Abstracts:

The linear Boltzmann equation for radiation in dense media and its approximation by discontinuous Galerkin methods

Prof. Dr. Guido Kanschat (University of Heidelberg)

The energy balance of light and matter imposes diffusive behavior in the asymptotic limit of high density. The numerical approximation of this limit is quite delicate and discretization methods must be designed with some care in order to achieve it. On the other hand, violation of the asymptotic limit by the numerical scheme yields qualitatively wrong approximations for even moderate densities.
We discuss the reasons for breakdown of the standard method and ways to preserve correct asymptotic behavior. In numerical experiments, we show that multilevel domain decomposition solvers work almost out of the box for asymptotic preserving discretizations.

Effective bending–torsion theory for rods with micro-heterogeneous prestrain

Prof. Dr. Stefan Neukamm (TU Dresden)

We investigate rods made of nonlinearly elastic, composite–materials that feature a micro-heterogeneous prestrain that oscillates on a scale thatis small compared to the length of the rod. As a main result we derive a homogenized bending–torsion theory for rods as Γ-limit from 3D nonlinear elasticity by simultaneoushomogenization and dimension reduction under the assumption that the prestrain is of the order of the diameter of the rod. The limit model features a spontaneous curvature-torsion tensor that captures the macroscopic effect of the micro-heterogeneous prestrain. We device a formula that allows to compute the spontaneous curvature-torsion tensor bymeans of a weighted average of the given prestrain, with weights depending on the geometry of the composite encoded by correctors. We observe a size-effect: For the same prestrain a transition from flat minimizers to curved minimizers occurs by just changing the value of the ratio between microstructure-scale and thickness.
This joint work with R. Bauer (TU Dresden) and M. Schäffner (U Leipzig).