UNIVERSITY OF LEEDS

Leeds Anniversary Research Scholarships (LARS)

Session 2016-2017

Faculty Closing Dates (23:59 UK time):
Please refer to http://www.leeds.ac.uk/info/130500/faculties for the list of Schools within each Faculty.

Arts; Biological Sciences; Business; Engineering; Mathematical & Physical Sciences; Medicine & Health	**15 January 2016**
Education, Social Sciences & Law; Environment	**11 March 2016**
Performance, Visual Arts & Communications	**1 June 2016**

At least 128 Leeds Anniversary Research Scholarships (LARS) are available for UK/EU or international Postgraduate Researchers for Session 2016-2017 for study in any Faculty at the University of Leeds.

ELIGIBILITY CRITERIA – Please read this information carefully, as your application form will be automatically rejected if you do not meet ALL of the eligibility criteria listed below

- Applicants MUST first submit a research degree study application form and be in receipt of a Student ID Number[1] to be eligible for a Leeds Anniversary Research Scholarship. **Applications without a valid Student ID Number will be rejected**. To apply for a place on a research degree programme, please visit: http://www.leeds.ac.uk/info/130206/applying/91/applying_for_research_degrees
- These awards are available to applicants who would be liable to pay academic fees at the UK/EU or the full international fee rate;
- Applicants must normally hold a First Degree at undergraduate level equivalent to at least a UK Upper Second Class Honours degree. Applicants should either have graduated with the appropriate First Degree or be in their final year of study.
- UK/EU applicants whose first language is not English must meet the University's English Language requirements prior to or at registration. **International applicants whose first language is not English must have already met the University's English Language requirements by the relevant scholarship closing date** or be a current undergraduate student in their final year or a current postgraduate student at a University in an English speaking country. Some Schools require a standard of English higher than the University minimum. You should have a valid test result, which is normally no more than two years old by your official start date at the University of Leeds. Examples of an acceptable English Language Standard can be found at: http://www.leeds.ac.uk/info/123100/admissions/143/entry_requirements
- These awards are not open to individuals who have already been awarded or are currently studying for a Doctoral degree or equivalent qualification;

REGULATIONS
These include the following (full information on the regulations will be sent to all successful applicants):

- Awards must be taken up on 1 October 2016;
- The awards are available for **new** Postgraduate Researchers undertaking full-time (3 years) study leading to the degree of **PhD;**
- The award provides academic fees at the University of Leeds standard UK rate of fees[2] and a maintenance grant (£14,057 in Session 2015/16). There are no additional allowances for travel or research costs;
- Applicants must live within a reasonable distance of the University of Leeds whilst in receipt of this Scholarship.

[1] On-line applicants automatically receive their Student ID Number by email; paper applicants should request their Student ID Number from the relevant Admissions office. Applicants who already have a Student ID Number must ensure they apply for the relevant research or taught postgraduate degree study place as soon as possible.
[2] For international students, the appropriate School will be responsible for paying the difference in fees between the UK and international rate

METHOD OF APPLICATION

- Before proceeding with your application, it is strongly advised that applicants view the relevant Faculty website, as some LARS scholarships have been allocated to specific projects.
- Applicants must complete all sections of the application form, with strict observation of any word limits. **Please do not include any other documents with the form, such as transcripts or CVs, as they will be disregarded.**
- Completed forms (**must be typed**) should be returned **in either Word or pdf format** by email to pg_scholarships@leeds.ac.uk.
- **To track the progress of your application**, please visit http://scholarships.leeds.ac.uk and select the tab 'Application Tracking', then follow the instructions on screen (this facility will not be available until late January 2016). Please note that, due to the large volume of applications, the Postgraduate Scholarships Office will not enter into any correspondence regarding the progress of an application.

APPLICATION PROCEDURE & RESULT

Applicants will receive an automated email confirming receipt of the application. Applications are logged by the Postgraduate Scholarships Office and passed on to the relevant Schools for initial consideration. After a School selection process, recommendations for award are then made at Faculty level and final approval given by the University Scholarships Group. Applicants can expect to be notified of the outcome of their application approximately 6 weeks after the relevant closing date. **The University will publish the names of the successful applicants within the University and externally on the University website.**

FOR OFFICE USE ONLY:

Date Rec'd	
Sent to School	
Logged	

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		Student ID Number (9 digits)								
Please tick if an offer of an academic place for PhD study has already been received	☒	2	0	1	0	0	3	3	1	6

Title (Miss/Ms/Mrs/Mr)	**Surname (Family Name)**	**First Name(s)**
Mr	Arora	Atul Singh

Country of Birth	**Nationality**	**Gender (M/F)**	**Date of Birth**		
India	Indian	M	20	Nov	1991
			Day	Month	Year

Permanent Home Address	**Temporary Address (with dates) if relevant**
4317/3 Ansari Road, Darya Ganj, New Delhi - 110002	Hostel 7, IISER Mohali, SAS Nagar, Sector 81, Mohali, Punjab - 140306
	Date from: Aug 2011 to June 2016
Tel No: +91 8699413350	Tel No: +91 8699413350
Email: toAtulArora@gmail.com	Email: toAtulArora@gmail.com

School in which you intend to study:
School of Astrophysics and Astronomy

Where did you hear about this Scholarship? Please tick ONLY ONE box (the most relevant source).

