

Microhydrodynamics & fluctuations

Lecture 1

Course organisation

Lecturers:

Maciej Lisicki, room 5.10, maciej.lisicki@fuw.edu.pl

Jeffrey Everts, room 5.32, jeffrey.everts@fuw.edu.pl

Lectures: Every Tuesday, 9:15-11:00

Tutorials: Every Thursday, 12:15-14:00

Passing requirements

Midterm exam (40%), Final exam (60%) (dates TBA)

To pass the course >50% of total amount of attainable points

In retake session: written exam and possibility to replace your result of the midterm by an oral exam.

Literature

E. Guazzelli and J. Morris – A Physical Introduction to Suspension Dynamics

S. Kim and S. J. Karrila – Microhydrodynamics: Principles and Selected Applications

J. K. G. Dhont – An introduction to the dynamics of colloids

J. Happel and H. Brenner – Low Reynolds number hydrodynamics

H. Ohshima – Theory of Colloid and Interfacial Electrokinetic Phenomena

S. R. de Groot and P. Mazur – Non-equilibrium thermodynamics

Research articles referenced in the course website & discussed in classes

Microhydrodynamics

G. K. Batchelor (1970s)

Fluctuations

Microscale/friction-
dominated flows

Brownian motion
Probability distributions

Microscale/friction-
dominated flows

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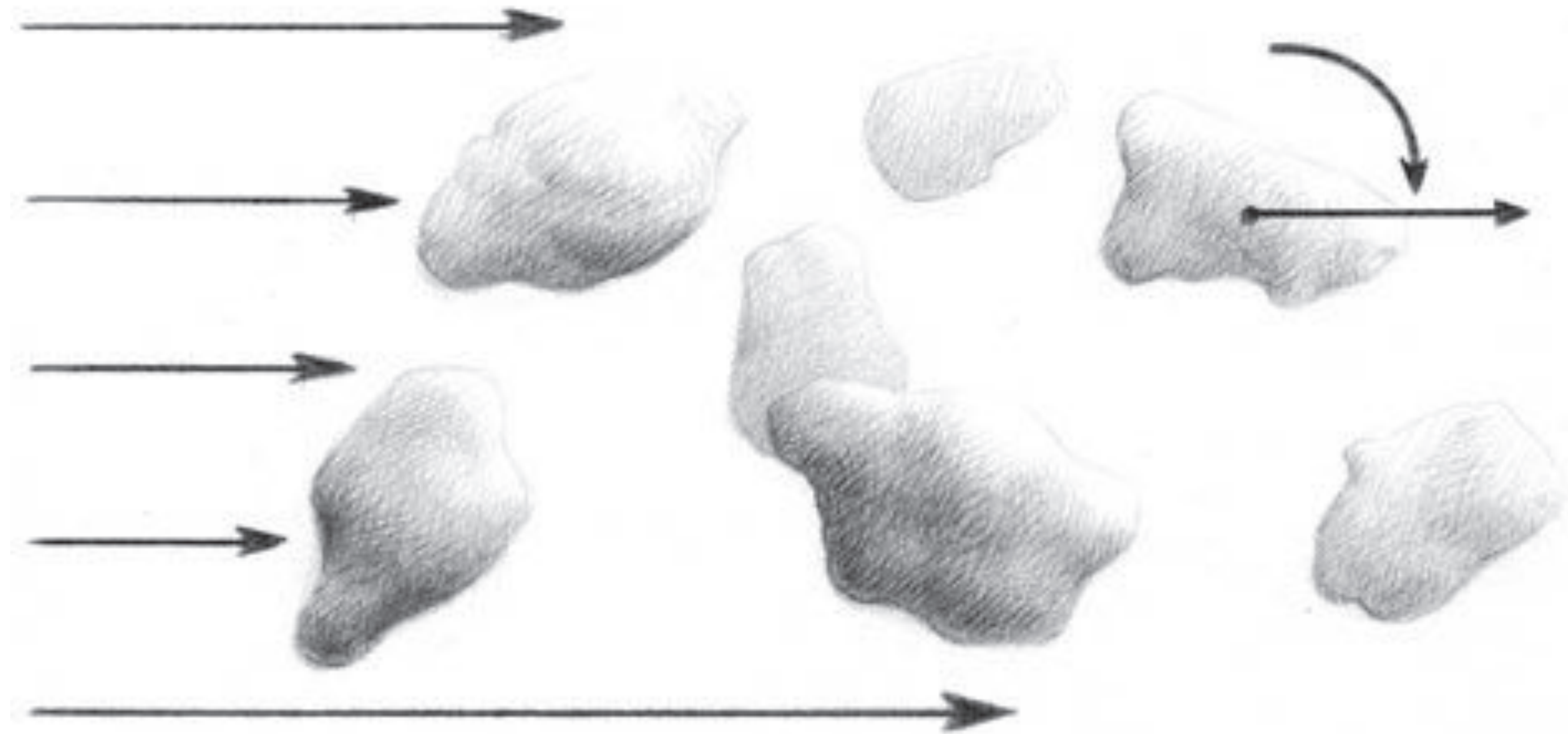
Where fluid mechanics and statistical mechanics meet!

