

## LUMICKS

### Untying your hands: Using optical tweezers to go beyond just imaging

---

**Presenter:**

Emma Verver, LUMICKS

**Abstract:**

Many crucial biological processes take place at the molecular level. In order to fully understand these dynamic processes in sickness and health, one must be able to interrogate the mechanisms both at the single molecule level as well as in real time.

Current techniques such as fluorescence microscopy are exceptionally equipped to study dynamic functionality of molecular processes, in particular single-molecule fluorescence. However, one thing that microscopists tend to struggle with, is the inability to interact with what is right before their eyes.

What if you could directly and precisely touch or poke your precious cell, while looking at its response in real time? What if you could see individual proteins move along a single DNA strand, while you stretch or knot the DNA molecule? What if you could not only observe a molecular motor run along a microtubule, but actually challenge it to a tug of war game?

The C-Trap, a correlative optical tweezers system, combines two crucial aspects: single molecule scale and real time dynamics. Optically trapped beads inside the microscope provides the researcher with a vehicle to directly manipulate the specimen, whether it is a cell, a DNA molecule or a protein. By actively introducing, manipulating and measuring single molecules and their interactions, complex molecular mechanics can be addressed in great detail.

During this workshop, we present the potential of combining optical tweezers with correlative fluorescence microscopy (widefield, TIRF, confocal and STED) and label-free Interference Reflection Microscopy (IRM). We present several examples in which our correlative technologies enhanced the understanding of DNA binding proteins, protein folding and dynamics, Cellular structure and Phase separation, leading to breakthrough discoveries in the field of biology and biophysics.