

The Laboratoire TIMC-IMAG at the University Grenoble Alpes and the Institut Laue-Langevin (ILL, Grenoble, France), jointly invite applications for a three-year PhD programme focusing on

Structure-function relationship of biomimetic membranes with incorporated membrane proteins

The nano-engineering of biomimetic membranes provides a sophisticated "self-assembled" approach to the manufacture of nanostructured devices. By incorporating membrane transport proteins in biomimetic membranes the group SyNaBi (within the laboratory TIMC-IMAG at Université Grenoble Alpes) showed that it is possible to built an artificial cell system for producing energy in a biomimetic fashion.

Although that biomimetic energy device has reached quite a sophisticated stage of development, its further optimisation is currently limited by the lack of a complete understanding of the structure/function relationship of the system of the biomimetic membrane and incorporated transport proteins. The research proposed for this **PhD thesis is aimed** to overcome that limitation by utilising neutron reflectivity and electric impedance spectroscopy to characterise the molecular detail of the biomimetic membrane system and associate to its electrochemical behavior.

The **outcome of this PhD project** will provide the results that would allow a great boost to the ongoing development of the biomimetic energy device, which would in-turn provide a strong basis for the miniaturisation and power for a raft of biomedical devices such as defibrillators, pacemakers that do not use leads, neurostimulators, muscle stimulators, implanted remote monitoring devices, or mechanical pumps such as to replace the urinary sphincter.

The PhD will benefit from all the experimental techniques available in both ILL and TIMC-IMAG laboratories. In particular, Electric Impedance Spectroscopy (EIS) and Patch Clamp will be used to determine the electrochemical properties of the biomimetic membranes and the single channel conductivity of the porins, respectively. EIS will be use also in combination with Quartz Crystal Microbalance and Neutron reflectivity experiments. The latter will be of high importance to understand the structural properties of supported bilayers with inserted proteins and to indirectly determine the effect of proteins activation on the floating bilayer fluctuations. Reflectivity measurements will be carried out also at the European Synchrotron Radiation Facility in Grenoble.

The PhD project will be located in Grenoble (France), at the ILL (under the supervision of Dr. Giovanna Fragneto) and a the laboratory TIMC-IMAG (under the supervision of Dr Marco Maccarini and Prof. Don Martin). The successful candidate will be employed for a period of up to three years, with a gross salary of around 2350 €/month, together with other benefits depending on the student's social status (for more details see: <http://www.ill.eu/science-technology/phd-students/phd-recruitment/phd-work-at-the-ill/>). Applicants should have a degree in physics or physical-chemistry. Academic knowledge of condensed matter physics and programming skills will be appreciated.

Supervisors: Dr. Marco Maccarini and Prof. Donald Martin, TIMC-IMAG (Grenoble) and Giovanna Fragneto, ILL (Grenoble).

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