Microscale flows

Brownian motion
Probability distributions

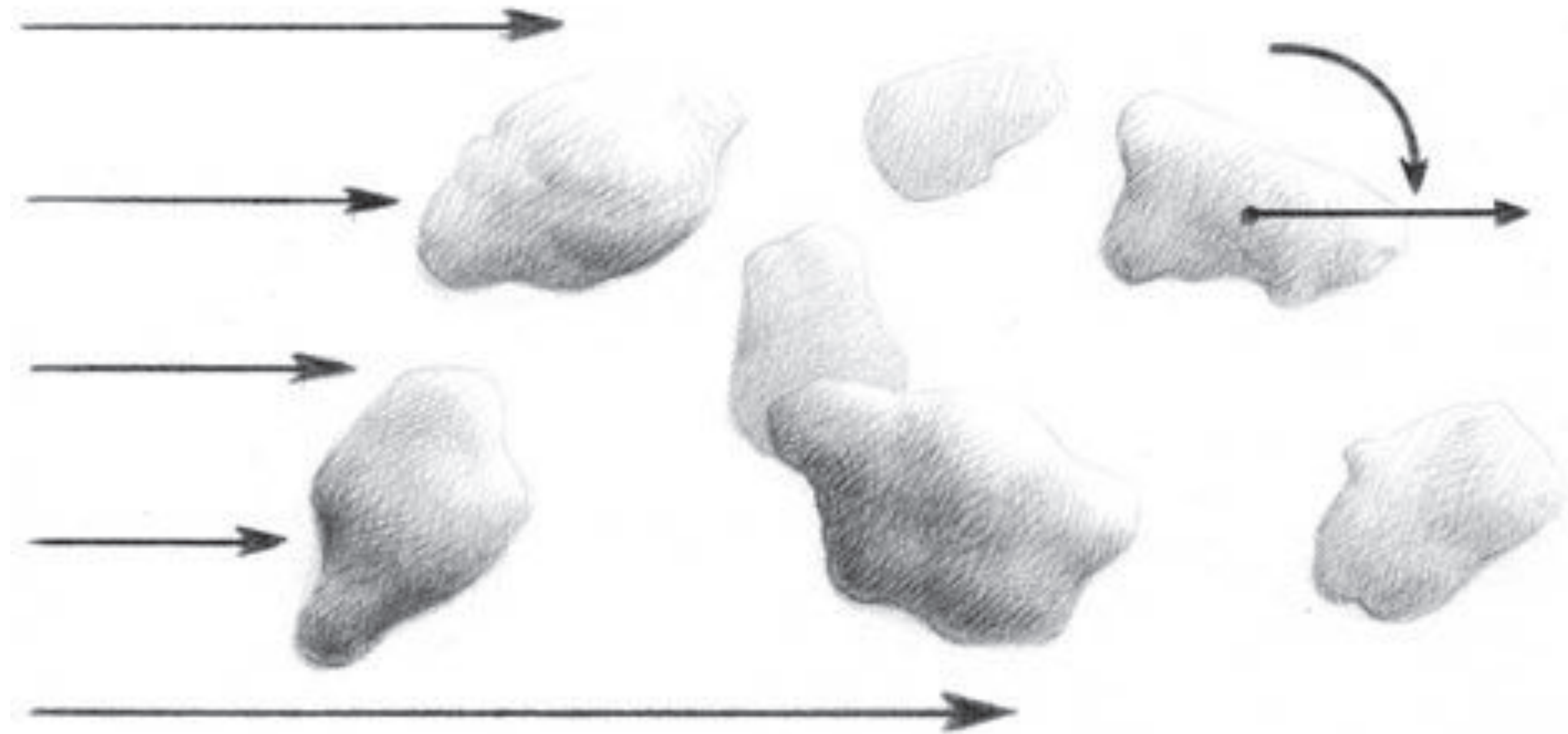
Where fluid mechanics and statistical mechanics meet!
(Made possible by the fluctuation-dissipation theorem)

