

Nice, March 6th, 2016

Concern: Proposal for a PhD funding starting in October 2016

Title: Development of new and versatile synthetic approaches of shape and environmental sensitive fluorophores

The fellowship is funded by the University of Nice Sophia Antipolis (from a MESR funding) and is available from October 2016.

Presentation of the research group: The "Sondes Fluorescentes" Group at the "Institut de Chimie de Nice - UMR 7272 " is interested in the design and the chemical synthesis of fluorescent innovative dyes for DNA labeling. The laboratory of our Team "Molécules Bioactives", recently renovated, presents optimal and efficient conditions to perform research at the cutting edge of technology (self-service facilities: LCMS, NMR 200-500 MHz, Combi-Flash, HPLC, Spectrophotometer UV, Spectrofluorometer, Microwave apparatus, Flow chemistry...).

Due to the extreme sensitivity, non-invasive character, high spatial and temporal resolution, fluorescence spectroscopy is a technique of choice to unravel the molecular mechanisms and dynamics of biomolecular machineries. To achieve this objective, elaboration of innovative and optimized fluorophores is a prerequisite. However, this aim remains challenging because rigorous and demanding schedule of conditions have to be met: high sensitivity to environmental changes, photostability, brightness, and absorption compatible with laser beams, etc.

In this context, our group has recently developed different pallado-catalyzed cross coupling reactions (Buchwald-Hartwig, Sonogashira, Stille) to access fluorescent push-pull dyes. The versatility of such approaches facilitates the access of different libraries of fluorophores bearing various types of donors and acceptors thus allowing a fine-tuning of the photophysical properties of the fluorophore. The new fluorophores exhibit visible absorptions, exquisite brightness and photostability, important solvatofluorochromism, mega-Stokes shifts and dramatic displacements in emission to near-infrared. Therefore, they possess major advantages that overcome the limitations of conventional dyes such as light scattering, auto-fluorescence and undesirable quenching of the fluorophore signal. These properties make them prospective fluorescent tools to study diverse macromolecular assemblies (DNA/protein interactions, membranes, polymers, etc.).

In this regard, the purpose of the PhD project will be to extend this rational approach to the synthesis of new boxes of fluorescent tools with optimized properties to overcome the bottlenecks of the currently available fluorescent dyes as well as to address unanswered questions. To give a taste of applications envisioned in this project, the implementation of these building blocks in different sensors to study DNA polymorphs, such A- and i-motifs as well as G-quadruplexes is programmed. This project is methodology- and organic synthesis-oriented but at the interface of the chemistry and biology. The applicant needs to have a strong background in organic chemistry

and structural analysis (RMN, MS). Knowledge in chemical biology will be appreciated. Applicants should submit a curriculum vita, a motivation letter and two letters of recommendations to the following e-mail address burger@unice.fr



Prof. Alain BURGER

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- 4) A. A. Kuznetsova, N. A. Kuznetsov, Y. N. Vorobjev, N. P. F. Barthes, B. Y. Michel, A. Burger, O. S. Fedorova "New Environment-Sensitive Multichannel DNA Fluorescent Label for Investigation of the Protein-DNA Interactions", *PLoS ONE* **2014** 9 (6): e100007.
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