



# Lothar-Collatz-Kolloquium für Angewandte Mathematik

**Donnerstag, den 24. Januar 2019, um 17:15 Uhr, im Hörsaal 5**

**Prof. Dr. Eberhard Bänsch\***

(Friedrich Alexander Universität Erlangen-Nürnberg, LS für Angewandte Mathematik 3)

## ***Convective transport in nanofluids existence of weak solutions and fem computations***

### **Zusammenfassung/Abstract:**

We present a mathematical model for convective transport in nanofluids including thermophoretic effects that is very similar to the celebrated model of Buongiorno. Our model is thermodynamically consistent and consequently an energy estimate can be shown.

We propose a semi-discretization in time that fully decouples the subproblems. Also for this semi-discrete problem an energy estimate can rigorously be shown. Based on this energy estimate it is proved that solutions of the semi-discrete problem converge to a weak solution of the system.

We use the time discretization to define an effective, fully discrete finite element scheme. Simulations are performed for a nanofluid flowing through a heated long pipe. Careful inspection of the computational results reveal the mechanism of enhanced cooling properties of the nanofluid compared to the base fluid: The temperature gradient at the wall reduces the concentration of particles by thermophoresis. Thus, close to the wall, the viscosity is smaller compared to the bulk leading to an enhanced convective transport in the boundary layer.

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**Die aktuelle Version der Kolloquiumsankündigungen (inkl. Abstracts) finden Sie unter:**

**<http://www.math.uni-hamburg.de/spag/angmath/kolloq/>**