Basudev Lahiri, PhD

Assistant Professor, Dept. of Electronics & Electrical Communication Engineering,
Indian Institute of Technology Kharagpur, Kharagpur, West Bengal, India 721302
Phone: +91- 3222-283522 Email: blahiri@ece.iitkgp.ernet.in

Professional Summary

I am an Assistant Professor at the Department of Electronics and Electrical Communication Engineering, IIT Kharagpur, India. I have over fifteen years of experience in various nanofabrication techniques as applied to nanophotonics. I combine my expertise both as a designer of nanophotonics devices, and as a developer of new optical characterization techniques to produce novel sensor technologies. Presently, I am developing new instrumentation methods that provide ultra-high resolution chemical images.

Education

University of Glasgow Glasgow, UK
PhD. Electronics and Electrical Engineering 2006–2010
Dissertation: *Split Ring Resonator (SRR) based Metamaterials: Modeling, Nanofabrication & Characterization*
Supervisors*:* Prof. Nigel P. Johnson and Prof. Richard M. De La Rue

University of Glasgow Glasgow, UK
M.Sc. Electronics and Electrical engineering 2004–2005
Dissertation: *Photonic Crystal Frequency Filter Devices based on SOI structures*
Supervisors*:* Prof. Richard M. De La Rue and Prof. Nigel P. Johnson

Visvesvaraya Technological University Belgum, India
B.Engineering. Electronics and Communications 1999–2003

Professional Experience

IIT Kharagpur
Assistant Professor Kharagpur, India
- Permanent Academic Position 2017- Present

University of Glasgow Glasgow, UK
Lord Kelvin Adam Smith Fellow in Sensor Systems 2013–2017
- Developing nanophotonic platforms for biological sensing
- Providing supervision to graduate and PhD students
- Lecturing in core subjects of Electronics & Nanoscale Engineering
- Successfully submitting and acquiring research grants

National Institute of Science and Technology, (NIST) Gaithersburg, USA
Centre of Nanoscale Science and Technology (CNST)
Post-Doctoral Research Associate 2011–2013
Advisor: Dr. Andrea Centrone and Dr. Nikolai Zhitenev
- Nanoscale chemical imaging of organic & metallic nanomaterials
- Establishing experimental proof of PTIR's signal generation theory
- Co-Inventor of the Surface Enhanced PTIR (SE-PTIR) technique for direct visualization of infrared absorption hot-spots in plasmonic metamaterials

Max-Planck Institute for the Science of Light Erlangen, Germany
Foreign Postdoc Grant Holder 2011

- Pioneering work on the interaction between graphene and plasmonic nano-resonators for biosensing applications

University of Glasgow Glasgow, UK
Research Assistant 2010–2011
Advisor: Dr. Nigel P. Johnson and Dr. Richard M. De La Rue

- Fabrication and Modeling of polymeric photonic crystals for biochemical sensing

University of Glasgow Glasgow, UK
PhD student 2006–2010
Modeling, Fabrication & Characterization of Split Ring Resonator (SRR) based Metamaterials

- Leading work on the application of metamaterials as optical biosensors
- Prominent work on nanofabrication of SRRs having magnetic responses in the visible spectrum
- Understanding the effects of adhesive layers on the frequency response of metamaterials

University of Glasgow Glasgow, UK
Master's student 2004–2005
Photonic Crystal Frequency Filter Devices based on SOI structures

- Modeling and nanofabrication of photonic crystal structures

Grants and Awards

Independent Research Grants

- The Royal Society of London Research Grant, UK £15,000; 2014–2015
- Lord Kelvin Adam Smith Fellowship, UK £50,000;2013–2016

Researcher Mobility Grant

- Marie Curie Actions LIMACONA, EU €1,900;2014–2015

Post-Doctoral Research Grant

- Max Planck Society, Germany €25,200;2011

PhD fellowships

- Metamorphose, ECONAM and COST MPO702, EU 2005–2009

Best Presentation

- Post Graduate Conference, University Of Glasgow, UK 2008

Best Poster

- Post Graduate Conference, University of Glasgow, UK 2007

Academic Excellence Award

- State Governor'sscholarship for securing highest marks in Secondary School examination, India 1997–1998

