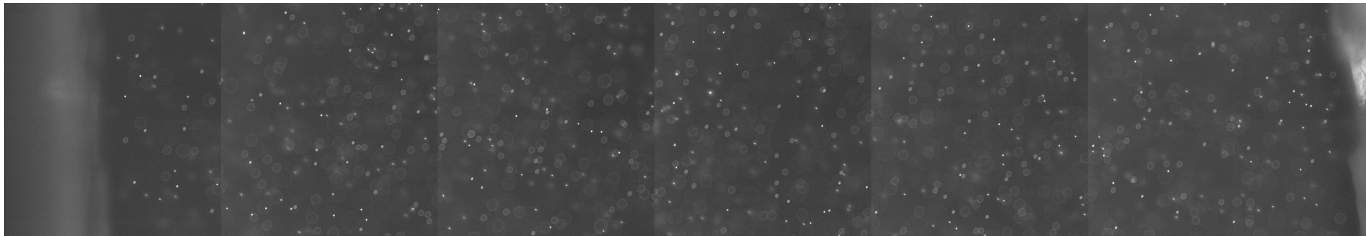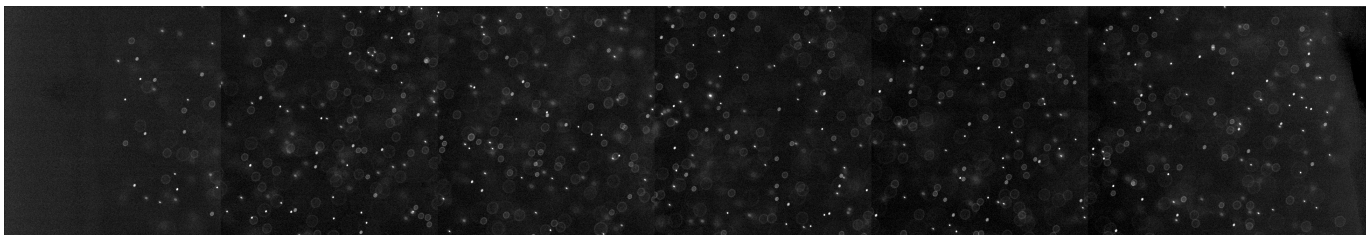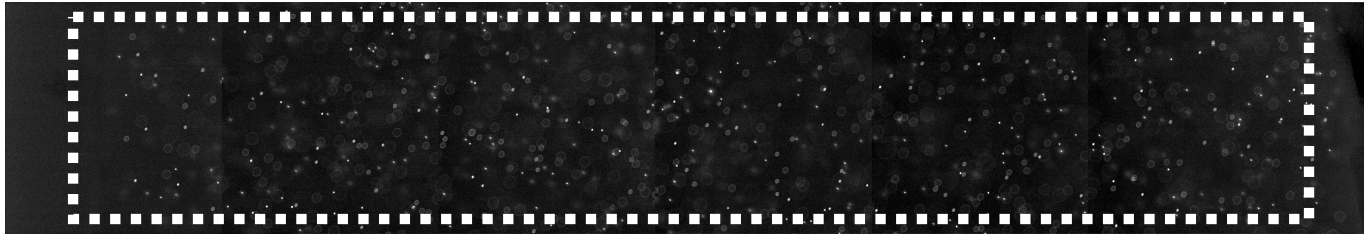Bacterial suspension

