

Preface

This book provides a selection of single molecule investigations, presented at the International meeting held at Palazzo Franchetti in Venice on “Single Molecule Activation and Detection in Molecular Devices” on October 13–14, 2012. This meeting gathered scientists active in developing tools and methodologies for single molecule analysis and was organized within the FOCUS project, sponsored by the EU FP7 FET Proactive 7 Programme: “Molecular Scale Devices and Systems [ICT-2009.8.7]” (grant agreement n, 270483).

The book captures selected contributions from members of the European “Focus” consortium as well as from other distinguished scientists operating in the field of single molecule analysis. The contributions collected here provide not only a good view of the activities of the FOCUS project, but also offer a wide spectrum of novel investigations in an emerging and important field at the interface between material science and biology. Andolfi and Lazzarino have modified the methods of SMFS to develop Single Cell Force Spectroscopy for analysing adhesion processes in cells and neurons. Bauer, Kendziora, Ahmed, Hung and Fruk describe the use of DNA stretches used to tether the computing molecules in a prototype of the molecular device developed within the FOCUS project. Bianco, Bongini, Melli, Falorsi, Salvi, Cojoc and Lombardi have introduced the force clamp methodology in the optical tweezers apparatus so to improve the detection and resolution of chemical reactions. Dal Maschio describes the development of holographic beams of light able to reveal and analyse molecular properties at a very fine scale and to characterize also circuit properties. Diaspro, Bianchini, Cella Zancchi and Vicidomini describe how it is possible to detect single molecule using conventional far field illumination by using stochastic reading methods. Endeman, Feyen, Ghezzi, Antognazza, Martino, Colombo, Lanzani and Benfenati show how, by using light sensitive organic semiconductors, it is possible to modulate and control the firing of neurons and neuronal networks. Izquierdo-Serra and Gorostiza describe the recent progress in optogenetics in which endogenous ion channels can be rendered light sensitive by the introduction of a light switchable gate. Petrini and Barberis have attached quantum dots to synaptic receptors and in this way they can monitor and follow the lateral diffusion of these membrane proteins in their physiological environment. Limongi, Ferrara, Das, Moretti, Marini, Miele, Accardo, Raimondo,

Gentile and Di Fabrizio make use of superhydrophobicity to develop a variety of novel devices with which they can detect single or very few molecules. Finally, Naumenko, Cassese, Lazzarino and Bek illustrate how it is possible to detect and activate single molecules by using the special properties of tips with nanometer dimensions.

The Venice workshop was very stimulating and inspiring for all the participants, and we hope that this book will be of interest and inspire its readers.

Acknowledgement

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