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Research Interests: single-molecule fluorescence microscopy, photochemistry, photophysics, super-resolution fluorescence microscopy

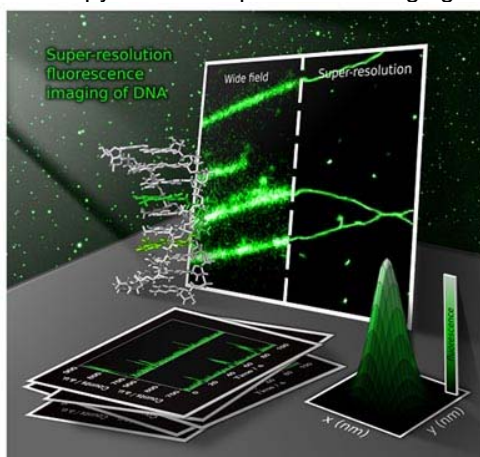


Single-molecule fluorescence microscopy

Single-molecule microscopy provides a different way of looking at chemical and biological samples. One of its advantages is that it can offer information on a distribution of behaviours, rather than an average value. Moreover, it enables us to identify intermediate species that would be obscured by ensemble averaging, and allows the observation of rare events. It is thus the ultimate sensitivity level in Chemistry and Biology. We use fluorescence microscopy to follow the behaviour of a range of fluorescent dyes, as well as that of fluorescently-labelled biological molecules.

An exciting development based on single-molecule detection involves the possibility of imaging fluorescent samples with sub-diffraction limit spatial resolution, which is about 250 nm in standard optical microscopes. We apply a technique based on the fluorescence photoswitching of single molecules to answer biological questions that lie below this resolution limit. In particular, we focus our efforts on super-resolution imaging of DNA.

Check out the Collaborative Optical Spectroscopy Micromanipulation & Imaging Centre (COSMIC)



Photophysics of fluorescent proteins

Fluorescent proteins are a crucial tool in biological studies, and it is important to understand their photophysics in order to use them correctly and improve them. One important aspect in this context is their ability to photosensitize reactive oxygen species such as singlet oxygen. Together with Prof. Santi Nonell from Institut Químic de Sarrià (Barcelona, Spain), we try to understand how the protein environment of the chromophore affects the photoproduction of singlet oxygen. This is relevant to the design of new fluorescent protein variants with better photobleaching properties, and for the development of better agents for chromophore-assisted light inactivation.

SELECTED RECENT PUBLICATIONS

1. A super-resolution map of the vertebrate kinetochore, S. A. Ribeiro, P. Vagnarelli, Y. Dong, T. Hori, B. F. McEwen, T. Fukagawa, C. Flors and W. C. Earnshaw, *Proc. Natl. Acad. Sci.* 2010, **107**, 10484-10489
2. Super-resolution imaging of DNA labelled with intercalating dyes, C. Flors, C. N. J. Ravarani, D. T. F. Dryden, *ChemPhysChem* 2009, **10**, 2201-2204 (front cover)
3. A stroboscopic approach for fast photoactivation-localization microscopy with Dronpa mutants, C. Flors, J. Hotta, H. Uji-i, P. Dedeker, R. Ando, H. Mizuno, A. Miyawaki, J. Hofkens, *J. Am. Chem. Soc.* 2007, **129 (45)**, 13970-13977
4. Singlet oxygen photosensitization by EGFP and its chromophore HBDI, Jimenez-Banzo, S. Nonell, J. Hofkens, C. Flors, *Biophys. J.* 2008, **94**, 168-172.