# KIDS TALK

## “Understanding more with less: What small mechanical systems can teach us about the emergence of thermodynamics”

Speaker: Lukas Gilz, AG Anglin

Abstract: This talk will present the theoretical discovery of a new class of very small dynamical systems which can shed unexpected light on the emergence of thermodynamics from mechanics - a major outstanding problem in physics which has hitherto been thought to involve large and complex systems essentially.
We start by identifying 'extreme downconversion', the transfer of energy between motional degrees of freedom with a large difference in natural frequency, as the defining feature of thermodynamics.
Rather than receding to a phenomenological description in terms of external control parameters and reservoirs, we present a simple model system which realizes 'extreme downconversion' in the context of closed system Hamiltonian (quantum-) mechanics.
Over a wide range of parameters, we discover that the model system's energy transfer efficiency is always limited to be strictly smaller than one, resembling the Second Law of thermodynamics. In the quantum regime, the efficiency bound is caused by an effective decoherence of slow dynamics due to a coupling to fast motion. In the classical limit, the transfer efficiency is limited by processes closely linked to spontaneity.
The presented model is only one example of a very wide class of dynamical systems, whose further exploration may offer a path towards the goal of fully understanding the interface between mechanics and thermodynamics; thereby understanding more with less.

When: Friday, Feb. 7th 2013, **10:00 am**

Where: Room 46-387/388

All undergraduate and graduate students as well as postdocs are welcome and encouraged to join our discussion!

********** COFFEE, TEA AND COOKIES WILL BE SERVED **********

For subscription to kids mailinglist, questions, comments or suggestions: grusdt@physik.uni-kl.de

MATERIALS IN MAINZ SCIENCE

TECHNISCHE UNIVERSITÄT KAISERSLAUTERN

OPTIMAS TU Kaiserslautern