School of Science

Research Associate:
Challenges of dispersionless integrability: Hirota type equations
Job Ref: REQ16796

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.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

[Department of Mathematical Sciences](#)

The Department of Mathematical Sciences at Loughborough is part of the School of Science, which contains some of the top ranked departments in the country, highly rated in the National Student Survey. Its Academic and research staff are international recognised experts working at the forefront of knowledge. The School enjoys a stimulating research environment with departments being rated highly in the most recent Research Assessment Exercise.

The Department of Mathematical Sciences strives to develop mathematically gifted graduates, train postgraduate students in specialist topics, and further the development of mathematics and its application through cutting edge research. Over 30 members of academic staff work across a variety of research interests in both pure and applied mathematics, to develop new ways of thinking and learning, and continually strengthen research within the department.

The Department's strength in research excellence is reflected in the latest Research Excellence Framework results (2014) where 87% of the Department's research was classed as internationally recognised and 10% as world-leading.

Job Description

Job Grade:
Specialist and Supporting Academic 6

Project Description
This is a 3 year EPSRC funded research project aimed at addressing a number of challenges in the area of multidimensional dispersionless integrable systems, with the emphasis on Hirota type equations. The topic lies at the intersection of partial differential equations, integrable systems, algebraic/differential geometry and the theory of special functions (theta functions, hypergeometric functions, modular forms). It will also involve a substantial computer algebra component. The key goal is to use modern techniques such as the method of hydrodynamic reductions and related differential-geometric machinery to classify multi-dimensional integrable Hirota type equations, and dispersive deformations thereof. The project involves a visiting researcher (Prof Kruglikov from Tromso, Norway), and collaborative visits to Germany, Canada, Italy, Norway, etc. The Research Associate will be based at Loughborough University.

Job Purpose

To undertake research to meet the objectives listed below:

- To find an explicit parametrisation of the generic Hirota `master-equation'in 3D.
- To classify integrable Hirota type equations in higher dimensions.
- To construct an integrable dispersive deformation of the Hirota master-equation.
- To develop a general solution procedure for integrable symplectic Monge-Ampere equations in 4D.
- To develop a geometric theory of integrability for general second-order PDEs in higher dimensions.

Job Duties

- To work on all aspects of the above project, to be prepared to study the relevant literature.
- To carry out necessary symbolic computations.
- To discuss the results at weekly meeting.
- To interact effectively with the collaborators in the project.
- To disseminate results both at conferences and in the scientific literature.
- To liaise with staff members and research students to ensure objectives and milestones within the project are met.
- To undertake tasks assigned by the Principle Investigator.
- There will be an opportunity to do a small amount of teaching in the Department of Mathematical Sciences.

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 – Test/Assessment Centre/Presentation
3 – Interview

Essential Criteria

Area	Criteria	Stage
Experience	Substantial experience of conducting research in the area of Integrable Systems	1, 3
	Familiarity with some of the following areas: Theory of Special Functions (modular forms, theta functions, hypergeometric functions); Algebraic Geometry (moduli spaces); Differential Geometry (generalised conformal geometry).	1, 3
	Proficiency in Computer Algebra (Mathematica, Maple)	1, 3
	Experience of publishing research outcomes	1, 3
Skills and abilities	Ability to publish in international journals	1, 3
	Oral communication skills sufficient to present material at international meetings	1, 3
	Ability to work as part of a team and to collaborate with others	1, 3
Training	Willingness to undertake further training as appropriate and to adopt new procedures as and when required	3
Qualifications	A PhD degree in Mathematics or Mathematical Physics	1, 3
Other	Evidence of a good working knowledge of equal opportunities and understanding of diversity in the workplace	1, 3

Desirable Criteria

Area	Criteria	Stage
Experience	Knowledge of differential geometry	1, 3
	Knowledge of algebraic geometry	1, 3
	Familiarity with special functions (including modular forms, theta functions and hypergeometric functions)	1, 3
Skills and abilities	Ability and willingness to teach at undergraduate level	1, 3
Qualifications	Postdoc experience	1, 3

Conditions of Service

The position is full time and fixed term for 36 months. Salary will be on specialist and supporting academic grade 6 (£29,301 – £38,183 per annum) at a starting salary commensurate with experience and qualifications.

The appointment will be subject to the University's normal Terms and Conditions of Employment for Academic and Related staff/Operational and Administrative 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 Professor Evgeny Ferapontov by email at E.V.Ferapontov@lboro.ac.uk or by telephone on +44 (0)1509 223309

Applications

The closing date for receipt of applications is **06 January 2017.**