

# Juan G. Duque

Los Alamos, NM USA  
Email: [jduque@lanl.gov](mailto:jduque@lanl.gov)  
Cell: (713) 817-9796

## EDUCATION

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- Post-Doctorate Director's Fellowship, Los Alamos National Laboratory, Los Alamos 2009  
Adviser: Stephen K. Doorn
- Ph.D., Chemical and Biomolecular Engineering, Rice University, Houston 2003 - 2008  
Adviser: Prof. Matteo Pasquali
- B.E., Chemical Engineering, The City College of CUNY, New York 1998 - 2003  
Adviser: Prof. Alexander Couzis

## POST-DOCTORATE RESEARCH

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**Los Alamos National Laboratory,** Physical Chemistry and Applied Spectroscopy 2009

### 1.) Spectroscopy of Single-Walled Carbon Nanotubes and Nanomaterials

- Ultrafast spectroscopy and excitonic dynamics of nanomaterials
- Resonant Raman spectroscopy of enriched SWNTs and nanomaterials

### 2.) Energy transfer with type specific SWNTs

- Developed and engineered efficient energy transfer pathways in SWNTs for photovoltaic applications

## GRADUATE RESEARCH

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1.) **Rice University,** Complex Flow of Complex Fluids Laboratory 2006 - 2008

### *Smalley Institute for Nanoscale Science and Technology.*

a.) Electrochemistry and Self-Assembly of Complex Single-Walled Carbon Nanotube (SWNT) Nanostructures

- Separation, Suspension and Characterization of SWNT in Surfactants, Acids, and Polymers.

### *Stable Luminescence from Individual Carbon Nanotubes in Acid, Basic and Biological Environments*

- Developed stable photoluminescent suspensions of SWNT in:
  - pH ranging from 1 to 11 and biological environments

### *Antenna Chemistry of Metallic SWNTs*

- Demonstrated that microwave fields drive redox reactions between metallic SWNTs and transition metal ions salts in solution at near diffusion-limited rates to produce novel composite nanostructures.

### *Carbon Nanotube Electrochemical Photocathodes with Optical Rectenna Behavior*

- Demonstrated that carbon nanotube structures produce rectified photocurrents when illuminated in the presence of aqueous electrolytes and anionic surfactants.

b.) Overseer of summer interns Summer 2006 and 2007

- Coordinated and supervised daily experiments. Processed, prepared and presented data.

2.) **Visiting Student at Centre de Physique Moléculaire Optique et Hertzienne (CPMOH),** February - July 2008

**Université Bordeaux 1, France. Nanophotonics Group.** Prof. Laurent Cognet and Prof. Brahim Lounis

- Studied the effects of extrinsic and intrinsic factor to the optical properties of SWNTs via ultrafast spectroscopy and excitonic dynamics of SWNTs at the single molecular level.

## UNDERGRADUATE RESEARCH

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### **The City College of New York, NY**

- **Research Assistant.** (Sponsored by Glaxo-Smith-Kline) Prof. Alexander Couzis 2000 - 2003
  - Study to identify the mechanism of action of a new oral care additive for cleaning and stain prevention.
- **Research Assistant.** (Sponsored by EXXONMOBIL Corp). Prof. Herbert Weinstein 2000 - 2001
  - An experimental investigation of vertical coaxial flows for a fluidized bed reactor.

## TEACHING EXPERIENCE

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**Rice University, Houston, TX** **Teaching Assistant** 2003 - 2006

- Graded homework and exams. Helped students clarify key concepts and ideas. Taught class in faculty absence.

**The City College of New York, New York, N.Y.** **Tutor** 2002 - 2003

- Mathematics and Engineering Tutor.