Typical situation of interest



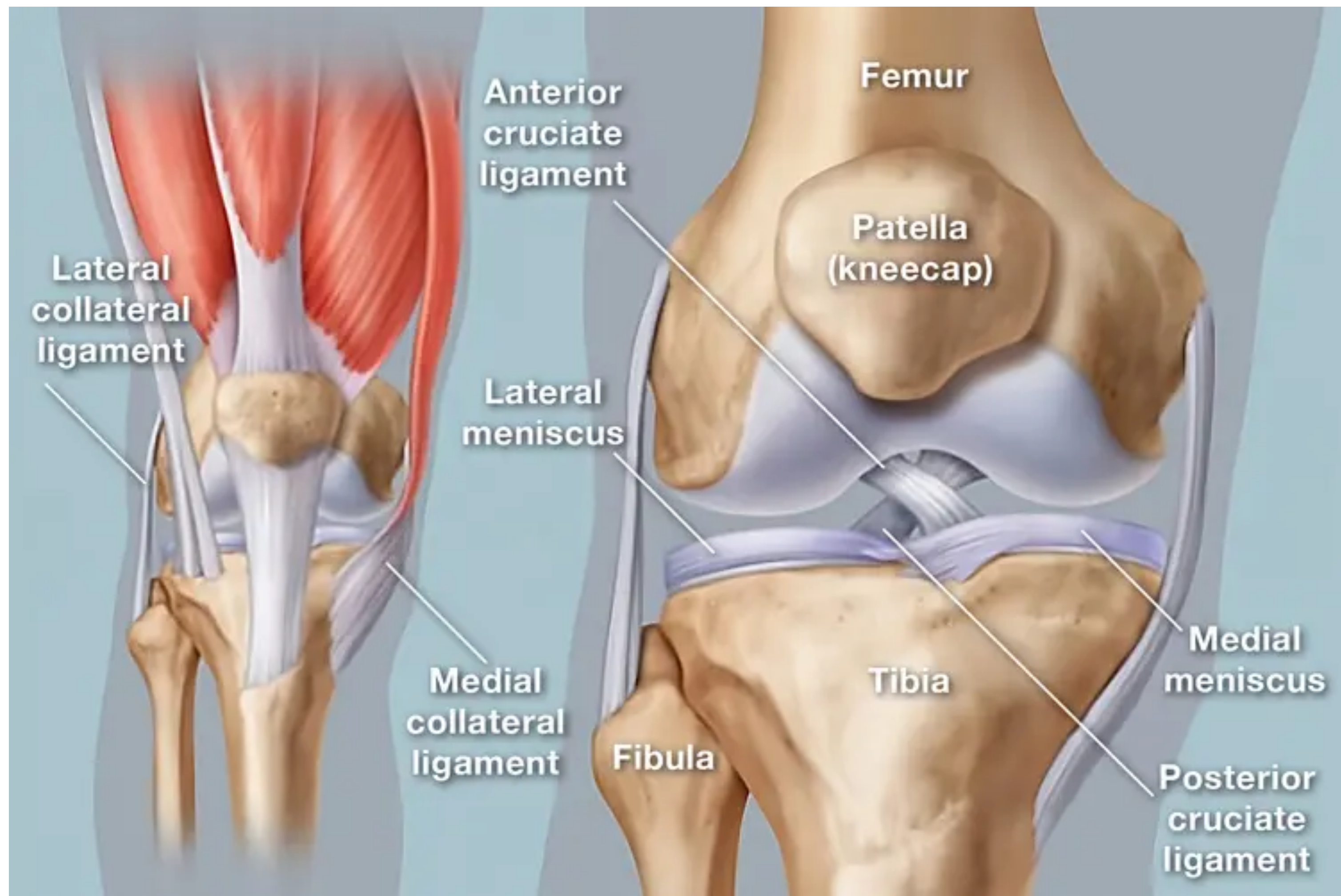
