

Paul Johns, Ph.D.

ASEE POSTDOCTORAL FELLOW · U.S. NAVAL RESEARCH LABORATORY

4555 Overlook Ave., SW, Washington, DC 20375

 pauljohns1

Education

University of Notre Dame

Notre Dame, IN

PH.D. IN PHYSICAL CHEMISTRY

May 2017

- Dissertation: *Surface Plasmon Polaritons in Gold Nanostructures: Conversion, Coupling, and Confinement*
- Advisor: Gregory V. Hartland

Saint Francis University

Loretto, PA

B.S. IN CHEMISTRY, MINORS: MATHEMATICS AND PHYSICS

May 2007

- *Magna Cum Laude*, Honors Program
- Thesis: *Quantum Mechanical/Molecular Mechanical Simulations of the Fluorescence Quenching of H-Type Homodimers of Fluorescein and Tetramethyl Rhodamine*
- Advisor: Pedro L. Muñio

Experience

U.S. Naval Research Laboratory

Washington, DC

ASEE POSTDOCTORAL RESEARCHER

Oct. 2017–present

- Designed and conducted transient absorption spectroscopy experiments to understand the ultrafast dynamics of laser induced welding of gold nanorod dimers
- Modeled gold nanorod absorption cross sections in various environments using COMSOL Multiphysics
- Designed, built, and tested aerosolization apparatus

University of Notre Dame

Notre Dame, IN

POSTDOCTORAL RESEARCHER

May 2017–Sep. 2017

- Continued finite element calculations to model electromagnetic phenomena including interference effects of surface plasmon polaritons in gold nanoplates

University of Notre Dame

Notre Dame, IN

DOCTORAL RESEARCHER, PHYSICAL CHEMISTRY

Sep. 2007–May 2008; Jan. 2013–May 2017

- Developed procedures to model surface plasmon propagation in nanostructures in two-dimensional and three-dimensional models using the finite element program COMSOL Multiphysics
- Utilized a pump/probe technique with a galvo scanning mirror to directly image plasmon propagation in nanostructures
- Wrote programs in LabVIEW, Igor Pro, MATLAB, Python, and Java to automate data acquisition and processing

Saint Francis University

Loretto, PA

VISITING LABORATORY INSTRUCTOR

Sep. 2011–May 2012

- Developed laboratory experiments for the General Chemistry Laboratory
- Maintained instruments and wrote instructional material on their use
- Taught Physical Chemistry I Laboratory, Organic Chemistry I & II Laboratory, and General Chemistry Laboratory to a total of 69 students, resulting in positive student reviews

Saint Francis University

Loretto, PA

UNDERGRADUATE RESEARCHER, CHEMISTRY

Sep. 2004–May 2007

- Continued investigating the quenching mechanisms of dimers of fluorescent dyes resulting in a conference presentation and Honors Thesis topic

Montana State University

Bozeman, MT

RESEARCH EXPERIENCE FOR UNDERGRADUATES, CHEMISTRY

Jun. 2006–Aug. 2006

- Investigated the quenching mechanisms of dimers of fluorescent dyes using molecular dynamics software

ChemImage, Corp.

Johnstown, PA

APPLICATIONS SCIENTIST INTERN

May 2004–Jun. 2005

- Validated CI Print Macroscopic Chemical Imaging System™ for detection of latent and patent fingerprints
- Assisted in developing a Raman chemical database for identification purposes which was incorporated into the Falcon Molecular Chemical Imaging System™ database

Publications

JOURNAL ARTICLES

Ultrafast Welding Dynamics of Plasmonic Nanorod Dimers

Paul Johns, Ryan J. Suess, Nicholas Charipar, Jake Fontana

The Journal of Physical Chemistry C **2019**, 123, 15209–15216

Plasmonic Aerosols

Jeffrey Geldmeier, Paul Johns, Nicholas J. Greybush, Jawad Naciri, Jake Fontana

Physical Review B **2019**, 99, 081112(R)

