We propose an interdisciplinary PhD thesis located at the interface “physics / pharmacy”. It will benefit from a collaboration between two laboratories of the University of Lille:
- UMR CNRS 8207: Unité Matériaux Et Transformations (UMET)
- INSERM U1008: Controlled Drug Delivery Systems and Biomaterials.
Dr. Jean-François Willart (DR CNRS, physicist) and Prof. Juergen Siepmann (pharmacist) will jointly supervise the PhD thesis.

This research work is dedicated to the optimization of the therapeutic efficacy of drugs by the manipulation of their physical state. The challenge is to improve the solubility of poorly soluble drugs by producing amorphous solid dispersions of the latter within a polymeric excipient. Poor aqueous drug solubility is a crucial hurdle for the development of innovative medical treatments. In the amorphous (disordered) state, the solubility of a drug is generally substantially higher than in a crystalline state. However, its physical stability is impaired, due to recrystallization during long term storage. The dispersion of the drug at the molecular state within an appropriate polymeric matrix former will overcome this disadvantage. The main objective of this project is to explore the relationship between the formulation, the manufacturing process and the performance of the system in terms of physical stability and drug release.

The physical stability of amorphous solid dispersions will be determined through a rational approach of physics of materials. This will require a deep physical characterization of amorphous formulations. This will also require the development and the application of efficient methods to determine the solubility line and the glass transition curve of drug / polymer alloys. These methods will be both experimental (X-ray diffraction, calorimetry, dielectric spectroscopy and Raman spectroscopy) and...
This part of the thesis project will be carried out within the team "Molecular and Therapeutic Materials" of UMET. The drug release performances of the amorphous solid dispersions in aqueous media simulating body fluids will be determined for different compositions and various modes of production (e.g., grinding, extrusion, spray drying, lyophilization...) to determine the most appropriate processing and formulation parameters. The innovative amorphous solid dispersions will be processed into administrable dosage forms, e.g. minitablets. Drug release from the latter will be monitored using adequate experimental set-ups and drug detection by High Performance Liquid Chromatography. This part of the thesis project will be realized in the INSERM U1008 laboratory: "Controlled Drug Delivery Systems and Biomaterials". Moreover, the project will benefit from an intersectorial collaboration with the company Roquette which is a global provider of plant-based excipients (starch, polyols...) for the pharmaceutical and biopharmaceutical industries. It will also benefit from an international collaboration with the group of Professor Van den Mooter from the University of Leuven (KU Leuven / Belgium), whose expertise in amorphous dispersion is internationally recognized.

<table>
<thead>
<tr>
<th>Expected profile of the candidate</th>
<th>University studies of physics (ideally specialized in Soft Matter) or pharmacy (ideally specialized in Pharmaceutical Technology). Capacity to work in a multidisciplinary team. Fluent English skills (written and spoken). Good organizational skills.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application procedure</td>
<td>The application procedure is detailed on the European programme PEARL website <a href="http://www.pearl-phd-lille.eu">www.pearl-phd-lille.eu</a>. The funding is managed by the I-SITE ULNE foundation which is a partnership foundation between the University of Lille, Engineering schools, research organisms, the Institut Pasteur de Lille and the University hospital. The application file will have to be submitted before April 15, 2020 (10h Paris Time) and emailed to the following address: <a href="mailto:international@isite-ulne.fr">international@isite-ulne.fr</a>.</td>
</tr>
<tr>
<td>Net salary and Lump Sum</td>
<td>A net salary of about €1,600 + €530 per month to cover mobility, travel and family costs.</td>
</tr>
</tbody>
</table>
PEARL, Programme for Early-stage Researchers in Lille, is offering 15 prestigious PhD positions cofounded by the European Commission and the I-SITE ULNE Foundation. The proposed subjects list is given below with a Web link for detailed information.

This call is being advertised worldwide in order to recruit PhD students who will respect the mobility rule (see below). The applicants will have to send their application via the following email address: international@isite-ulne.fr, following an evaluation on file, selected applicants will be invited to interviews (videoconference).

Please, carefully check the following eligibility criteria before applying. In case of any doubt, please contact contact@pearl-phd-lille.eu or check out the last updates on www.pearl-phd-lille.eu.

**Unique advantage of PEARL:**

In the framework of this doctoral programme, as fellows, you will have the opportunity to pursue your research in a dynamic environment. The students will participate to innovative training sessions, international conferences, networking sessions with fellows from different fields and weeks dedicated to explore the opportunities offered by companies, regional authorities and associations.

Secondments in non-academic partners and/or foreign research units will be mandatory for all after-mentioned research projects.

Alongside your research activities you will be helped by the programme management team for any topics related to your moving and your stay in France.

As Marie Skłodowska Curie fellows, you will receive a net PhD salary (= €1,600) alongside with a monthly lump sum to cover your mobility, family and travel costs (= €530).

**Applicants eligibility:**

- **Mobility rule:** Applicants from all countries are eligible. However, you cannot apply if you have resided or carried out your main activity (work, studies)\(^1\) in France for more than 12 months during the 3 years immediately preceding the call deadline (04/15/2017 - 04/15/2020).
- As Early-Stage Researchers (ESR) you shall be, at the time of recruitment by the host organisation (between September 1\(^{st}\) and November 1\(^{st}\)), in the first four years of your research career and not have been awarded a doctoral degree yet. The four years start to count from the date when a researcher obtained the degree which would formally entitle him/her to embark on a doctorate.