Teaching Experience

IIT Kharagpur Kharagpur, India

- **Lecturer** 2017- Present

  Integrated Photonics (EC61036)
  - Lecture tri-weekly a class of ~10 M.Tech and PhD students
  - Prepare course materials, assignments and exam paper
  - Evaluate and assign grades for assignments and final exam
  - Correct and evaluate B.Tech and M.Tech project thesis reports

University of Glasgow Glasgow, UK

- **Lecturer** 2013-2017

  Microwave, Electronic and Optoelectronics Devices 4 (ENG4099)
  - Lecture bi-weekly a class of ~25 Graduate students
  - Prepare course material, assignments and exam paper
  - Evaluate and assign grades for assignments and final exam
  - Correct and evaluate MSc project thesis reports
  - Received good feedback from students on course evaluation
  - Teaching style was appreciated in student-teacher annual meeting

- **Lecturer**

  Introduction to Nanotechnology: Pre-sessional English Program 2009 – 2010
  - Developed an entire new course for beginners in nanotechnology
  - Lectured a class of ~20 international Master's students with various educational background
  - Received excellent feedback from both students and course coordinators
  - Lecture was video recorded for University's online curriculum

- **Teaching and Research assistant**

  Electronic Engineering 1Y (ENG1022) 2006 – 2009
  - Assisted in teaching a class of 75 Freshmen studentseach semester
  - Led weekly laboratory classes
  - Led tri-weekly tutorials sessions for group of 25 students each
  - Evaluating assignments

- **Teaching and Research assistant**

  Micro and Nano Technology (ENG5055) 2006 – 2009
  - Trained ~20 Honors student each semester on microfabrication techniques
  - Assisted students in fabricating their own microelectronic devices
  - Evaluated and graded assignments

- **Research Assistant**

  Optical Communications (ENG5066) 2006 – 2008
  - Setting Laboratory curriculum for a class of 15 Honors students
  - Led weekly tutorial sessions
  - Evaluated laboratory assignment sheets

Professional Associations

- Optical Society of America (OSA)
- Institute of Physics (IOP)
- American Chemical Society (ACS)

Management and Responsibility

- Initiated Scotland's first Sensors Conference for Early Career Researchers2014
    - Organized, as a part of six member team, a two day conference at an off-site venue
    - Invited over 30 members from academia and industry from all over Scotland
    - Co-arranged a workshop on writing successful grant applications
    - Facilitated sessions on Academia-Industry collaborative research
    - Managed a budget of £25,000
    - Received good feedback from all participants
    - Asked to make this conference a regular annual event

- Founding member of the international advisory panel of IOP's journal Materials Research Express (MRX) 2014

- Reviewed research grant application for United Arab Emirates University (UAEU) 2014

- Refereed several papers for Optics Express, Journal of Selected Topics in Quantum Electronics 2011–Present

- Published monthly column on the progress of optical metamaterials for the web magazine of Metamorphose, EU 2007 – 2009

Activities and Interests

- Courses completed from Centre for Open studies, University Of Glasgow
    - Philosophy for Beginners
    - Introduction to Indian Philosophy
    - Buddhism for Beginners Part-1
    - Archeology of ancient Egyptian temples
    - Introduction to digital photography

- Traveled widely throughout South America, Europe and Asia

- Fluent in Bengali and Hindi, with intermediate knowledge of American Sign Language (ASL)

- Worked part-time as Waiter, Cleaner, Janitor, Grocery store worker and Call-Center agent

Peer Reviewed Publications

1. Mbomson I.G.; Tabor S.; **Lahiri B**.; Sharp G.J.; De La Rue R.M.; and Johnson N.P. "Asymmetric split H-shape nanoantennas for molecular sensing." **Biomedical Optics Express, 2017**, 8, 395-406.

2. Sharp G.H.; Vilhena.; **Lahiri B**.; McMeekin S.G.; De La Rue R.M.; and Johnson N.P. " Mapping the sensitivity of split ring resonators using a localized analyte." **Applied Physics Letters**, **2016**, 108, 251105 1-3.