Flow

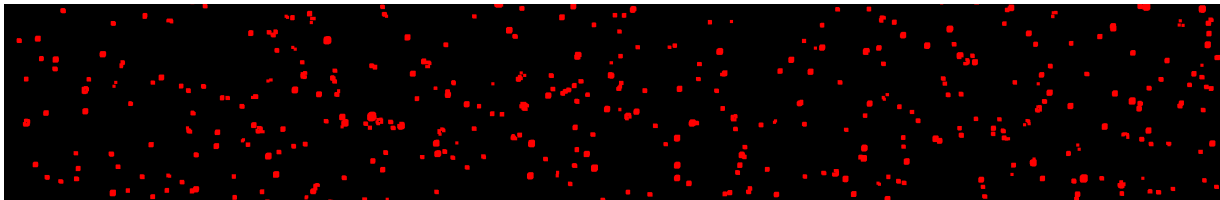Observation channel

Background

Bacteria

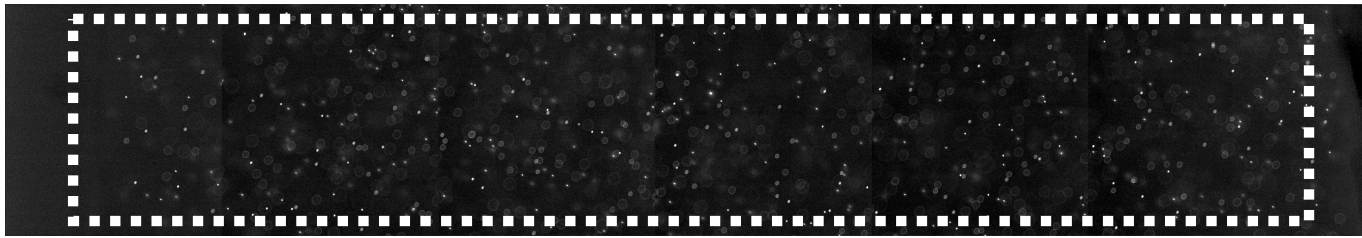Bacteria - Background
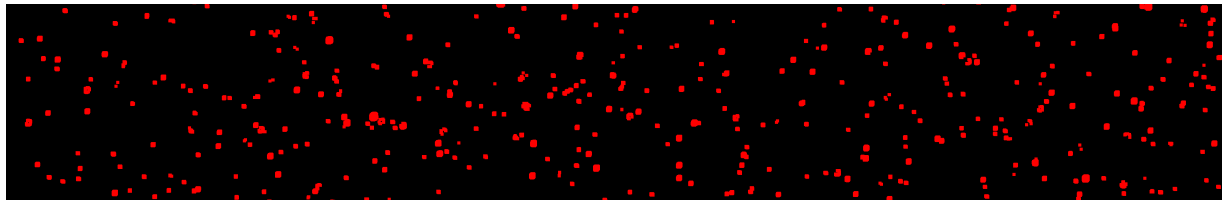
Crop

Threshold & binarize

Remove small clusters

$$\text{\# of bacteria} = \frac{\sum_{k=1}^{N} A_k}{A_b} \quad ; A_b = \text{average cell surface}$$

$$\text{Concentration of bacteria} = \frac{\text{\#of bacteria}}{S \cdot h} \quad ; S = \text{image surface}, h = \text{depth of focus}$$

Crop

Threshold & binarize

Remove small clusters

$$\text{\# of bacteria } = \frac{\sum_{k=1}^{N} A_k}{A_b} \quad ; A_b = \text{average cell surface}$$

$$\text{Concentration of bacteria} = \frac{\#\text{of bacteria}}{S \cdot h} \; ; S = \text{image surface}, h = \text{depth of focus}$$

Crop

Threshold & binarize

Remove small clusters

$$\# \text{ of bacteria } = \frac{\sum_{k=1}^{N} A_k}{A_b} \quad ; A_b = \text{average cell surface}$$

