

Research Associate in Applied Mathematics - *Complex flows and optics to model topographical substrate design: Solar panel application balancing superhydrophobicity and concentrated photovoltaics*

Job Ref: REQ170992

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

School/Department summary

The Department of Mathematical Sciences is part of the School of Science at Loughborough. The Department has attracted staff and students from all over the world, making it a diverse and stimulating environment in which to study. Active in high quality research across the broad spectrum of mathematics, the Department has an international reputation, with four fifths of research rated internationally leading or better in REF 2014. Further information about the Department can be found here: <http://www.lboro.ac.uk/departments/maths/>, and about the School here: <http://www.lboro.ac.uk/science/>

Project Description

This project is funded through an EPSRC grant entitled "Complex flows and optics to model topographical substrate design: Solar panel application balancing superhydrophobicity and concentrated photovoltaics". The project will explore the fundamental relationships between light, surface microstructure, and hydrodynamics for the design of advanced optical materials by combining theory and computations---with the ultimate goal being optimal design leading to more efficient, safer, and lower cost materials/surfaces. The project will use phase-field/diffuse-interface modelling of fluids on surfaces coupled to equations describing the propagation of incident optical light or other electromagnetic waves. A prototype situation in the project will be that of rain on solar panels, where we will model how best to achieve objectives such as self-cleaning, reflection reduction, and concentrated photovoltaics with one substrate design. The project will last for 18 months, the entire duration of the Research Associate (RA) position, and will be undertaken jointly by the RA and Dr David N. Sibley as supervisor/principal investigator (PI).

Job Description

Job Grade: Specialist and Supporting Academic Grade 6

Job Purpose

To conduct research in the area of Applied Mathematics to understand, develop and optimise models of surfaces that interact with fluids and light or other electromagnetic radiation. Initially this will be to be responsible for the development of enabling tools and computational work for the modelling of fluid dynamics via a phase-field/diffuse-interface model coupled to equations describing the propagation of incident electromagnetic waves. Following this, the role will require the analysis of results applicable to textured solar panel surfaces and the generalisation of models and results to a wider context.

Job Duties

- To work on all aspects of the above project.
- To become familiar with and evaluate the present literature on fluid interaction with, and optical performance of, textured surfaces along with other relevant literature.

- To develop and analyse a phase-field/diffuse-interface model of fluids on surfaces coupled to equations describing the propagation of incident electromagnetic waves.
- To discuss results and progress at weekly meetings.
- To interact effectively with any collaborators on the project.
- To support the project team by enhancing relationships with existing collaborators and by assisting the establishment of relationships with new collaborators.
- To disseminate results both at national/international conferences and in the scientific literature, and be involved in providing accessible content for online use to the wider public.
- Contribute ideas for new research and enterprise directions.
- To undertake tasks assigned by the Principle Investigator (Dr David N. Sibley).
- There will be an opportunity to do a small amount of teaching in the Department of Mathematical Sciences.
- Engage in training programmes in the University (or elsewhere) that are consistent with the needs and aspirations of the project and those of the Department.
- Undertake other duties as may be reasonably requested and that are commensurate with the nature and grade of the post.

Points to Note

The purpose of this job description is to indicate the general level of duties and responsibility of the post. The detailed duties may vary from time to time without changing the general character or level of responsibility entailed.

Special Conditions

All staff have a statutory responsibility to take reasonable care of themselves, others and the environment and to prevent harm by their acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Policy & Procedures.

All staff should hold a duty and commitment to observing the University's Equality & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equality & Diversity legislation and University policies/procedures.

Successful completion of probation will be dependent on attendance at the University's mandatory courses which include Respecting Diversity and, where appropriate, Recruitment and Selection.

Organisational Responsibility

Reports to the Principal Investigator.

Person Specification

Your application will be reviewed against the essential and desirable criteria listed below. Applicants are strongly advised to explicitly state and evidence how they meet each of the essential (and desirable) criteria in their application. Stages of assessment are as follows:

1 – Application

2 – Presentation and Interview

Essential Criteria

Area	Criteria	Stage
Experience	Experience of conducting research in Applied Mathematics, Theoretical Physics, Engineering, or a related area	1, 2
	Proficiency in using computers to solve mathematics problems	1, 2
	Experience of obtaining the solution of Partial Differential Equations (PDEs) numerically	2
	Authoring original work for academic journal papers, conference papers or technical reports	1
Skills and abilities	Ability to publish in international journals	1, 2
	Oral communication skills sufficient to present material at international meetings	2
	Self-motivated with ability to meet deadlines	2
	Excellent interpersonal, and organisational skills	2
	Working knowledge of mathematical modelling techniques such as nondimensionalisation	2
	Ability to work as part of a team and to collaborate with others	1, 2
Training	Willingness to undertake further training as appropriate and to adopt new procedures as and when required	2
	Commitment to observing the University's Equal Opportunities policy at all times.	2
Qualifications	A PhD degree (or near completion) in Applied Mathematics, Theoretical Physics, Engineering, or a related area	1

Desirable Criteria

Area	Criteria	Stage
Experience	Knowledge of Fluid Dynamics	1, 2
	Knowledge of Geometrical Optics	1, 2
	Knowledge of Nonlinear Dynamics	1, 2
	Knowledge of super-hydrophobicity/wetting behaviour	1, 2
	Working in a high quality academic research environment	1, 2
	Experience of teaching and / or supervision of students in relevant areas	1, 2
Skills and abilities	Ability and willingness to teach at undergraduate level	1, 2
	A strong publication track record	1
	Ability to use finite element techniques and libraries for solution of PDEs	1, 2
	Working knowledge of software packages such as Matlab	1, 2
Qualifications	Postdoctoral experience	1, 2

Conditions of Service

The position is full time and fixed term for 18 months. Salary will be on Specialist and Supporting Academic Grade 6, £29,799 - £31,604 per annum, subject to annual pay award and salary to be confirmed on offer of appointment depending on experience.

The appointment will be subject to the University's normal Terms and Conditions of Employment for Academic and Related staff, details of which can be found [here](#).

The University is committed to enabling staff to maintain a healthy work-home balance and has a number of family-friendly policies which are available at <http://www.lboro.ac.uk/services/hr/a-z/family-leave-policy-and-procedure---page.html>

We also offer an on-campus nursery with subsidised places, subsidised places at local holiday clubs and a childcare voucher scheme (further details are available at: <http://www.lboro.ac.uk/services/hr/a-z/childcare-information---page.html>

In addition, the University is supportive, wherever possible, of flexible working arrangements.

We also strive to create a culture that supports equality and celebrates diversity throughout the campus. The University holds a Bronze Athena SWAN award which recognises the importance of support for women at all stages of their academic career. For further information on Athena SWAN see <http://www.lboro.ac.uk/services/hr/athena-swan/>

Informal Enquiries

Informal enquiries should be made to Dr David N. Sibley, Lecturer in Applied Mathematics, by email at d.n.sibley@lboro.ac.uk or by telephone on +44 (0)1509 228127.

Applications

The closing date for receipt of applications is **12 November 2017**.