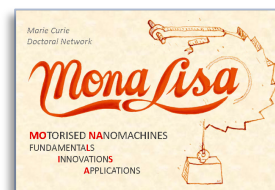




Funded by the
European Union

Marie Skłodowska-Curie
Doctoral Network (DN)



PhD position in Marie Curie Doctoral Network “MonaLisa” Motorised nanomachines: Innovations, Fundamentals, Applications

The Center for Light Activated Nanostructures (CLAN), Dipartimento di Chimica Industriale “Toso Montanari” of the University of Bologna, Italy, is offering a PhD position on:

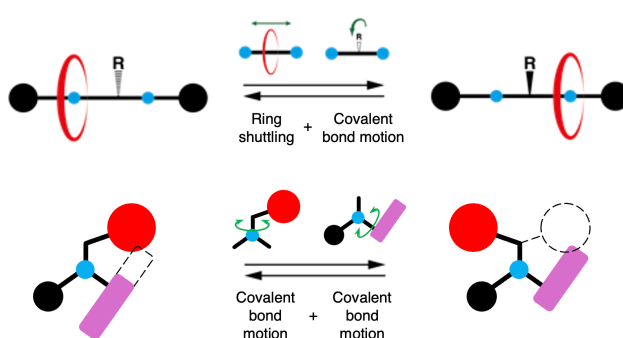
Topic: **Geared movements in mechanically interlocked systems**

Reference: **MonaLisa-DC06**

<https://euraxess.ec.europa.eu/jobs/337748>

The project is funded by the Marie Skłodowska Curie Innovative Doctoral Network “MonaLisa”, within the Horizon Europe Programme of the European Commission. within the Horizon Europe Programme of the European Commission. The project aims to structure a training network for doctoral students in the field of Artificial Molecular Machines for a period of 48 months. MonaLisa is a consortium of 20 partners composed of high-profile universities, research institutions and companies located in 5 European countries, and will train 15 Doctoral Candidates. More information about the MonaLisa consortium and activities can be found in the [dedicated page](https://centri.unibo.it/clan/en) on the CLAN web site: <https://centri.unibo.it/clan/en>

PROJECT DESCRIPTION: The dynamic interaction between different movements occurring within supramolecular structures is essential to the functional properties of natural molecular machines. Despite progresses made on artificial counterparts, the development of molecular systems where two (or more) motions are integrated together to produce an outcome is still in its infancy. The goal of DC6 will be to design, synthesize, and characterize systems displaying thermally activated and/or stimuli-induced movements and their coupling with other distinct degrees of freedom at the molecular level (see figure). Drawing from previously developed architectures showing concurrent macrocycle shuttling and covalent bond rotation, we plan to use rotaxane-based scaffolds to gear multiple movements so they occur in a concerted fashion. Another line will deal with the development of molecular rotary motors and the possible effect of the rotation on nearby mechanically entangled moieties. Other options, such as linking the moving parts by covalent tethers, will also be explored. DC6 will apply state-of-the-art synthetic methodologies to make the molecules, and use advanced (dynamic) NMR techniques (VT, 2D, etc.) to structurally and kinetically characterize the movements and investigate the level of gearing. The exploitation of known molecular motors and ratcheting mechanisms will be also considered in order to implement features such as unidirectional geared motion and autonomous operation. The ultimate goal is the development of sophisticated artificial molecular machines capable of transforming and transmitting motion at nanoscale. The envisioned studies will significantly improve our fundamental understanding of how molecular components interact dynamically and will provide a test ground for the investigation of non-trivial molecular isomerisation mechanisms.



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References: [10.1016/j.chempr.2021.04.010](https://doi.org/10.1016/j.chempr.2021.04.010); [10.1021/jacs.1c02230](https://doi.org/10.1021/jacs.1c02230); [10.1016/j.chempr.2024.11.013](https://doi.org/10.1016/j.chempr.2024.11.013).

PhD SUPERVISOR: **Alberto Credi**, Professor of Chemistry at the University of Bologna and CNR Associate Research Director. For enquiries about the position, please write to: alberto.credi@unibo.it.

LOCATION: The PhD will be based in **Bologna, Italy**, at the [Center for Light Activated Nanostructures \(CLAN\)](https://centri.unibo.it/clan/en), a joint laboratory between the University of Bologna and the Italian CNR.

ELIGIBILITY CRITERIA: In order to be eligible, each applicant must fulfil the following criteria:

Nationality: Candidates may be of any nationality.

Mobility: At the date of recruitment, the applicant must not have resided or carried out his/her main activity (work, studies etc.) in Italy for more than 12 months in the last 3 years immediately prior to his/her recruitment. Compulsory national service and/or short stays such as holidays are not taken into account.

Qualifications and research experiences: the applicant must fulfil the requirements defined for Doctoral Candidates (DCs): DCs are researchers who **at the date of recruitment have NOT yet been awarded the doctoral degree and are in the first 4 years (full time equivalent) of his/her research career**. Full-time research experience is measured from the date when a researcher obtained the degree that formally entitled him/her to begin a doctorate, either in the country in which the degree was obtained or in the country in which the researcher is recruited or seconded, irrespective of whether or not a doctorate is or was ever envisaged.

KEY RESPONSIBILITIES: The position is available for 36 months and the key tasks as a PhD student are:

- To manage and carry out through research projects
- To attend and participate in research and training activities within the MonaLisa network and local courses
- To write articles for scientific peer reviews
- To write a PhD thesis
- To teach and disseminate research in the scientific community (international conferences) and non-scientific community, by outreach and public engagement
- To be involved in departmental and group activities

FORMAL REQUIREMENTS: Applicants should hold MSc degree (or equivalent) with good grades and good English skills. As criteria for the assessment of your qualifications, emphasis will also be laid on relevant work experience and previous publications (if any).

BACKGROUND OF SUCCESSFUL CANDIDATE: We are looking for an outstanding highly motivated candidate with a strong academic record holding a Master degree in Chemistry. An excellent theoretical background, experience in supramolecular chemistry / organic synthesis / spectroscopy / physical chemistry / molecular modeling / photochemistry, and good laboratory skills are prerequisite for this ambitious project. Candidates will become part of an international multidisciplinary team and will have to integrate in other laboratories of the network for training periods. The candidate must therefore have excellent personal skills and be able to work in a team. Women are especially encouraged to apply.

TERMS OF EMPLOYMENT: The successful candidate will receive an attractive salary in accordance with the MSCA regulations for doctoral candidates. The generous financial package includes a living allowance (gross 3300€/month), a mobility allowance (600€/month) and a family allowance (if eligible, 660€/month). The candidate will be enrolled in the [PhD program in Nanoscience for Medicine and the Environment](#) at the University of Bologna. The guaranteed PhD funding is for 36 months.

A career development plan will be prepared for each fellow in accordance with his/her supervisor and will include training, planned secondments and outreach activities in partner institutions of the network. The DC fellows are supposed to complete their PhD thesis by the end of the third year of their employment.

More information can be found on the CORDIS page: <https://cordis.europa.eu/project/id/101169136>.