Speaker: **Camilla Wulff, University of Freiburg**

Title: **Microscopic models of pressure**

Date: **Thursday, September 5th, 11 o‘clock (s.t.)**

Place: **Seminar room 915**

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Abstract:

We examine under which conditions the statistical definition of pressure can be applied to a single-particle quantum sytem. The main criterion will be that the calculated pressure must be isotropic, as this is the case for a statistical ensemble. In contrast to the single-particle quantum system the statistical ensemble is chaotic and averages over many particles, through which the pressure becomes isotropic. Generally speaking, this is not the case for a single-particle quantum system.

We first look at a two-dimensional, rectangular box, so that the degrees of freedom uncouple, making its dynamics non-chaotic. We find that isotropic pressure can be obtained through averaging over several single-particle quantum states within an appropriate energy window, and for high enough energies.

Then, we change the geometry of the region that encloses the particle, so that its dynamics become classically chaotic. The eigenstate thermalisation hypothesis then suggests that a single quantum state can generate isotropic pressure. This will be investigated. In fact, we find that the perturbation makes the pressure of individual eigenstates more isotropic than in the regular case, which means that an arbitrary initial state that can be expressed as a superposition of the eigenstates will yield the statistical pressure in thermodynamical equilibrium in the long-time limit.