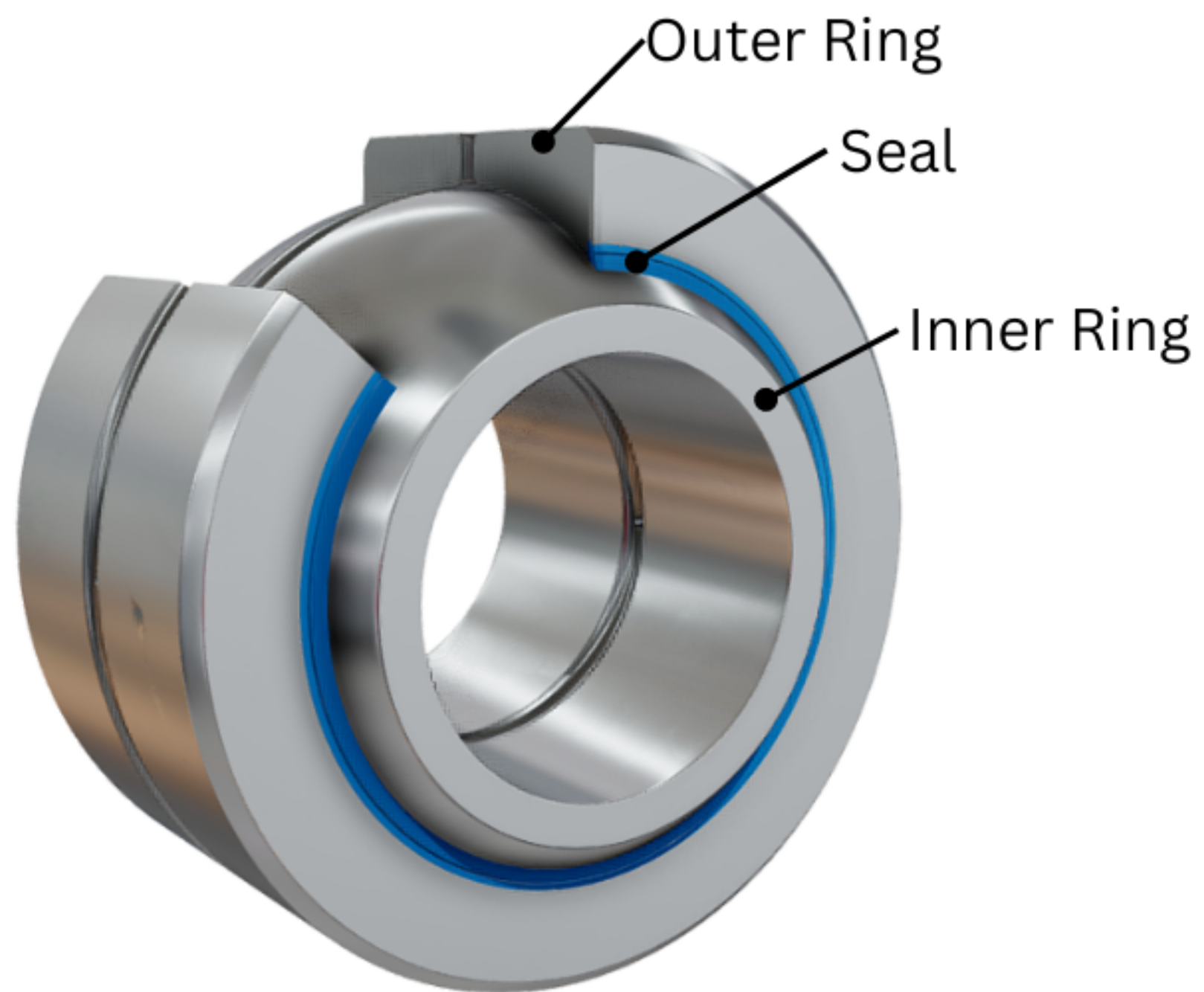
Transport equations + boundary conditions