Postgraduate Scholarships Website	☐	Supervisor/Tutor	☐	
University of Leeds website	☒	Previous Award Holder	☐	
University of Leeds Portal	☐	Family/Friends	☐	
Student Service Centre Screen	☐	Prospects	☐	
School	☐	Find a PhD website	☐	
Jobs.ac.uk	☐	Other	☐	- Please specify:

[3] Applicants who already have a Student ID Number must ensure that they apply for a research degree study place as soon as possible.

Surname (Family Name)	First Name(s)
Arora	Atul Singh

English Language Qualifications: Is English your first/native language: YES ☐ NO ☒
UK/EU applicants whose first language is not English must meet the University's English Language requirements prior to or at registration. **International applicants whose first language is not English must have already met the University's English Language requirements by the relevant scholarship closing date**. You should have a valid test result, which is normally no more than two years old by your official start date at the University of Leeds.

IELTS Score and Test Date	TOEFL Score and Test Date	Other Qualification (give details)
Score: Test Date:	Score: 117/120 Test Date: 26 September 2015	

Academic Qualifications (including any for which you are currently aiming):

Name & Country of University/Institution	Dates		Qualification Obtained (eg BA/BSc) and Main Subject Area	Degree Classification (eg 1st Class Honours)	Grade (GPA) or Percentage Mark eg 3.5/4.0	Position in Class (eg 2/30)
	Start	Finish				
Name: IISER M Country: India	Aug 2011	May 2016	BS-MS (dual degree)		9.4/10	~1/25
Name: Country:					/	/
Name: Country:					/	/

Professional or Other Qualifications:

Dates of Course	Title of Course	Qualifications obtained or to be taken (give dates and grades)

Employment History – please complete in full without any gaps (including any industrial experience or other relevant practical experience):

Name and Address of Employer	Job Title	Dates	
		From	To
Prof. Otfried Guehne, University of Siegen | DAAD	Summer Intern	May 2015	July 2015
Prof. Arvind, IISER Mohali, India | KVPY	Summer Intern	May 2014	July 2014
Dr. Ravi Mehrotra, National Physical Laboratory, India | KVPY	Summer Intern	May 2013	July 2013

Please indicate your **proposed career**:

Academic Research (Quantum Physics)

Prizes or Awards:
Please provide details of any prizes or awards received.

Total No of Prizes/Awards: 5		Details of up to 2 Prizes/Awards most relevant to application.
(i)	Certificate of Merit for the best academic performance (Odd Sem 2014-15 & Even Sem 2015-16)	
(ii)	DAAD Fellowship for a summer internship in Germany (2015), KVPY Fellowship (India) for pursuing science from 2011-16	

Surname (Family Name)	First Name(s)
Arora	Atul Singh

Publication Details/Events Organised:
Please provide details of any **published peer reviewed** papers, journal papers or conference papers at national or international level (please include any web address if available), together with details of any performances, compositions, exhibitions organised. Please include the name of any journal and state the Digital Object Identifier (DOI)

Total No of Publications: 1	Details of up to 5 Publications most relevant to application. Please indicate type of publication – ie whether these are conference contributions/publication of book chapters etc:	Web Address and Digital Object Identifier
(i)	Proposal for a macroscopic test of local realism with phase-space measurements	URL: link.aps.org/doi/10.1103/PhysRevA.92.062107 DOI: http://dx.doi.org/10.1103/PhysRevA.92.062107
(ii)		URL: DOI:
(iii)		URL: DOI:
(iv)		URL: DOI:
(v)		URL: DOI:
Total No of Performances/Compositions/Exhibitions Organised:		Details of up to 3 Events most relevant to application:
(i)		
(ii)		
(iii)		

Residency Details:
Please state the country in which you are normally resident:

India

On what date did you take up residence there?	How long have you resided there?
November 20, 1991 (by birth)	24 years

Please give below details and the exact dates of any non-holiday periods spent away from your country of normal residence.

Date From	Date To	Location	Purpose of Residence (eg education, employment etc)

Are there any unusual circumstances regarding your application that you would like to draw to the attention of the University of Leeds Scholarships Committee, eg unusual education path, change of study direction **(awards are based on academic merit, financial circumstances are not taken into account)**

None.

Word Count: **(Maximum of 150 words)**

Have you applied for any other Scholarship? Please specify:

No

Surname (Family Name)	First Name(s)
Arora	Atul Singh

Please outline how your previous academic and professional achievements demonstrate your potential and your ability to complete your proposed project successfully. Please include any information about previous research experience.