$$\text{Concentration of bacteria} = \frac{\#\text{of bacteria}}{S \cdot h} \; ; S = \text{image surface}, h = \text{depth of focus}$$
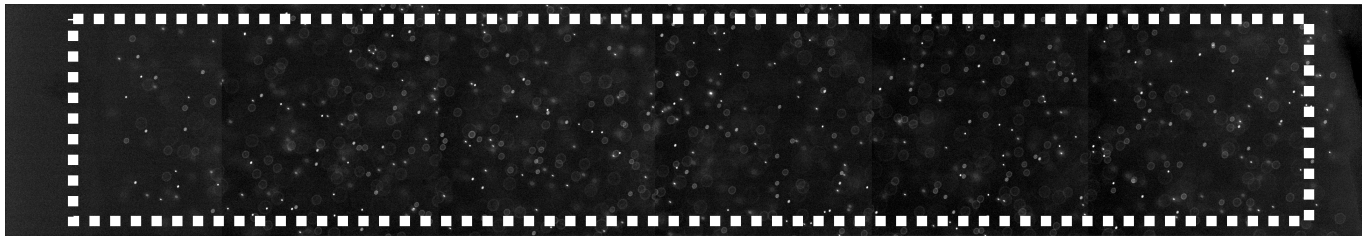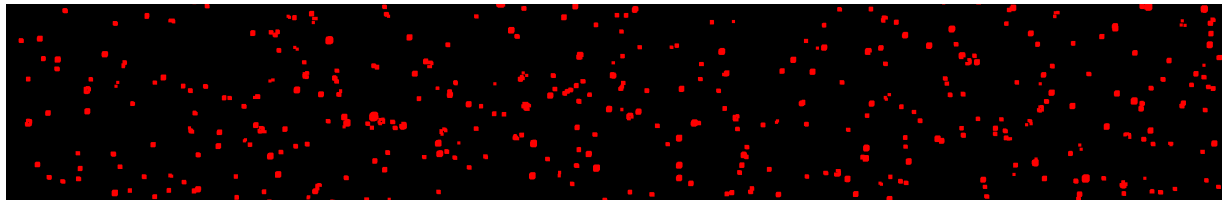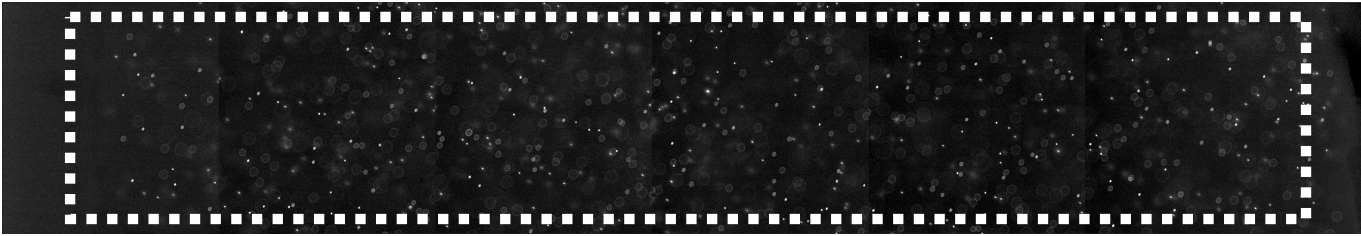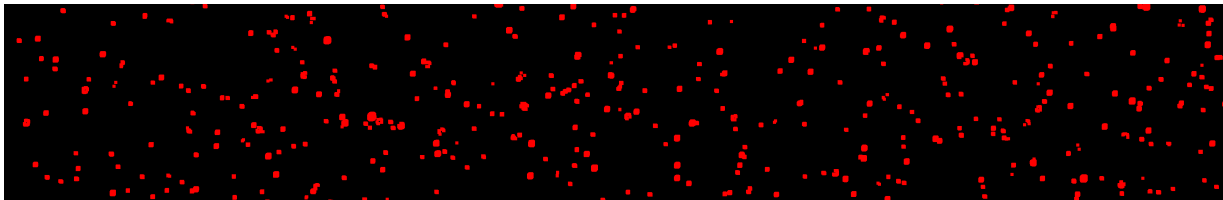
Crop

Threshold & binarize

Remove small clusters

$$\text{\# of bacteria } = \frac{\sum_{k=1}^{N} A_k}{A_b} \quad ; A_b = \text{average cell surface}$$