## PUBLICATIONS

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8. J. G. Duque, et al., *J. Phys. Chem. C*, **2009**, In press.
7. J. G. Duque, et al., *ACS Nano* **2009**, *3*, 2153-2156.
6. C.L. Pint, et al., *Chem. of Mat.*, **2009**, *21*, 1550-1556.
5. A. L. Higginbotham, et al., *Comp. Sci. & Tech.*, **2008**, *68*, 3087.
4. C. Pint, N. Nicholas, et al., *J. Phys. Chem. C*, **2008**, *112* (36), 14041–14051.
3. J. G. Duque, et al., *J. Am. Chem. Soc.*, **2008**, *130*, 15340.
2. J. G. Duque, et al., *J. Am. Chem. Soc.* **2008**, *130*, 2626-2633.
1. R. Wang, et al., *Carbon* **2007**, *45*, 2388-2393.

### In Preparation

- J. G. Duque, et al., [target: *JPC Lett.*]
- J. G. Duque, et al., [target: *JACS*]
- J. G. Duque, et al., [target: *JACS*]
- J. G. Duque, et al., [target: *Nat. Nanotechnol*]

### PRESENTATIONS

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- **Environmental and Synthesis-Dependent Luminescence Properties of Individual Single-Walled Carbon Nanotubes**
  - Workshop on Nanotube Optics and Nanospectroscopy (WONTON09), Japan 2009. (Poster)
  - Excited State Process in Electronic and Bio-Nanomaterials Meeting (ESP2009), Santa Fe, NM 2009. (Oral)
- **Antenna Behavior of Metallic Single Wall Carbon Nanotubes**
  - ChemOn Tubes International Meeting, Zaragoza, Spain 2008. (Oral)
  - NT08 International Meeting, Montpellier, France 2008. (Poster)
  - AIChE National Meeting, Philadelphia, PA 2008. (Oral)
  - MRS National Meeting, Boston, MA 2007. (Poster)
- **Stable Luminescence from Individual Carbon Nanotubes in Acid, Basic and Biological Environments**
  - ChemOn Tubes International Meeting, Zaragoza, Spain 2008. (poster)
  - NT08 International Meeting, Montpellier, France 2008. (Poster)
  - AIChE National Meeting, Salt Lake City, UT 2007. (Oral)
  - French-American Symposium, Houston, TX 2007. (Poster)
  - MRS National Meeting, Boston, MA 2007. (Poster)
- **Carbon Nanotube Electrochemical Photocathodes with Optical Rectenna Behavior**
  - AIChE National Meeting, Philadelphia, PA 2008. (Oral)

### PATENTS

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- Self-Assemble Nanoparticles-Nanostructures (nanoPaNTs) Based on Antenna Chemistry of Single Walled Carbon Nanotubes. Pub. No.: WO/2008/156504. International Application No.: PCT/US2007/088428.
- Optical Rectification Device and Method of Making Same. 2008.
- Stable Luminescence from Individual Carbon Nanotubes in Acid, Basic and Biological Environments. 2008.

### TECHNICAL SKILLS

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**Clean Room Trainee:** Microfabrication specialist on Electron Beam Evaporator, Mask Maker, and Mask Aligner.

**Electrochemistry:** Cyclic Voltammetry, Linear Sweep Voltammetry.

**Characterization:** AFM, Ultrafast Spectroscopy, Raman Spectroscopy, Fluorescence, UV-vis, TEM, SEM, and XPS.

### HONORS/AWARDS

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- Most Promising Director's Fellowship Postdoc, LDRD Project 2009
- Ralph Budd Award for Best Doctoral Thesis in the School of Engineering, Rice University 2009
- Director's Fellowship Los Alamos National Laboratory 2009
- NT08: selected best poster among more than 100 contributions "Antenna Chemistry of SWNTs" 2008
- Wagner Foreign Study Fellowship Recipient 2008
- Shell Fellowship 2008
- Welch Fellowship Recipient 2005 & 2007-2008
- Grove Foundation Scholarship 2002 - 2003
- Proctor & Gamble Chemical Engineering Undergraduate Scholarship 2003
- Outstanding Latino Student Scholarship 2003