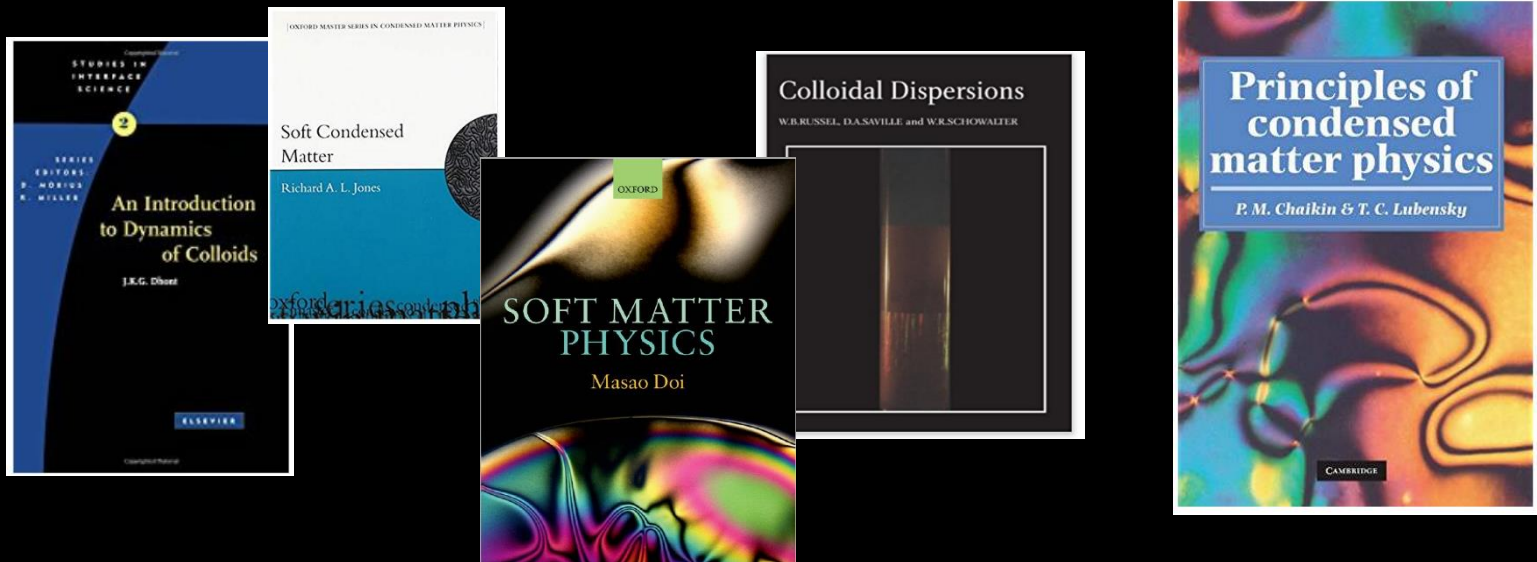


- - - Präsentation steht demnächst auf Webseite AG Bechinger zur Verfügung - - -

Physik der weichen kondensierten Materie

Prof. Clemens Bechinger

Vorlesung: Mo: 10:00 - 11:30 & Do: 08:15 – 09:45
Übungen: Di 13:30-15:00



What is Soft Matter ?

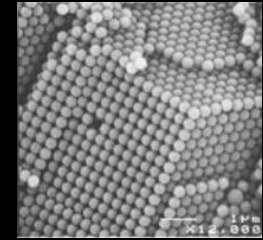
colloids, polymers, ...



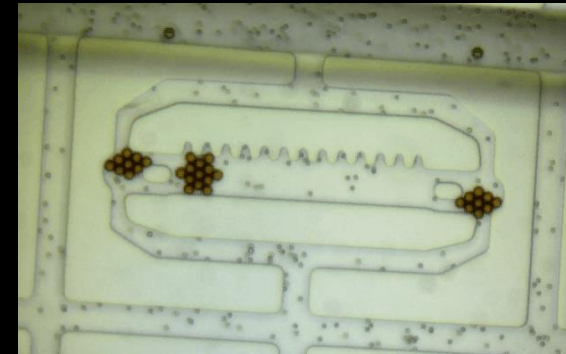
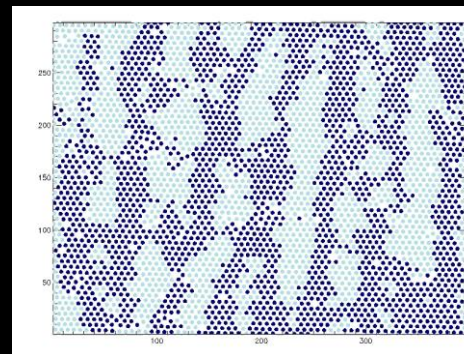
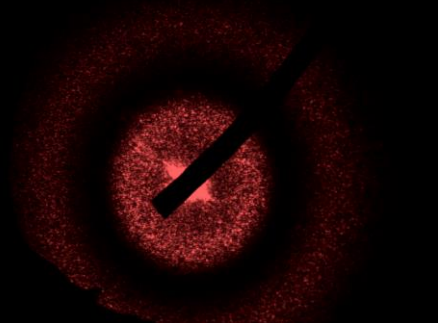
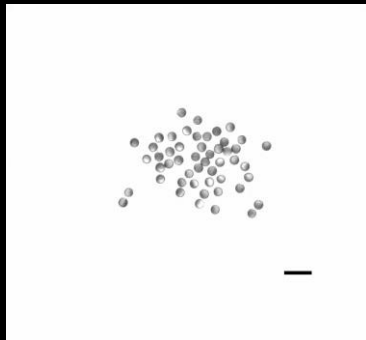
atoms

proteins

viruses, vesicles



Soft Matter - strong coupling to external fields (optical tweezers, ...)
- dynamics governed by thermal fluctuations