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\(^1\) Time spent as part of a procedure for obtaining refugee status under the Geneva Convention and/or short stays such as holidays are not taken into account.
You must have a master’s degree or equivalent university degree (with respect to the requirements of the host institutions and the regional doctoral school) earned no more than 4 years prior to the call deadline (April 15, 2020) and in hand by the start of the PhD contract (before August 31, 2020).

Additional information:

- Upon discussion with the potential supervisors, you are welcome to modify/add elements to the PhD project proposal (in the dedicated part of the application form).
- There is no limit to the number of applications per candidate: you can apply for more than one research project.
- PEARL PhD students shall participate to mandatory activities and trainings during their 3-year degree. We require that the doctoral degree must be awarded to the students at the end of the 3 years.
- PEARL programme will fund the PhD students for a 3-year period of time. If the PhD students in ‘cotutelles’ which lasts more than three years he/she has to find external additional funding. In any case, no extra funding from the I-SITE ULNE will exceed the 3-year period.

Proposed PhD research projects:

- 002 - [Click chemistry and unnatural amino acids to illuminate oncogenic activities in living cells](#) - ONCOGIMAGING
- 003 - [Risk assessment related to DIsinfection by-Product formation in drinking water](#) - DIP
- 004 - [Nano-therapeutics for topical treatment of ocular diseases](#) - NATO
- 006 - [FMRI-based closed-loop neurofeedback to relieve drug-resistant hallucinations in schizophrenia](#) - NEUROFEEDBHAL
- 007 - [Development of an instrumented microfluidic culture system to study tumour-stroma interaction and drug sensitivity of pancreatic adenocarcinoma](#) - MATisSE
- 008 - [NMR characterization and antimicrobial activity of mechanically synthesised organometallic complexes](#) - NMR-MECA-DRUG
- 009 - [Magnesium based Nano Composites for Othopedic Applications](#) - MAGNACOM
- 010 - [Halophytes of the Region Hauts-de-France as a source of potential anti-human coronavirus biomolecules](#) - HaloHcov
- 013 - [FabriCAtion of solid state asymmetric MIcro-SupercapacitOrs for Internet of Things applications](#) - CAMISOL
- 014 - [Formulation in the Amorphous State](#) - FAST

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2 The identification numbers will be asked in the application form. This is an internal identification number.
Documents required for the application:

- Application form duly completed (see annex);
- An identity paper (ID, Passport);
- A 2-page CV/ résumé;
- A 2-page cover letter;
- At least one reference letter;
- Certificate of enrolment in a Master degree in case you cannot provide the ongoing diploma (see annex);
- Sworn statement on compliance with the mobility rule (see annex);
- Evidence of English proficiency (minimum B2 or equivalent);
- Grades obtained during your last 3 years of graduate studies and a description of the degree programme and courses taken for studies completed outside of France. (with translation for documents that were not obtained from an English- or French-speaking country – Official academic transcripts must be provided for each semester of each year.)
- Copy of post-secondary diplomas (with translation for degrees that were not obtained from an English- or French-speaking country; at this stage these copies do not have to be legalized)

To finalize your application, send these documents via the following email address: international@isite-ulne.fr

**Evaluation criteria:**

**Step 1 – Evaluation on file**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
<th>Subcriteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific excellence</td>
<td>/60</td>
<td>Academic education and training, Academic excellence (incl. prizes, publications, participation in international programmes such as Erasmus) Dual degree/diploma</td>
</tr>
<tr>
<td>Adequacy of the career plan and the thesis project</td>
<td>/20</td>
<td>Ambition both in relation to the PEARL Project/s applied for and in relation to the applicant's research interests more broadly.</td>
</tr>
<tr>
<td>Research experience</td>
<td>/20</td>
<td>Research environments within and outside of the Higher Education sector, as well as sectors and organisations which are impacted by research outcomes.</td>
</tr>
<tr>
<td><strong>Total score</strong></td>
<td>/100</td>
<td></td>
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</tbody>
</table>

*Step 1: Evaluation Criteria (Application Files)*

You must be awarded at least the score of 80 of the step 1 total score and be in the top-3 best candidates to be eligible for step 2.

**Step 2 - Interview**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
<th>Subcriteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>/40</td>
<td>Analysing their knowledge of the environment of the position they are applying for.</td>
</tr>
<tr>
<td>Career prospects</td>
<td>/35</td>
<td>Adequacy of their profile with the research topic and challenging their future career.</td>
</tr>
<tr>
<td>Communication</td>
<td>/15</td>
<td>Ability to communicate in English concerning the potential societal impact of the PEARL research project they are applying for.</td>
</tr>
<tr>
<td>3I potential</td>
<td>/10</td>
<td>Willingness and potential to work in an interdisciplinary, intersectoral and international context.</td>
</tr>
<tr>
<td><strong>Total score</strong></td>
<td>/100</td>
<td></td>
</tr>
</tbody>
</table>

*Step 2: Evaluation Criteria (Interview)*

**Deadline and results**

The application file has to be sent by email at international@isite-ulne.fr before **April, 15, 2020** (10:00 am – Paris time). Please make sure the principal investigators are copied on the email.

At the end of April (**04/30/2020**), you will be informed if you pass or not the first step of the procedure. Two weeks after you will be interviewed by video conference by our committee (**between May, 11 and May, 15**). The results will be published on **May, 19 2020**.

If you pass the interview you will be redirected toward the competent services which will allow you to proceed to your administrative registration.