

**Prize Talk** PV IX Tue 13:30 HSZ 03  
**Honey, I shrunk the laser!** — ●MARTINA HENTSCHEL — MPI  
für Physik komplexer Systeme, Nöthnitzer Str. 38, 01187 Dresden —  
Laureate of the Hertha-Sponer-Prize

The miniaturisation of well-known devices for nanophotonic or optoelectronic applications is now feasible, thanks to the tremendous progress in the fabrication, experimental control, and theoretical investigation of mesoscopic systems over the past two decades. With sizes typically in the micrometer range, quantum dots, optical microcavities, and graphene are too big for a full quantum mechanical description, yet small enough to see quantum signatures such as interference effects: this opens up an ideal playground for basic research. The focus of this talk will be on interference phenomena associated with the ex-

istence of the boundary in optical and electronic mesoscopic systems. Boundary effects induce deviations from well-known macroscopic behaviours, for example in the many-body response that determines the photoabsorption cross section of quantum dots vs. metals. Unexpectedly, we observe violations of Snell's law and ray path reversibility which call for wave-inspired corrections to the naive ray model. Even without this, the far-field emission characteristics of optical microcavities depends sensitively on the resonator geometry. So, while I did not shrink the laser (nor Wayne's kids from the 1989 movie) myself, experimentalists have already been able to build lasers smaller than 100 micrometer cavity size that emit almost unidirectionally, based on our predicted shapes. The near future will show us whether this concept is also suitable to reach the nanoscale.