What it is good for ?

study physical processes in real time and real space under highly controlled conditions

Lecture:

how do thermodynamic machines operate at micron-scales ?
stochastic thermodynamics

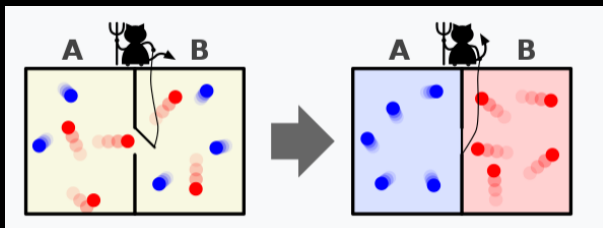
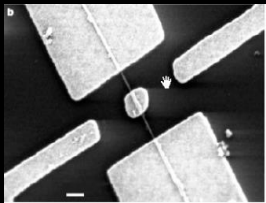
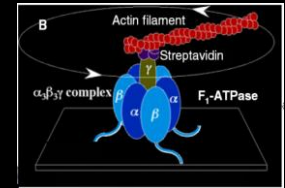
what are the thermodynamic costs of erasure of information ?
the Landauer limit

what is a Maxwell demon and how does it work ?
the Szillard engine

how noise can be used to improve the detection of weak signals?
stochastic resonance

how birds, fish and insects organize in groups?
collective behavior of active particles

how to transport particles in noisy environments ?
Brownian ratchets



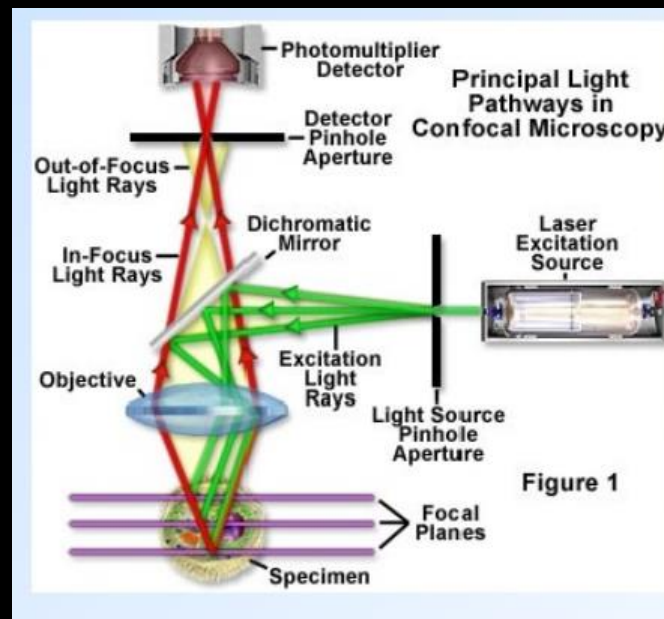
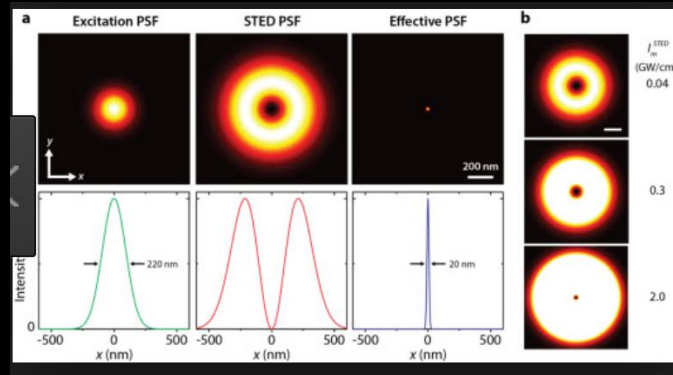
Tutorials

- Image Analysis & Particle Tracking (Python/MatLab)
- Berechnung verschiedener Korrelationsfunktionen
- Simulationen (BD)
- Besprechung relevanter Originalpublikationen

Modern Microscopic techniques (STED)



Prof. Stefan Hell (MPI Göttingen)
Nobel price 2014



Lecture

- Brownsche Bewegung
- Paarwechselwirkungen
- Die Langevin Gleichung: Theoretische Beschreibung der dynamischen Eigenschaften
- Paarkorrelationsfunktion u. Strukturfaktor
- Optische Pinzetten, elektr. & magnetische WW
- Phasenübergänge in zweidimensionalen Schmelzen (KTHNY-Übergang)
- Entropische Wechselwirkungen
- Diffusion
- Dynamische Lichtstreuung, Forced Rayleigh-Scattering
- Diffusion in eindimensionalen Systemen (single-file Diffusion)
- Thermodynamik fernab vom thermodyn. Limes: Stochastische Thermodynamik
- Aktive Brownsche Bewegung
- Stochastische Resonanz

Tutorials

- Image Analysis & Particle Tracking (Python/MatLab)
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