

Friederike Schmid

Soft Matter and Statistical Physics Group



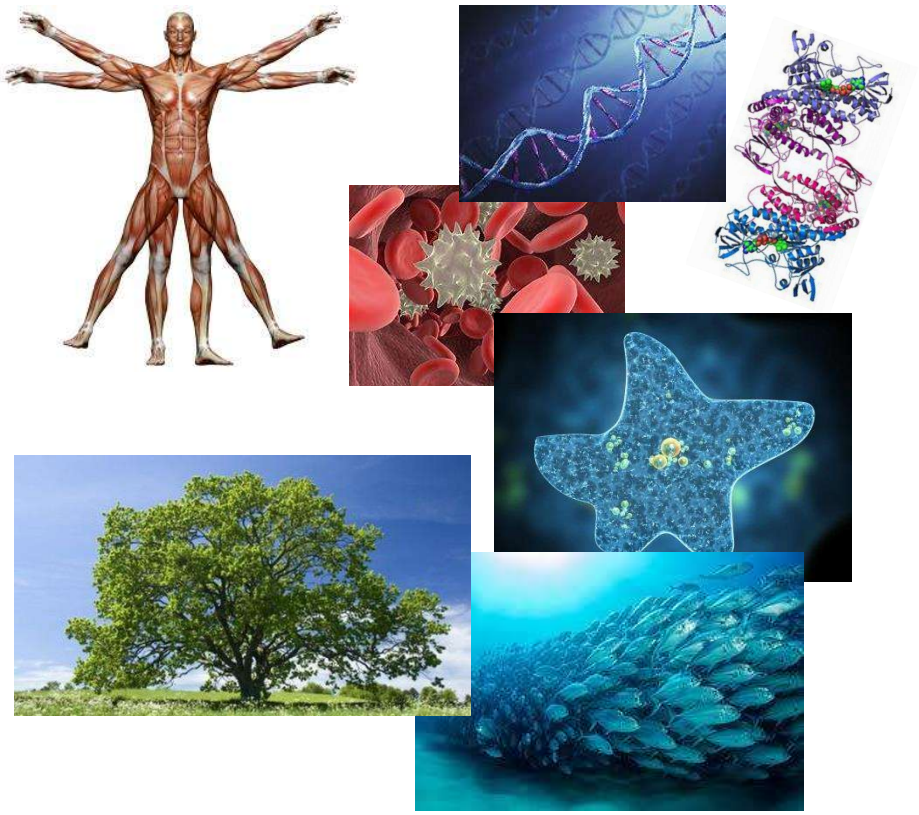
Michael te Vrugt



Peter Virnau

What is soft matter ?

The stuff that life is made of!

