Determining the 3D orientation of a single organic dye molecule

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Over the past 30 years, the detection of single organic dye molecules has emerged as a pivotal research field, offering a sensitive nano-environment probe that avoids result averaging across the molecule ensemble. The aim of this study was to visualize the direction of the S_0-S_1 transition in terrylene (Tr) molecules embedded within the structures of naphthalene (N) crystals and naphthalene crystal derivatives (i.e. 2,3-dimethylonaphthalene). By determining the orientation of the observed transition, we gain the precise insight into the long axis direction of the Tr molecules, allowing to obtain valuable information about their integration within the host crystalline structure.

To conduct this research at room temperatures, we rebuilt the confocal microscope previously used for low-temperature studies.