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Polariton Lasers

More than a century after the introduction of incandescent lighting and half a century after the realization of semiconductor lasers, semiconductor light sources are continuing to revolutionize applications and having a paramount impact on our everyday life. The creativity of quantum and photonics engineers and material scientists results in semiconductor light emitting diodes and semiconductor lasers with unprecedented characteristics, including ever better efficiency or brightness and ultra-wide wavelength coverage. In this talk, after a summary of general semiconductor laser research undertaken in our group, I will focus on the description of a novel kind of coherent light emitter based on a semiconductor microcavity with embedded quantum wells. In contrast to conventional lasers, this sort of device, termed polariton laser, relies not on stimulated emission of photons but on stimulated scattering of bosonic quasiparticles, the polaritons. These devices have lower thresholds than conventional lasers, and I will describe the physics underlying these devices and routes towards possible practical applications.