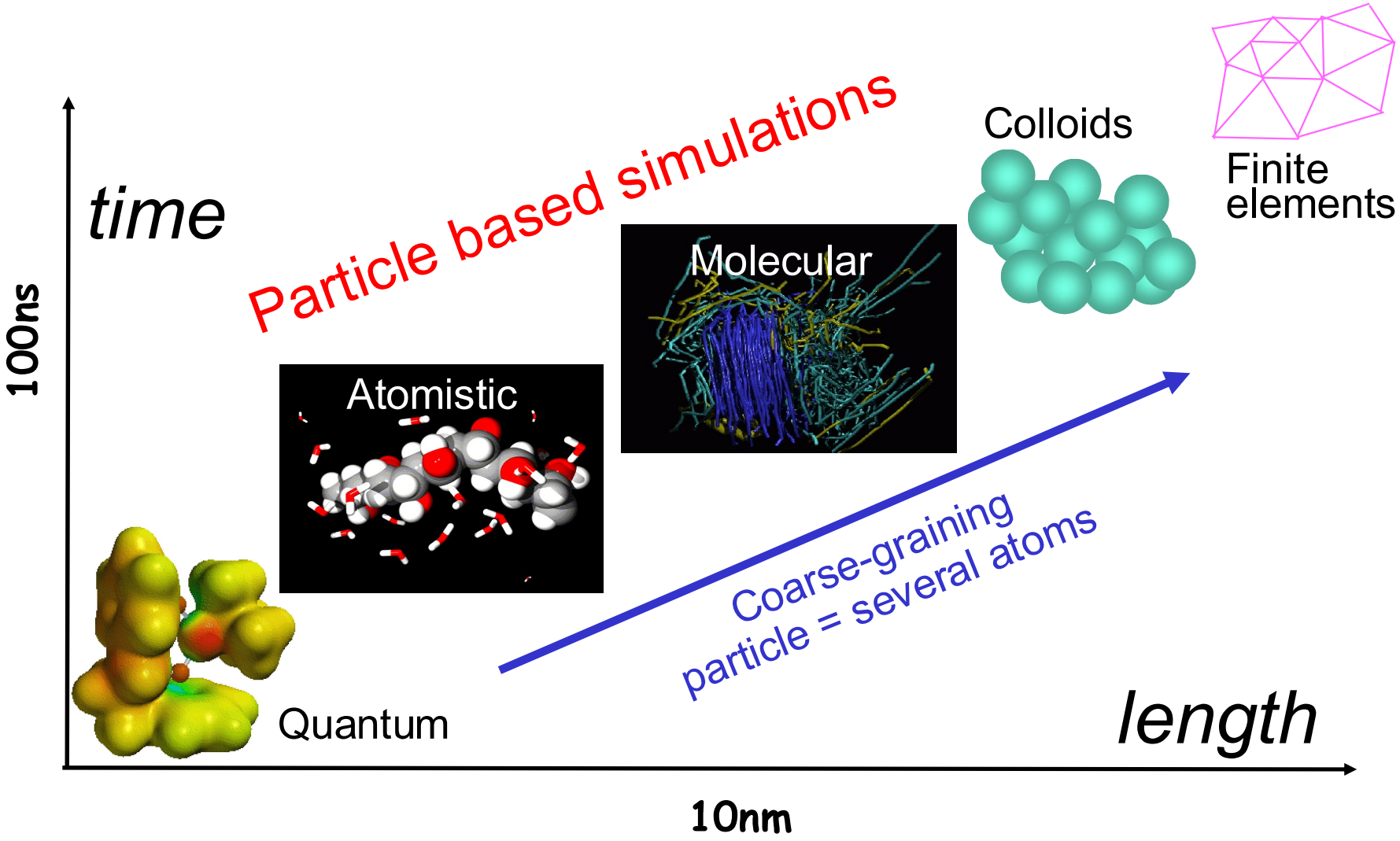


- Thermal energy k_BT and entropy matter
- Broad spectrum of length and time scales

… and many other things



Time and length scales in simulation



What will you learn in our group?

- **Interesting physics**
  (modelling and theory of emerging phenomena)
- **How to work with computers**
  (simulation, programming, Linux)