3. Chae J.; **Lahiri B.**; and Centrone A. "Engineering Near-Field SEIRA Enhancement in Plasmonic Resonators." **ACS Photonics, 2015**, 3, 87-95.

4. Chae J.; **Lahiri B.**; Kohoutek J.; Holland G.; Lezec H.; and Centrone A. "Meta-dielectric-metal resonators with deep subwavelength dielectric layers increase the near-field SEIRA enhancement." **Optics Express**, **2015**, 20, 25912-25922.

5. Aksyuk V.; **Lahiri B.**; Holland G.; and Centrone A. "Near-field asymmetries in plasmonic resonators." **Nanoscale**, **2015**,7, 3634-3644.

6. Kishor K.; Baitha M.N.; Sinha R.K.; and **Lahiri B.** "Tunable Negative Refractive Index Metamaterials from V shaped SRR Structure: Fabrication and Characterization." ***Journal of Optical Society of America B***, **2014**, 31, 1410-1414.

7. Katzenmeyer A.M.; Chae J.; Kasica R.; Holland G.; **Lahiri B.**; and Centrone A. "Nanoscale Imaging and Spectroscopy of Plasmonic Modes with the PTIR Technique." ***Advanced Optical Materials***, **2014**, 2, 718-722. (*Inside cover Article*)

8. **Lahiri B.**; Holland G.; and Centrone A. "Nanoscale Imaging of Plasmonic Hot Spots and Dark Modes with the Photo thermal-Induced Resonance Technique." ***Nanoletters***,**2013**, 13, 3218-3224.

9. **Lahiri B.**; McMeekin S. G., De La Rue R. M.; and Johnson N. P. "Enhanced Fano Resonance of Organic Material Films Deposited on Arrays of Asymmetric Split Ring Resonators (A-SRRs)." ***Optics Express***, **2013**, 21, 9343-9352.

10. Centrone A.; **Lahiri B.**; Holland G. "Chemical Imaging Beyond the Diffraction Limit Using Photo Thermal Induced Resonance Microscopy." ***Microscopy and Analysis***, **2013**, 27, 6-9.

11. Sarau G.*; **Lahiri B.***; Banzer, P.; Gupta P.; Bhattacharya A.; Vollmer F.; Christiansen S. "Enhanced Raman Scattering of Graphene using Arrays of Split Ring Resonators." ***Advanced Optical Materials***, **2013**, 1, 151-157. (* Equal Contribution) (*Frontispiece Article*)

12. **Lahiri B.**; Holland G.; and Centrone A. "Chemical Imaging Beyond the Diffraction Limit: Experimental Validation of the PTIR Technique." ***Small***, **2013**, 9, 439-445. (*Backcover Article*)

13. **Lahiri B.**; McMeekin S. G.; De La Rue R. M.; and Johnson N. P. "Resonance Hybridization in Nanoantenna Arrays Based on Asymmetric Split-Ring Resonators." ***Applied Physics Letters***, **2011**, 98, 153116 1-3.

14. **Lahiri B.**; Dylewicz R.; De La Rue R. M.; and Johnson N. P. "Impact of Titanium Adhesion Layers on the Response of Metallic Split-Ring Resonators (SRRs)." ***Optics Express***, **2010**, 18, 11202-11208.

15. **Lahiri B.**; McMeekin S. G., Khokhar A. Z.; De La Rue R. M.; and Johnson N. P. "Magnetic Response of Split Ring Resonators (SRRs) at Visible Frequencies." ***Optics Express***, **2010**, 18, 3210-3218.

16. **Lahiri B.**; Khokhar A. Z.; De La Rue R. M.; McMeekin S. G., and Johnson N. P. "Asymmetric Split Ring Resonators for Optical Sensing of Organic Materials." ***Optics Express***, **2009**, 17, 1107-1115.

Selected Invited and Contributed Talks

1. **Lahiri B**.; Holland G.; Centrone A.; McMeekin S.G.; Johnson N.P.; De La Rue R.M. "Imaging electromagnetic hot-spots in plasmonic nanostructures using AFM-IR technique." International Conference in Optics and Photonics (ICOP), Optical Society of India and SPIE, Calcutta,*India*, February20-22, 2015. (**Invited Presentation**).