$$\text{Concentration of bacteria} = \frac{\#\text{of bacteria}}{S \cdot h} \; ; S = \text{image surface}, h = \text{depth of focus}$$
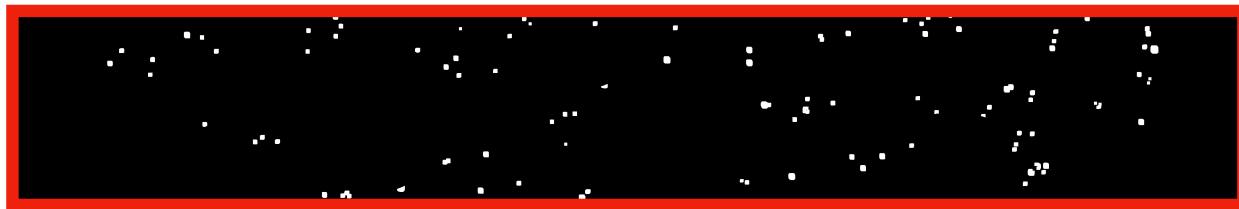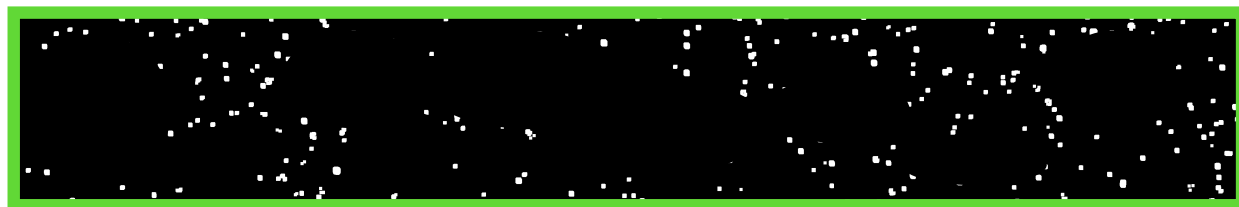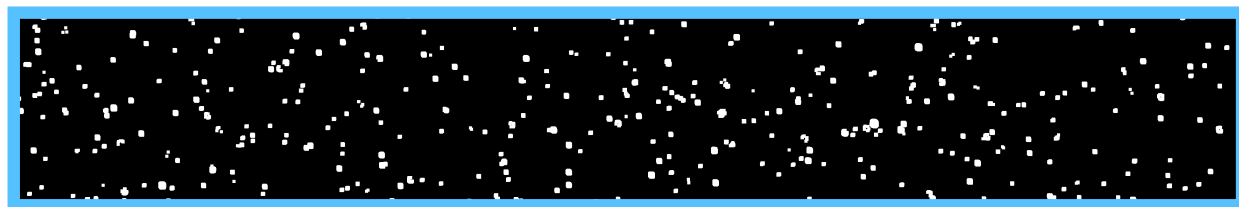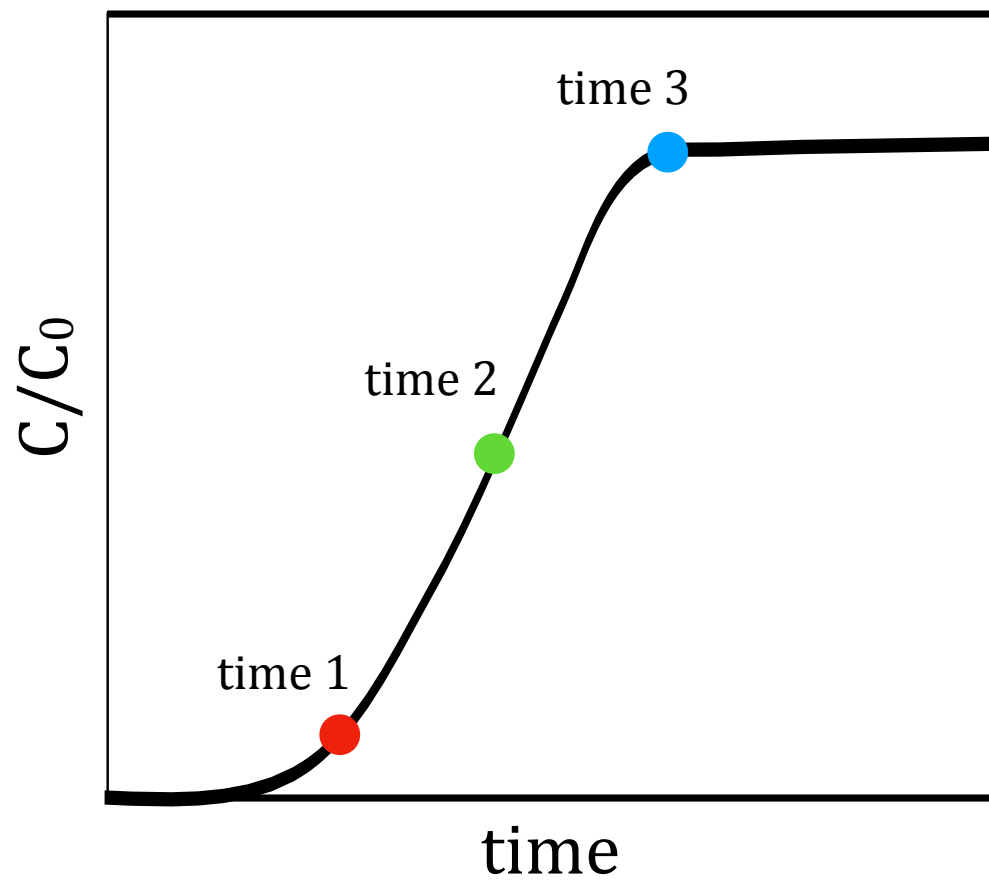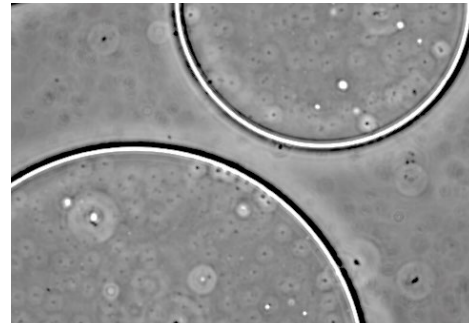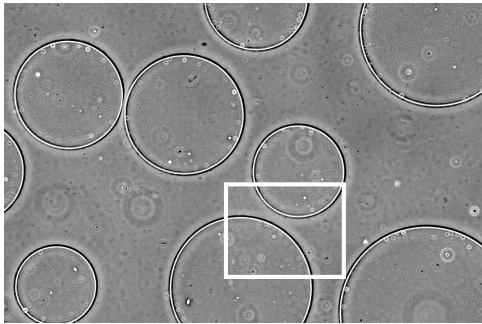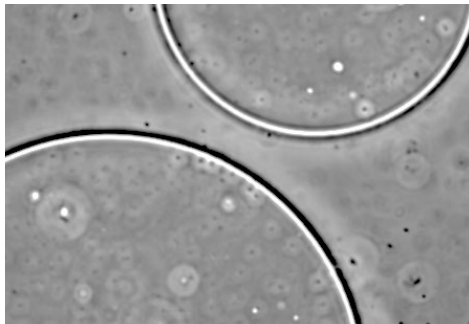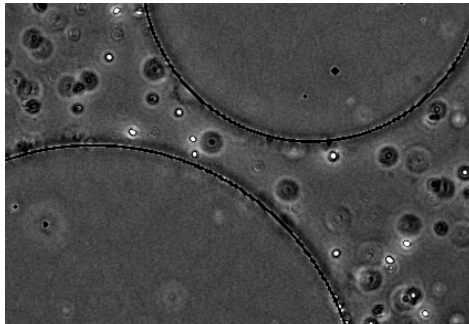
time 1

