In a cell, viscosity can play a role in several diffusion mediated processes, such as drug delivery, signalling and mass transport. Previously, alterations in viscosity in cells and organs have been linked to malfunction; however, mapping viscosity on a single-cell scale remains a challenge. Kuimova’s lab has imaged viscosity inside lipid mono- and bi-layers, in cells and in atmospheric aerosol particles using fluorescent probes, called molecular rotors. The talk will cover the recent developments of this technique, such as genetic and passive targeting of rotors and applications to monitoring neurodegeneration.