2. **Lahiri B**.; Holland G.; and Centrone A. "Nanoscale Chemical Imaging of Plasmonic hot-spots beyond the infrared diffraction limit." CIMTEC 2014 – 13th International Ceramic Congress & 6th Forum on New Materials, MontecatiniTerme, *Italy*, June 13, 2014. (**Invited Presentation**).

3. Mbomson I.G.; McMeekin S.G.; **Lahiri B**.; De La Rue R. M.; and Johnson N.P. "Gold asymmetric split ring resonators (A-SRRs) for nano sensing of estradiol." Proc. SPIE 9125 Photonics Europe, Brussels, *Belgium*, April 14, 2014.

4. **Lahiri B**.; Katzenmeyer A.; Holland G.; and Centrone A. "Chemical imaging beyond the limit using photo thermal induced resonance technique." 246th ACS National Meeting, Indianapolis, *USA*, September 8, 2013.

5. Dortu F.; Egger H.; **Lahiri B.;***et al.* "Design and process development of a photonic crystal polymer biosensor for point-of-care diagnostics." Proc. SPIE 8087 Biomedical Optics, Munich, *Germany*, May 22, 2011.

Book Chapters

1. **Lahiri B.**; McMeekin, S.G.; De La Rue, R. M.; Johnson, N. P. "Nanoscale Split Ring Resonator-Based Metamaterials: Fabrication Techniques, Properties, and Applications." *Vistas in Nanofabrication*. Ed. FaizRehman, Eds. Singapore: Pan Stanford Publishing, 2012. 49-74.

Newsletter Releases

1. "New Nanoscale Imaging Method Finds Application in Plasmonics"
   NIST *Tech Beat*: July 16, 2013 http://www.nist.gov/cnst/ptir-071613.cfm
2. "NIST Captures Chemical Composition with Nanoscale Resolution"
   NIST *Tech Beat*: February12, 2013 http://www.nist.gov/cnst/ptir-021213.cfm

Referees

1. **Prof. Richard M. De La Rue**
Professor Emeritus
Relationship: PhD supervisor
Optoelectronics Research Group
Electronics and Nanoscale Engineering
University of Glasgow
Rankine Building, Oakfield Avenue
Glasgow G12 8LT
United Kingdom
Phone: +44 (0)141-330-4110
Email: Richard.DeLaRue@glasgow.ac.uk

2. **Prof. Nigel P. Johnson**
Reader
Relationship: PhD supervisor
Optoelectronics Research Group
Electronics and Nanoscale Engineering
University of Glasgow
Rankine Building, Oakfield Avenue
Glasgow G12 8LT
United Kingdom
Phone: +44 (0)141-330-4110
Email: Nigel.Johnson@glasgow.ac.uk

3. **Dr. Andrea Centrone**
Project leader
Relationship: Postdoctoral advisor
Energy Research Group
Center for Nanoscale Science and Technology (CNST)
National Institute of Standards and Technology (NIST)
100 Bureau Drive, Gaithersburg,
MD 20899-6204
United States
Phone: +1 301-975-8225
Email: andrea.centrone@nist.gov

4. **Dr. Nikolai Zhitenev**
Group leader
Relationship: Postdoctoral advisor
Energy Research Group
Center for Nanoscale Science and Technology (CNST)
National Institute of Standards and Technology (NIST)
100 Bureau Drive, Gaithersburg,
MD 20899-6204
United States
Phone: +1 301-975-6039
Email: nikolai.zhitenev@nist.gov

5. **Prof. Scott G. McMeekin**
Associate Dean
Relationship: PhD/Postdoc advisor
School of Engineering and Built Environment
Glasgow Caledonian University
Cowcaddens Road
Glasgow G4 0BA
United Kingdom
Phone: +44 (0)141-331-3541
Email: Scott.McMeekin@gcu.ac.uk

6. **Prof. Faiz Rahman**
Stocker visiting professor
Relationship: PhD/Postdoc advisor
377 Stocker Center
School of Electrical Engineering and Computer Science
Ohio University
Athens, OH 45701
United States
Phone: +1 740-593-2462
Email: rahmanf@ohio.edu