time 2

time 3

Background
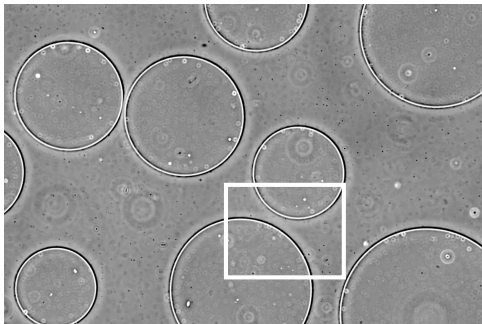
Bacteria
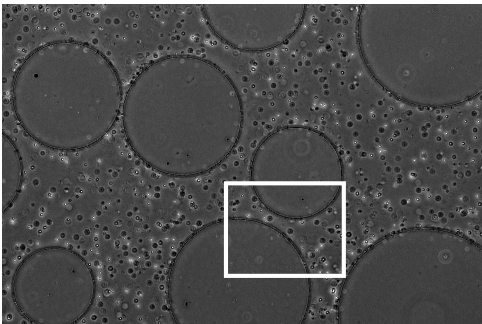
Im = Bacteria - Background
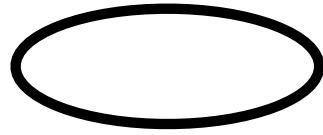
Compute image gradient (B)
of the processed image (Im) as:

$$\nabla \mathrm{Im} = \left[\frac{\partial \mathrm{Im}}{\partial x} ; \frac{\partial \mathrm{Im}}{\partial y} \right] \longrightarrow B = \frac{\sqrt{\frac{\partial \mathrm{Im}^2}{\partial x} + \frac{\partial \mathrm{Im}^2}{\partial y}}}{max}$$

