

## Proseminar Theoretical Physics FS 2017 (4KP)

**Start:** Wednesday Feb. 22, 16:15 Uhr in Seminarraum 4.1

**Prerequisites:** Quantum mechanics, Statistical Mechanics (or be prepared to acquire the necessary concepts)

**Assistants:** Dr. Niels Lörch, office 4.16; Dr. Simon Nigg, office 4.10

In this proseminar, students will independently prepare and present 1-hour talks on “Highlights of Theoretical Physics”, based on journal articles and/or book chapters.

Your first task is to read and understand the relevant literature. In your talk you are then supposed to introduce your colleagues to the main ideas of the field and convince them that this is an interesting and relevant topic.

### Example topics (in no particular order):

- (1) Bose-Einstein condensation  
Literature: A.J. Leggett, *Quantum fluids*, Oxford University Press.
- (2) Interacting Fermi systems / Landau Fermi liquid theory  
Literature: P. Coleman, Chapter 6 of *Introduction to Many-Body Physics*, Cambridge University Press.
- (3) Superfluidity, superconductivity, and off-diagonal long-range order  
Literature: C.N. Yang, *Rev. Mod. Phys.* **34**, 694 (1962).
- (4) Correlation functions and sum rules  
Literature: W. Brenig, *Statistical Theory of Heat*, Springer.
- (5) Phase transitions and broken symmetry (Kosterlitz-Thouless Berezinskii?)  
Literature: N. Goldenfeld, *Lectures on Phase Transitions*, Benjamin.
- (6) Geometric phases  
Literature: A. Shapere and F. Wilczek, *Geometric phases in physics*, World Scientific.
- (7) Quantum Measurements  
Literature: K. Jacobs, *Quantum measurement theory and its applications*, Cambridge University Press.
- (8) Decoherence (and Dissipation?) in quantum mechanics  
Literature: M. Schlosshauer, *Decoherence*, Springer.

- (9) Landau-Zener-Stückelberg transition  
Literature: N.V. Vitanov, Phys. Rev. A **59**, 988 (1999).
  
- (10) The Laser  
Literature: B.-G. Englert, *Elements of Micromaser Physics*, arXiv:quant-ph/0203052
  
- (11) Foundations of quantum mechanics  
Literature: Chapter 12 of K. Gottfried and T.-M. Yan, *Quantum mechanics*, Springer.

Students are welcome to propose another topic of their choice.  
Please contact Christoph Bruder to discuss this possibility.