Dynamic Plasmonic Pixels

Nicholas J. Greybush, Kristin Charipar, Jeffrey A. Geldmeier, Stephen J. Bauman, Paul Johns, Jawad Naciri, Nicholas Charipar, Kyoungweon Park, Richard A. Vaia, Jake Fontana

ACS Nano **2019**, 13, 3875–3883

Strong Exciton–Plasmon Coupling in Silver Nanowire Nanocavities

Gary Beane, Brendan S. Brown, Paul Johns, Tuphan Devkota, Gregory V. Hartland

The Journal of Physical Chemistry Letters **2018**, 9, 1676–1681

Surface Plasmon Polariton Interference in Gold Nanoplates

Gary Beane, Kuai Yu, Tuphan Devkota, Paul Johns, Brendan Brown, Guo Ping Wang, Gregory Hartland

The Journal of Physical Chemistry Letters **2017**, 8, 4935–4941

What's so Hot about Electrons in Metal Nanoparticles?

Gregory V. Hartland, Lucas V. Besteiro, Paul Johns, Alexander O. Govorov

ACS Energy Letters **2017**, 2, 1641–1653

Photothermal Microscopy of Coupled Nanostructures and the Impact of Nanoscale Heating in Surface-Enhanced Raman Spectroscopy

Zhi-Cong Zeng, Hao Wang, Paul Johns, Gregory V. Hartland, Zachary D. Schultz

The Journal of Physical Chemistry C **2017**, 121, 11623–11631

Dynamics of Surface Plasmon Polaritons in Metal Nanowires

Paul Johns, Gary Beane, Kuai Yu, Gregory V. Hartland

The Journal of Physical Chemistry C **2017**, 121, 5445–5459

Role of Resonances in the Transmission of Surface Plasmon Polaritons between Nanostructures

Paul Johns, Kuai Yu, Mary Sajini Devadas, Gregory V. Hartland

ACS Nano **2016**, 10, 3375–3381

Imaging Nano-Objects by Linear and Nonlinear Optical Absorption Microscopies

Mary Sajini Devadas, Tuphan Devkota, Paul Johns, Zhongming Li, Shun Shang Lo, Kuai Yu, Libai Huang, Gregory V. Hartland

Nanotechnology **2015**, 26, 354001

Effect of Substrate Discontinuities on the Propagating Surface Plasmon Polariton Modes in Gold Nanobars

Paul Johns, Kuai Yu, Mary Sajini Devadas, Zhongming Li, Todd A. Major, Gregory V. Hartland

Nanoscale **2014**, 6, 14289–14296

Detection of Single Gold Nanoparticles Using Spatial Modulation Spectroscopy Implemented with a Galvo-Scanning Mirror System

Mary Sajini Devadas, Zhongming Li, Todd A. Major, Shun Shang Lo, Nicolas Havard, Kuai Yu, Paul Johns, Gregory V. Hartland
Applied Optics **2013**, 52, 7806

CONFERENCE PROCEEDINGS

Welding Dynamics of Plasmonic Gold Nanorods Under Femtosecond Laser Excitation

Ryan J. Suess, Paul Johns, Jawad Naciri, Nicholas A. Charipar, Jake Fontana

Conference on Lasers and Electro-Optics **2018**

Transient absorption microscopy studies of single metal and semiconductor nanostructures

Paul Johns, Mary Sajini-Devadas, Gregory V. Hartland

Physical Chemistry of Interfaces and Nanomaterials XIV **2015**

Imaging Surface Plasmon Polaritons in Nanostructures with Transient Absorption Microscopy

Paul Johns, Mary Sajini Devadas, Gregory V. Hartland

Frontiers in Optics **2015**

Presentations (* indicates presenting author)

Ultrafast Gold Nanorod Welding Mechanisms: Fabricating High Aspect Ratio Nanorods