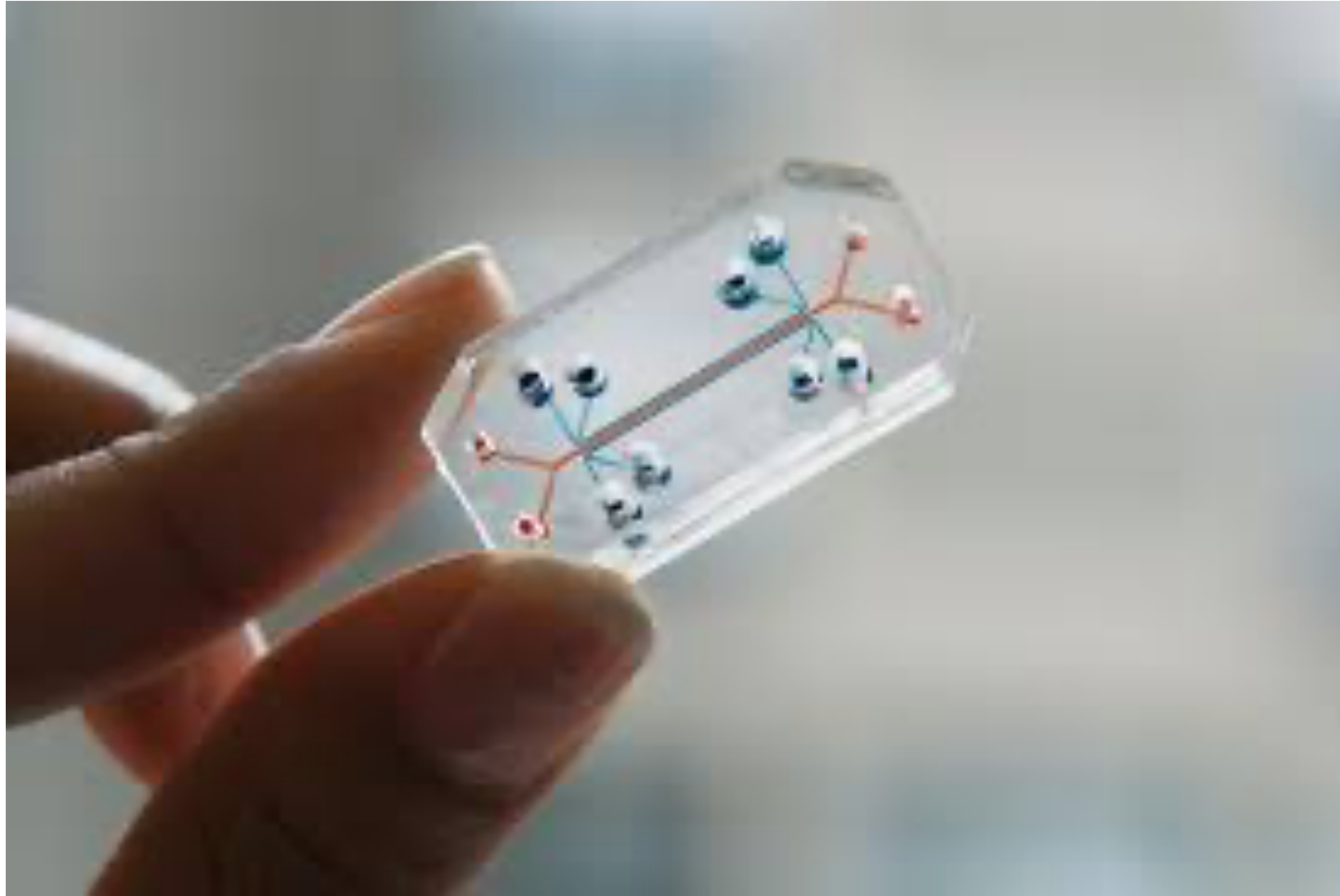
Typical situation of interest



What are particle velocities and forces? What is the effective viscosity of the suspension?

Some examples where microscale flows are relevant





Mixing, separating, detecting, ..

