

*PhD position available:
Building DNA directed protein nano-structures.*¹
Supervised by Professor James Sturgis
May 16, 2018

A PhD position is available starting in October 2018 to work in James Sturgis' research group on an interdisciplinary project funded for 3 years by the Amidex foundation. Professor Sturgis directs the LISM laboratory located in the CNRS campus in Marseilles, France. The project is part of a collaboration involving laboratories in Marseilles, the Netherlands, the UK and the USA.

Project

THE PRIMARY OBJECTIVE of this project is to develop technology for the one, two and three dimensional engineering of membrane protein organization. In order to achieve this aim the student will use structural DNA based nano-engineering to precisely position objects in space. The objects to be positioned will be membrane proteins and other hydrophobic molecules that can thus be assembled into specific structures. Precise protein positioning by DNA nano-structures has previously been used to elucidate fundamental mechanisms, such as substrate channeling, and build novel devices.

The production of these novel and exciting structures will require the purification of different membrane proteins prior to building hybrid protein-DNA structures. The proteins will then be attached to DNA molecules to allow their positioning in DNA structures, using various chemical strategies that we have recently set up. The student will also master the assembly of structural DNA architectures using several different schemes. The research group has considerable experience in many of these techniques.

THE STUDENT WILL USE the nano-structures produced to engineer novel photonic devices based on photosynthetic membrane proteins. We hope that these structures will provide biological insight into the energetic processes of energy and electron transport. Furthermore, the use of photo-activated proteins provides the opportunity of constructing novel biologically based photo-voltaic and photonic devices.

In parallel with the synthesis of the different nanostructures the student will use a variety of methods to characterize them both structurally and functionally. These will include microscopic analysis for structural assessment including electron microscopy, atomic-force microscopy, confocal and super-resolution optical microscopy. For functional or dynamic measurements a variety of state of the art spectroscopic methods will be used. Some of these more demanding measurements will be made in collaboration with our foreign partners.

¹ Funded by Amidex, initiative of excellence

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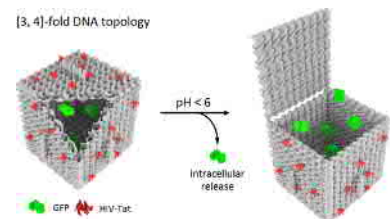


Figure 1: Structural DNA box decorated with proteins that can be opened. (doi:10.1021/acssynbio.7b00278).

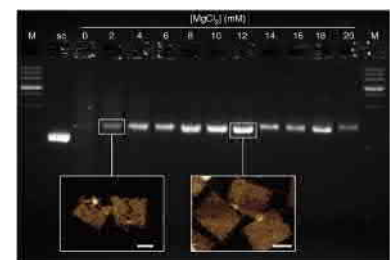


Figure 2: Quality and yield of DNA nanostructures followed by gel electrophoresis and AFM. doi:10.1038/nprot.2014.079

Laboratory

THE STURGIS GROUP is one of eight research groups in the LISM. The team has considerable experience in the study of membrane proteins, in particular the complexes involved in bacterial anoxygenic photosynthesis. The project developed here is aimed at using this experience of membrane proteins to design and build novel nano-structures. The other teams of the lively research unit are mostly more centered on microbiology, molecular machines and the mechanisms associated with microbial infection. As part of the microbiology research institute (IMM) we enjoy access to state of the art core services including: nmr; microscopy (cryo-EM, confocal, super-resolution); mass spectrometry; biophysical analysis.

The laboratory is located on the CNRS research campus in southern Marseilles with easy access to public transport, the center of town, the university and the surrounding countryside and the Mediterranean.

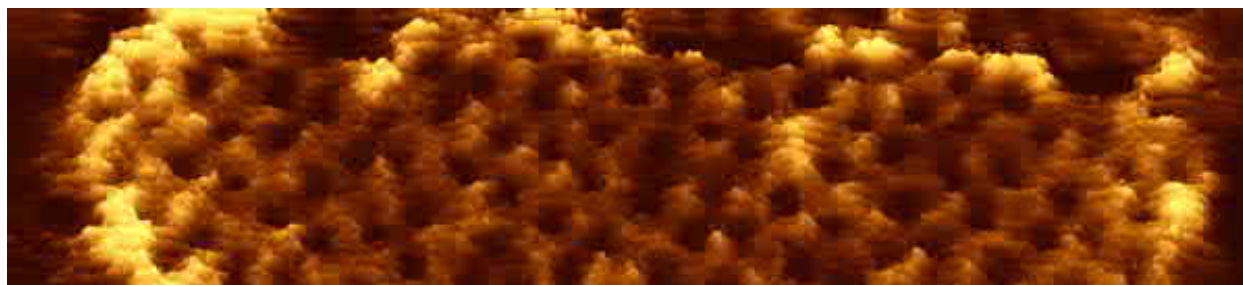
Application

THE CANDIDATE should have a Masters degree or equivalent in a science subject and be ready to participate in a demanding project involving biology, chemistry and physics. Practical experience in one of the domains pertinent to the project: membrane proteins, protein chemistry or DNA nano-structures; would be a plus but is not essential. As the project will involve international collaborations proficiency in English will be necessary.

TO APPLY FOR THIS POSITION, please send a recent CV, information on your masters project and together with recommendation letters and a letter explaining your interest in this position to Professor Sturgis. These should be received before the 30th June. Potential candidates will be interviewed, either coming to Marseilles or by internet ² prior to selection expected in mid- to late- July.

IF YOU WISH FOR FURTHER INFORMATION either about the project, the laboratory or the environment do not hesitate to contact Prof. Sturgis.

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² Skype, WhatsApp