Im   B

x_1, y_1, t_1 x_2, y_2, t_2 x_3, y_3, t_3

Record x, y coordinates
and time frame in a 3-column file

Perform a particle tracking analysis
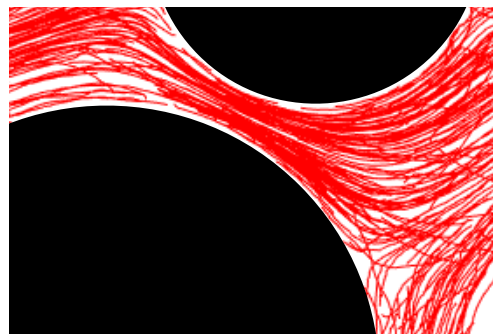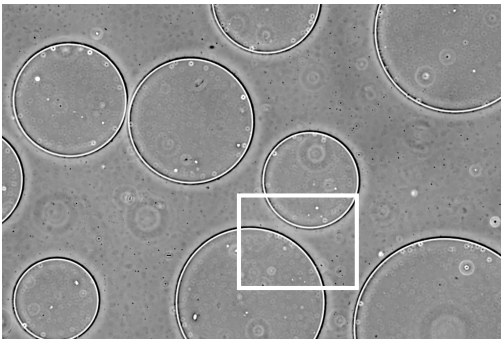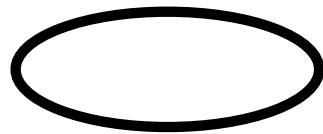and compute trajectories

Im
B

Compute image gradient (B)
of the processed image (Im) as:

$$\nabla\text{Im} = \left[\frac{\partial\text{Im}}{\partial x} \ ; \ \frac{\partial\text{Im}}{\partial y}\right] \quad \longrightarrow \quad B = \frac{\sqrt{\frac{\partial\text{Im}}{\partial x}^2 + \frac{\partial\text{Im}}{\partial y}^2}}{max}$$

Record x, y coordinates
and time frame in a 3-column file

x_1, y_1, t_1 x_2, y_2, t_2 x_3, y_3, t_3

Perform a particle tracking analysis
and compute trajectories

Im

B

Compute image gradient (B)
of the processed image (Im) as:

$$\nabla \mathrm{Im} = \left[\frac{\partial \mathrm{Im}}{\partial x} ; \frac{\partial \mathrm{Im}}{\partial y} \right] \longrightarrow B = \frac{\sqrt{\frac{\partial \mathrm{Im}}{\partial x}^2 + \frac{\partial \mathrm{Im}}{\partial y}^2}}{max}$$
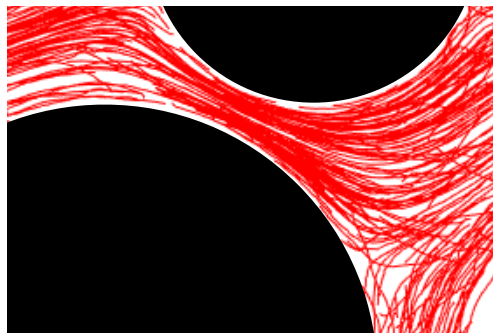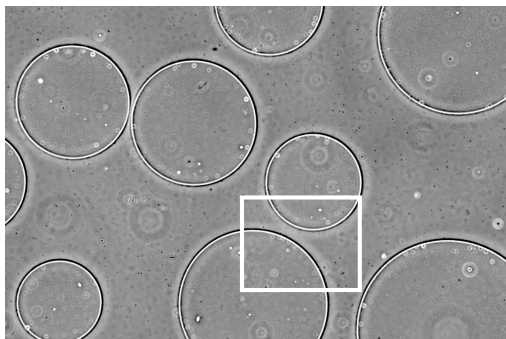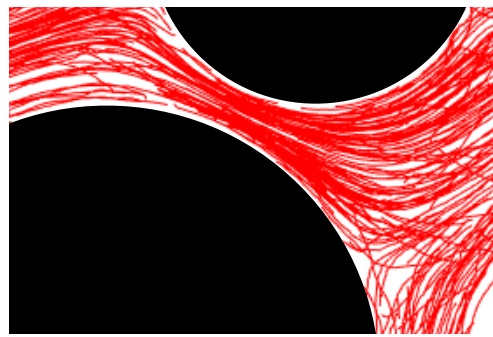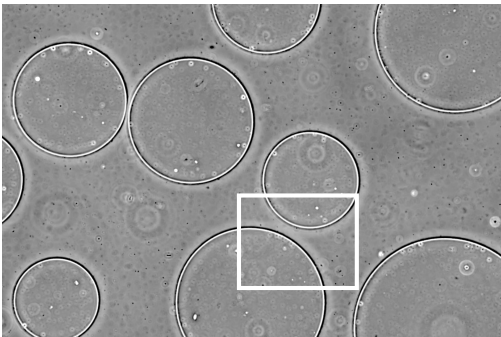
Record x, y coordinates
and time frame in a 3-column file

