

Molecular transport in cells by the pair correlation fluctuation method

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Traditional fluctuation spectroscopy methods are employed to determine molecular diffusion in cells. While these methods provide information about a local dynamics in a specific point in the cell, they do not respond to the question of the path taken by a molecule to travel from one point to another. This kind of question is generally addressed by techniques such as single particle tracking. However, in single particle tracking the same molecule must be observed for an extended period of time and the molecule must be isolated from others. Also, many single particle trajectories must be recorded before we have sufficient statistics to delineate the path following by the particles. These conditions are difficult to achieve and the collection of many trajectories takes some time, especially if the volume to be interrogated is small. As a consequence, single particle tracking is used with large and bright particles. We developed a method in which we can follow relatively dim molecules in the presence of many other molecules, and statistically follow the flow of many molecules at a time. We have applied this method to the traffic of molecules inside the nucleus of cells and among the cytoplasm and the nucleus.