Post-Doc position in ultrafast photo-emission spectroscopy of rhodopsin-mimicking photo-switches (21 months)

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Rhodopsins are the protein photo-receptors for vision in vertebrates. Microbial organisms use them, too, but for other forms of photo-sensing or for primitive photosynthesis. From a molecular point of view, the start for these processes is photo-isomerisation: light converts the chromophore retinal from its *cis* to the *trans* form, a photo-chemical process, which occurs within a few hundreds of femtoseconds and with > 50% quantum efficiency.
Photo-isomerisation implies large molecular motion, out-of-plane bond twists and rotation around C-C bonds of retinal. Quantum mechanically, the transition from *cis* to *trans* occurs when these motions make the electronic excited and ground states degenerate, at the so-called conical intersections (CInt). Quantum chemistry has predicted these transition states to be the decisive states determining the quantum efficiency of the reaction, but CInt's have so far escaped from direct observation in standard UV/VIS/mid-IR pump-probe transient absorption experiments.
In this joint collaboration between the Max-Born-Institute, Berlin (Dr. O. Kornilov) and the IPCMS Strasbourg (Dr. J. Léonard & Prof. S. Haacke), we bring together our expertise to investigate the CInt of rhodopsin-mimicking photo-switches using novel tools of of femtosecond and attosecond XUV physics. In particular, we plan to apply the method of XUV time-resolved photoelectron spectroscopy (XUPS) to investigate Cints in rhodopsin-mimicking systems.

JOB DESCRIPTION
Within a joint collaboration of the above partner labs, the post-doc position is located in both ultrafast spectroscopy labs in Strasbourg (IPCMS) and at MBI, Berlin. The Strasbourg team has a long-standing experience with these particular, vibrationally coherent photo-switches[1], studied by broadband UV/VIS TAS with sub-10fs resolution[2]. The team of Dr. O. Kornilov at MBI runs a state-of-the-art femtosecond UV-pump-HHG/XUPS-probe experiment with liquid jets[3]. In recent experiments, the ground state XUPS spectra of the photo-switches were obtained, for both anionic and cationic forms with high photo-emission yield. The first pump-probe experiments are in progress at MBI.
The post-doc will complete the first proof-of-principle phase on well-characterised molecules, in Berlin, before the project is extended to new complexes aimed at studying the influence of vibrational coherence and chemical substitutions on the isomerisation quantum yield and dynamics at the CInt. This second phase implies experiments both in Strasbourg and Berlin, relying on the above set-ups. Theoretical support will be provided by Prof. M. Olivucci (U Siena & Bowling Green), inventor of the photo-switches, and Dr. S. Gozem (GSU Atlanta). Photo-switches will be designed for this project and provided in sufficient amount by chemistry partners. The candidate should posess good knowledge in molecular physics and/or physical chemistry and have to be ready to utilize novel non-standard experimental methods and perform advanced data analysis.
The post-doc, since in an early stage of his career, is encouraged to pursue new ideas, publish first-class papers and present his work at conferences, mentor graduate students, and contribute to fund raising.

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[1] M. Gueye, M. Paolino, E. Gindensperger, S. Haacke, M. Olivucci, J. Léonard, Faraday Discussions, *DOI: 10.1039/C9FD00062C*;
[2] M. Gueye, M. Manathunga, Y. Orozco, M. Paolino, S. Fusi, S. Haacke, M. Olivucci, and J. Léonard, *Nature Comm.* **9,** 313 (2018); DOI: 10.1038/s41467-017-02668-w
[3] J. Hummert, G. Reitsma, N. Mayer, E. Ikonnikov, M. Eckstein, O. Kornilov, J. Phys. Chem. Lett. 2018, 9, 6649−6655

MINIMUM QUALIFICATIONS
Doctoral Degree in Physics, Chemistry, or Photonics and demonstrated research ability. Preferred applicants should have a strong background in ultrafast optics, and molecular spectroscopy, possibly in the condensed phase. We like to work with team players and young enthusiastic scientists attracted by a broad interdisciplinary horizon, and an international collaboration.

The ideal candidate has two years of research experience in the field of ultrafast optics and spectroscopy. Experience with synthesis of organic molecules, data analysis, and new technical developments, including software, are a plus. **Starting date:** ASAP.

Applicants should send a CV and cover letter summarizing previous expertise and research interests, and arrange for a letter of recommendation. **Informal inquiries** can be sent to haacke@unistra.fr or oleg.kornilov@mbi-berlin.de.

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