

# Spécialité de Master « Optique, Matière, Paris »

Stage de recherche (4 mois minimum, à partir de début mars)

## Proposition de stage (**ne pas dépasser 1 page**)

Date de la proposition : 17/11/2017

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| <b>Responsable du stage / internship supervisor:</b>                        |  |   |
| Nom / name:   | SIMS   | Prénom/ first name : Ian                  |
| Tél :   | 02 23 23 69 18   | Fax :                                     |
| Courriel / mail:  | ian.sims@univ-rennes1.fr   |   |
| <b>Nom du Laboratoire / laboratory name:</b> Institut de Physique de Rennes |  |   |
| Code d'identification :   | IPR UMR 6251   | Organisme : CNRS – Université de Rennes 1 |
| Site Internet / web site:   | <a href="https://ipr.univ-rennes1.fr">https://ipr.univ-rennes1.fr</a> ou <a href="https://perso.univ-rennes1.fr/ian.sims/">https://perso.univ-rennes1.fr/ian.sims/</a> |   |
| Adresse / address:  | Institut de Physique de Rennes, UMR 6251 du CNRS - Université de Rennes 1, Bat. 11c, Campus de Beaulieu, 263 Avenue du Général Leclerc, 35042 RENNES CEDEX, FRANCE     |   |
| Lieu du stage / internship place:   | Rennes   |   |

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| <b>Titre du stage / internship title:</b> CRESUCHIRP - Ultrasensitive Chirped-Pulse Fourier Transform mm-Wave Detection of Transient Species in Uniform Supersonic Flows  |
| <b>Résumé / summary Research project:</b> The CRESU (Reaction Kinetics in Uniform Supersonic Flow) technique, combined with laser photochemical methods, has been applied with great success to perform research in gas-phase chemical kinetics at low temperatures, of particular interest for astrochemistry and cold planetary atmospheres, as well as for combustion and atmospheric chemistry. We have been involved in a collaboration with Arthur Suits (U. Missouri) and Bob Field (MIT) to develop a new combination of the revolutionary chirped pulse broadband rotational spectroscopy technique invented by Brooks Pate and co-workers with a novel pulsed CRESU, which we have called Chirped Pulse in Uniform Flow (CPUF).<br>Recently, the European Research Council (ERC) has awarded an Advanced Grant to Ian Sims along with his senior collaborators and a team of external experts (project CRESUCHIRP). In this project we aim to exploit the exceptional quality of the Rennes CRESU flows to build an improved CPUF instrument, and use it for the quantitative determination of product branching ratios in elementary chemical reactions over a wide temperature range (data which are urgently required as input to models of gas-phase chemical environments such as interstellar clouds and planetary atmospheres), as well as the detection of reactive intermediates and the testing of modern reaction kinetics theory. Applications to the areas of combustion and terrestrial atmospheric chemistry are also envisaged.<br>We are looking for one or two M2 students to join a multinational team (currently comprising French, British, American and Australian researchers). A new, completely refurbished laboratory facility has been created, along with dedicated collaborative office space, and the necessary instrumentation is currently being acquired.<br><b>Keywords:</b> chemical physics, molecular physics, physical chemistry, molecular astrophysics, experimental astrochemistry, CRESU, CPFTMW spectroscopy, laser photochemistry, low temperature kinetics, product branching<br><b>Research training environment:</b> The Rennes Laboratory Astrophysics group ( <a href="https://ipr.univ-rennes1.fr/labastro">https://ipr.univ-rennes1.fr/labastro</a> ) is internationally known for its experimental studies of elementary processes of interest for astrophysics, atmospheric science and combustion, and provides an excellent environment for research training. It is situated within the Molecular Physics Department of the Institute of Physics Rennes. It benefits from excellent technical and administrative support, and is situated in Rennes, the attractive and vibrant capital of the French region of Brittany. A gratification of at least 504 € / month will be provided, and the length of the internship can be from 4–6 months.<br><b>Candidate profile:</b> Candidates should be registered for a Masters degree (M2) or the final year of a "Diplôme d'Ingénieur" in physics or (physical) chemistry. Experience in experimental research would be advantageous, but full on-the-job training will be provided. A working knowledge of English is essential to be able to interact effectively with the multinational CRESUCHIRP team.<br><b>Procedure for candidatures:</b> Inquires and applications, including a detailed CV citing grades, an accompanying letter, and the names and contact details of two potential referees (with letters in pdf format if available), should be addressed to Prof. Ian Sims ( <a href="mailto:ian.sims@univ-rennes1.fr">ian.sims@univ-rennes1.fr</a> ). We plan the recruitment of two PhD students starting in September 2018, and the successful completion of an M2 internship would be expected to lead to an offer of a PhD contract. |

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| <b>Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : Yes</b>                           |   |                          |   |
| <b>Si oui, financement de thèse envisagé/ financial support for PhD: ERC Advanced Grant (~1650 € / mo)</b> |   |                          |   |
| Lumière, Matière, Interactions   | X | Lasers, Optique, Matière | X |

Fiche à transmettre (fichier pdf **obligatoirement**) sur le site <http://stages.master-omp.fr>