

What you need to know after reading:

**For week 2:**

- 1) Describe how a brightfield microscope works.
- 2) What is a numerical aperture?
- 3) What is a colloidal particle?
- 4) What is viscosity?
- 5) Describe the Stokes-Einstein relation.

**For week 3:**

- 6) What is a random walk? Why do we use it to model particles in a solution?
- 7) If there is no drift in the system, do particles experience a displacement? If so, why?
- 8) How can you describe the displacement of particles from the origin, as a function of time, and why?
- 9) How does a probability distribution function of a Brownian particle displacements look like, and why?
- 10) Plan an algorithm for calculating the mean square displacement of colloidal particles from their trajectories. Does the density of colloidal particles in the movies matter? In what way?

**For week 4:**

- 1) How is the pair correlation function  $g(r)$  defined?
- 2) Plan an algorithm for calculating  $g(r)$  from particle trajectories. Do you need a movie, or is it better to use a single image? Explain. How can you use particles near the border of the image for this calculation?