Paul Johns*, Ryan Suess, Jawad Naciri, Nicholas A. Charipar, Jake Fontana

256th National Meeting of the American Chemical Society **2018**, Boston, MA

Understanding Surface Plasmon Propagation in Cut Waveguides

Paul Johns*, Kuai Yu, Mary Sajini Devadas, Gregory V. Hartland

IEEE Annual Mini-symposium on Electron Devices and Photonics **2015**, Notre Dame, IN

Effects of Localized Dielectric Substrate Discontinuities on Surface Plasmon Polariton Modes in Gold Nanobars

Paul Johns*, Kuai Yu, Mary Sajini Devadas, Zhongming Li, Todd A. Major, Gregory V. Hartland

IEEE Annual Mini-symposium on Electron Devices and Photonics **2014**, Notre Dame, IN

Quantum Mechanical/Molecular Mechanical Simulations of the Fluorescence Quenching of *H*-Type Homodimers of Fluorescein and Tetramethyl Rhodamine

Paul Johns*, Patrik Callis, Pedro Muoo

51st Biophysical Society Annual Meeting **2007**, Baltimore, MD

Validation of the CI Print Macroscopic Chemical Imaging System for the Analysis of Latent Fingerprints

Rebecca Schuler*, David Exline, Tammy Powers, Paul Johns, Patrick Treado

American Academy of Forensic Sciences 57th Annual National Meeting **2004**, New Orleans, LA

Skills

Optics Pump/probe spectroscopy, transient absorption spectroscopy, femtosecond lasers, oscilloscopes, photodetectors

Cleanroom Class 100 training, Airco FC-1800 electron-beam evaporator, JEOL JEM-2200FS transmission electron microscope

Computer/Programming COMSOL Multiphysics, LabVIEW, MATLAB, Mathematica, Igor Pro, OriginPro, Python, Java, L^AT_EX

Selected Honors & Awards

| | | |
|-----------|---|-----------------------|
| 2014–2017 | Graduate Assistance in Areas of National Need (GAANN) Teaching Fellow, University of Notre Dame | <i>Notre Dame, IN</i> |
| 2015 | Advanced Teaching Scholar, Kaneb Center for Teaching and Learning | <i>Notre Dame, IN</i> |
| 2014 | Striving for Excellence in College and University Teaching, Kaneb Center for Teaching and Learning | <i>Notre Dame, IN</i> |
| 2008 | Outstanding Graduate Student Teacher Award for Excellence in Teaching, Kaneb Center for Teaching and Learning | <i>Notre Dame, IN</i> |
| 2006 | Barry M. Goldwater Scholar, Barry M. Goldwater Scholarship and Excellence in Education Program | |

Leadership and Service

Barry Goldwater Scholarship and Excellence in Education Foundation

Alexandria, VA

WEBINAR PANELIST FOR CAREERS OUTSIDE OF ACADEMIA

2019

- Discussed my career path and how the Goldwater Scholarship assisted in my development as a scientist to an audience of Goldwater Scholars

Northern Indiana Regional Science & Engineering Fair

Notre Dame, IN

SCIENCE FAIR JUDGE, ELEMENTARY PHYSICAL SCIENCES COMMITTEE/JUNIOR
PHYSICAL SCIENCE COMMITTEE

2013–2014, 2016, 2017

11th, 18th, and 19th Annual Science Day

Loretto, PA

SCIENCE DAY PRESENTER

2004, 2011–2012

***Spectrum*, the self-published journal of Saint Francis University**

Loretto, PA

PEER REVIEWER

2010–2011

Penn Mont Montessori School

Hollidaysburg, PA

ORGANIZER PHYSICAL SCIENCE LESSONS

2011

- Supervised the development of science lessons by students from my Physical Chemistry I lab to present to elementary school students

Archbishop Carroll High School

Washington, DC

TRIGONOMETRY TUTOR

2010–2011

Rural Outreach Chemistry for Kids

Loretto, PA

EVENT LEADER

2003–2009

- Led and demonstrated science experiments with area elementary, middle, and high school students

Pennsylvania Junior Academy of Science

Altoona, PA

SCIENCE FAIR JUDGE

2005