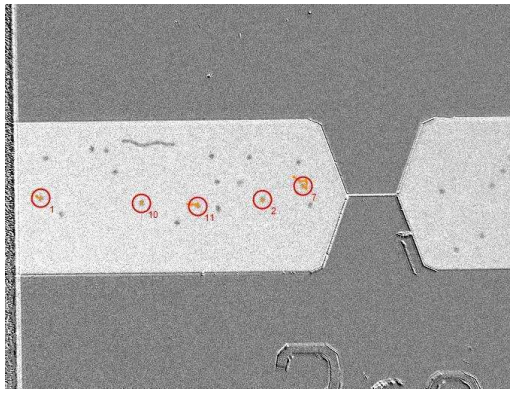




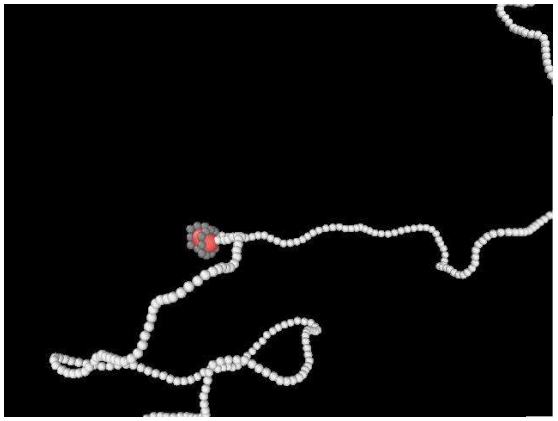


Research group of Peter Virnau

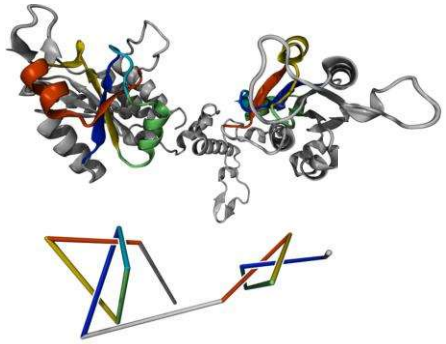
Skyrmion simulations



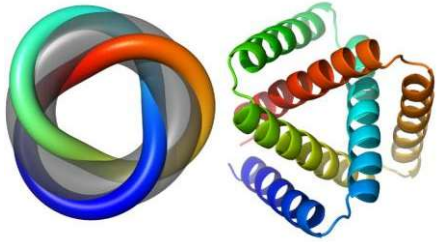
Simulations of DNA looping



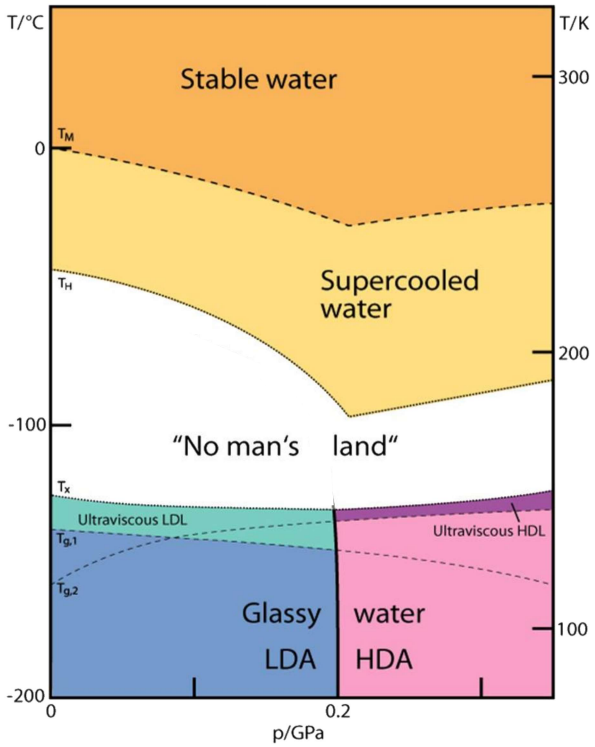
Knots in DNA and proteins



Protein design



Water



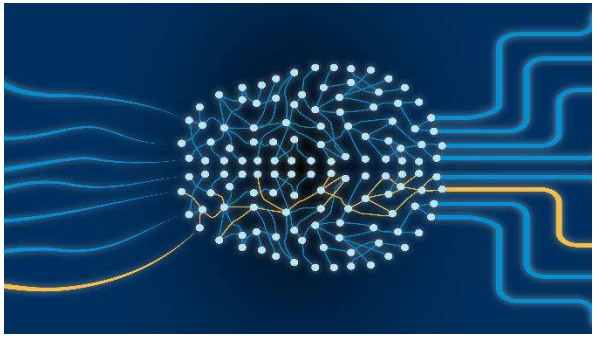
Possible thesis topics – Michael te Vrugt



Particles adsorbing on solar cells

$$\frac{\partial}{\partial t}\rho(\vec{r},t) = \Gamma\vec{\nabla}\cdot\left(\rho(\vec{r},t)\vec{\nabla}\frac{\delta F[\rho]}{\delta\rho(\vec{r},t)}\right)$$

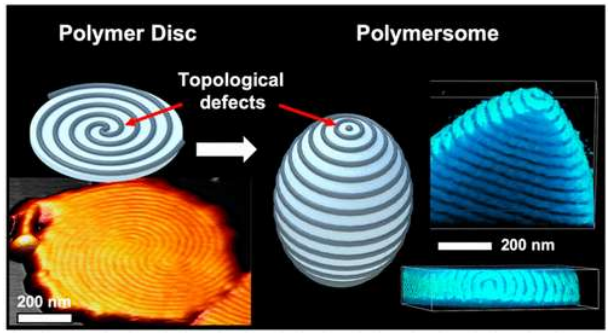
Microscopic derivation of field theories



Machine learning with physical systems



Biophysics of circadian clocks (“innere Uhr”)



Classification of topological defects

Pictures: https://hirstlab.ucmerced.edu/?p=600, https://www.ardalpha.de/wissen/gesundheit/gesund-leben/chronobiologie-gesundheit-folgen-innere-uhr-biorhythmus-schlafen-100.html, https://www.sciencedirect.com/science/article/pii/S1631070515000791, https://www.baslerweb.com/de-de/learning/deep-learning/, https://www.sunbrushmobil.com/de/einsatzgebiete/sand-auf-dem-solarmodul

Related classes

Advanced lab (Fortgeschrittenenpraktikum):

Substitute experiments with computer simulation projects

Lectures MSc:

- Advanced statistical physics (“Theorie” oder “Spezialvorl.”) WS
- Computer simulations in Statistical Physics (6 credits) SS
- Theoretical polymer physics (6 credits) SS
- Master seminar: Biophysics SS