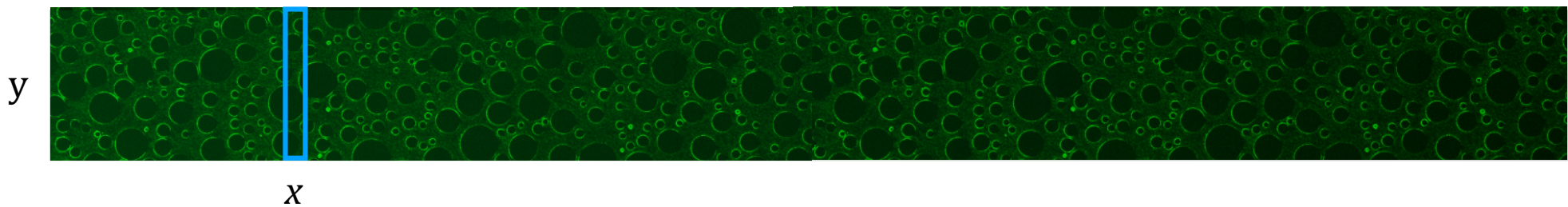x_1, y_1, t_1 x_2, y_2, t_2 x_3, y_3, t_3

Perform a particle tracking analysis
and compute trajectories

Background

Image of bacteria - background

y

x

Compute deposition profile (D) from the sum of the bacterial fluorescence intensity (I) along image sections of width y, and length x:

$$D_n = \sum_{w=1}^{y} \sum_{l=1}^{x} I$$

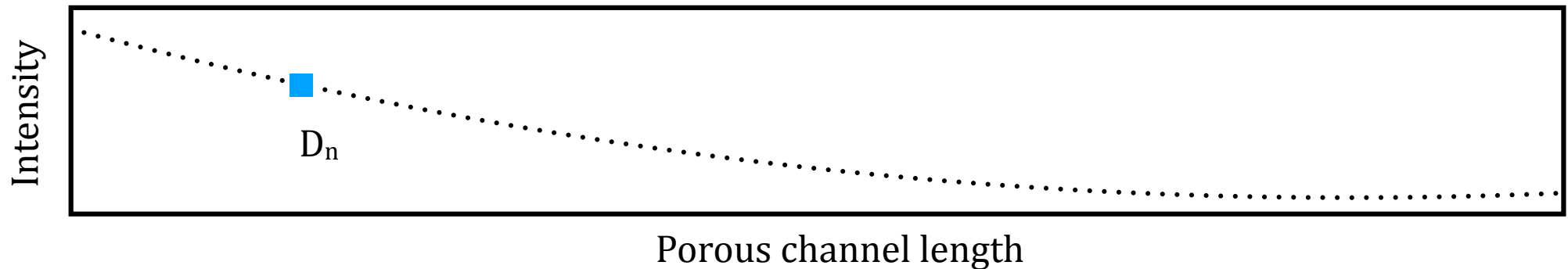Intensity

D_n

Porous channel length

Background

Image of bacteria - background

y

x

Compute deposition profile (D) from the sum of the bacterial fluorescence intensity (I) along image sections of width y, and length x:

$$D_n = \sum_{w=1}^{y} \sum_{l=1}^{x} I$$

Intensity

D_n

Porous channel length

Background

Image of bacteria - background

y

x

Compute deposition profile (D) from the sum of the bacterial fluorescence intensity (I) along image sections of width y, and length x:
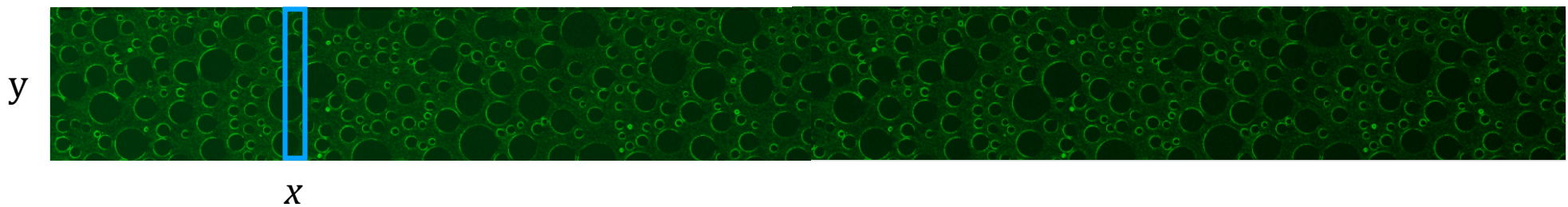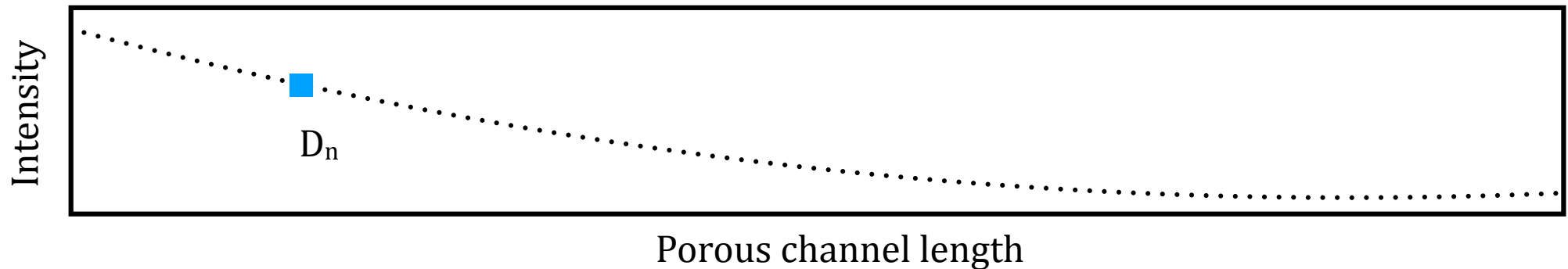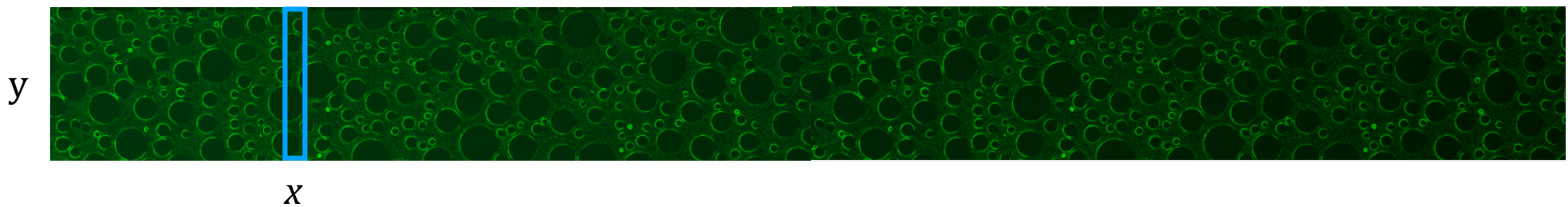
$$D_n = \sum_{w=1}^{y} \sum_{l=1}^{x} I$$

Intensity

D_n

Porous channel length