I have taken the following elective courses, which are of direct relevance to the project: “Symmetry and Group Theory”, “Spectroscopy”, “Quantum Computation & Information”, “Quantum Field Theory (QFT)”, “Selected topics in classical & quantum mechanics”, “Radiative effects and Renormalization Group in QFT”, “Gauge theories, the Standard Model & beyond”, in addition to one undergraduate, two standard graduate courses on Quantum Mechanics (QM) and one on Nuclear and Particle Physics.
I have been among the top performers all through the major (graduate) years, in my class.

I had undertaken various projects (of which five were research projects) in the summers, during the coursework.

Summer 2015, University of Siegen, Local Realism in Phase Space: I had worked under the guidance of Dr. Ali Asadian and Prof. Otfried Guehne. We constructed a generalization of the Bell test (local realism) using phase-space measurements, to extend the idea from spins, to position and momentum.

Summer 2014, IISER Mohali, Quantum Simulation: The project was supervised by Prof. Arvind. A quantum computer simulator was written from scratch and results of a paper on quantum simulations were verified. The quantum simulation algorithm was extended to simulate mixed states (this result was however already known).

Winters 2014, IISER Mohali, Study project
Monsoon 2013, NCBS, Summer School, Physics of Life

Summer 2013, NPL Delhi, Lattice Dynamics: Worked on setting up an experiment to study dynamics of a two dimensional magnetic dipole lattice, with Dr. Ravi Mehrotra. It involved intensive programming, electronics and minor mechanical assembly.

Winter 2012, IISER Mohali, Study project

Summer 2012, IISER Mohali, Symmetry and Group Theory: Linear Algebra, Symmetry and Knot Theory were explored.

Summer 2011, IIT Bombay, Yarn Fault Detection: Worked on extending an IIT alumni’s master’s thesis; worked on image recognition techniques using OpenCV for Yarn Fault detection, under the supervision of Prof. Anirban Guha.

Word Count: 302 (**Maximum of 300 words)**

Describe **in your own** words in language accessible to a lay reader, your proposed research field or project in the space provided below. Your summary might cover context; objectives; significance; method (how the work would be done).

Project Title: Foundations of Quantum Mechanics and Quantum Field Theory
Project Description: To even talk about the foundations of Quantum Mechanics (QM) is an embarrassing condition for a physical theory. The founders of QM were able to abstract out the practically relevant from the philosophical implications. This forced them to have 'observers' play a pivotal role in the axioms of the theory. More precisely, the theory explicates how the system will evolve if it is not 'observed' and also how it evolves upon being 'observed'. This has been among the main focus of analysing the foundations of the subject, for the theory fails to tell us precisely what being observed means; this maybe rephrased as that the theory fails to tell which type of evolution to use without any ad-hoc reference to observers. This has been studied in great depth in the past and is still an active area of research; foundations of Quantum Field theories on the other hand is still not as popularly studied.
However, even if we are able to arrive at an answer to this question, there are at least two other rather mysterious aspects at the heart of the theory worth exploring.
The first involves what is called a Bell's inequality. This intriguing development proved that nature is not locally real (while some claim reality maybe derived from locality and vice versa). As though this wasn't startling enough, it was shown that despite this 'non-locality', one can't send signals faster than speed of light! In fact, a recent exploration of the constraint of no-signalling has shown that this by itself is too liberal. The quantum theory is more restrictive than simply satisfying no-signalling, which has been captured in what's called "information causality". This shows a very curious relation between apparently distinct concepts and a foundational aspect of a physical theory.
Another fascinating direction of research is as follows. Imagine that we were to recast QM into a probability distribution. Now it would seem obvious that if QM is to have some peculiarities, then it must arise from these distributions going negative at some point. Else, it would appear that they represent something we can already imagine in the classical world. Well, it can be shown that this is not entirely true. There can be completely positive distributions that can defy local reality, yes, using the same Bell's inequality. The key here is that the measurement here corresponds to 'very sharp observables'. The nature of these observables isn't very well understood. This is of fundamental interest because the sharpness decides the degree of classicality; this in turn relates to understanding where we define the boundary between the quantum and classical, between the system and the observer.
Of course, there are various other directions one can take to explore the different fundamental aspects of QM which exist and others that might arise as we progress, however I hope I have been able to convey the excitement and relevance of the intended research project.

Word Count: 482 (**Maximum of 500 words)**

Undertaking by applicants
By submitting this application, applicants attest to the accuracy of the information given and to their compliance with the regulations of the Scholarship.

Date:	January 17, 2016

Completed forms (must be typed) should be returned by email: pg_scholarships@leeds.ac.uk) **by 23:59 UK time** on **the relevant deadline.**

CFN/sy/Oct-15
rdscommo/scholars/standard/appform/sess2016/LARS-AppForm16