“Searching for the ultimate limit: an exploration of the smallest lasers possible”.

Scattering lasers: an exploration of the smallest lasers possible.

The use of lasers has become increasingly popular in modern society. This evolution has been stimulated in the past by a continuous succession of technological discoveries which allowed for the current trend toward miniaturization. This drive toward smaller laser systems is fueled by the desire for fast, low-power optical devices in highly integrated structures. Intrigued by this quest for increasingly smaller light sources, Tom Savels explored the ultimate miniaturization limit and asked the question as to how many atoms one needs to build a laser. His research shows that, quite surprisingly, only two atoms in free space suffice to exhibit laser behavior: one atom is pumped and provides optical gain, while the other atom acts as “mirror” and provides feedback. Remarkably, no macroscopic mirrors or cavity are required to observe laser phenomena. This research may prove to be useful in two respects. The predicted laser behavior not only occurs for atoms, but for a broad range of microscopic objects such as quantum dots, molecules or DNA strings and may as such lead to interesting experiments and applications. Additionally, this research provides insight in laser dynamics on a microscopic scale which may allow for an optimization of future technological laser miniaturization.