# Sriharsha V. Aradhya

Applied Physics & Applied Mathematics
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## Education

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| **Ph.D.**, Applied Physics<br>Dissertation: Single Molecule Electronics and Mechanics<br>Advisor: Prof. Latha Venkataraman | **Columbia University**<br>New York, NY | Oct 2013<br>GPA: 4.00/4.00 |
| **M.S.**, Mechanical Engineering<br>Thesis: Interfacial Bonding of Carbon Nanotubes<br>Advisors: Prof. Timothy Fisher & Prof. Suresh Garimella | **Purdue University**<br>West Lafayette, IN | Aug 2008<br>GPA: 3.73/4.00 |
| **B.Tech.**, Mechanical Engineering<br>Minor in Chemistry | **Indian Institute of Technology (IIT Madras),** Chennai, India | May 2006<br>GPA: 8.25/10.00 |

## Awards

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| *Graduate Student Gold Award* - Materials Research Society (MRS) | 2013 |
| *Best Paper Award* - Society for Experimental Mechanics (SEM) | 2012 |
| *Excellence in Graduate Research Travel Award* - American Physical Society (APS) | 2012 |
| *Education Fellowship* - New York Academy of Sciences | 2011 |
| *Fellow* - Columbia Technology Ventures | 2009 |
| *Inventor Medal & Best Intern Award* - GE Global Research | 2005 |
| *Summer Research Fellowship* - JNCASR, Bangalore, India | 2004 |
| *Young Engineering Fellowship* - Indian Institute of Science, Bangalore, India | 2004 |

## Patents

1. US Patent No. 8,262,835, 'Method of bonding carbon nanotubes' (issued Sep 2012).
2. US Patent No. 7,337,678, 'MEMS flow sensor' (issued Mar 2008).

[Cited as a '*key patent*' for MEMS technologies by the MEMS investor journal, Jun 2008]

## Research Experience

**Doctoral Research, Columbia University** Sep 2008 - present

- Building a high-resolution conducting atomic force microscope (AFM) for simultaneous mechanical and electrical measurements on single molecule junctions
- Implementing new approaches for statistically reliable, quantitative analysis of large datasets
- Formulating models to bridge experiments and theory in single-molecule electronics, mechanics and energetics

**Graduate Research Assistant, Purdue University** Sep 2006 - Aug 2008

- Developing a new electrothermal bonding method to bond vertically aligned carbon nanotube (CNT) to surfaces
- Using fabrication techniques like e-beam/thermal evaporation and chemical vapor deposition (CVD)
- Applying analytical techniques such as scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS) to determine surface topology and chemical composition

**GE Global Research Summer Intern, John F. Welch Technology Center - Bangalore** May 2005 - Aug 2005

- Designing a new microelectromechanical (MEMS) device to monitor fluid flow using Finite Element Method (FEM) software and fundamental fluid mechanics relationships

**JNCASR Summer Research Fellow, Indian Institute of Science - Bangalore** May 2004 - Aug 2004

- Performing experimental measurement of the scaling behavior in turbulent flows

## Teaching Experience

**Instructor, Science Honors Program - NSF Nano Sci. & Engg. Center, Columbia Univ.** Jan 2012 - present
- Teaching motivated high-school students about topics in nano-science and nano-technology
- Hosting tours and demonstrations in multiple Columbia University laboratories

**Grader – Dept. of Applied Physics and Applied Mathematics, Columbia University** Jan 2012 - May 2012
- Grading assignments for an undergraduate linear algebra course

**Education Fellow, New York Academy of Sciences - Salomé Ureña I.S., Harlem, NYC** Sep 2011 - Jan 2012
- Mentoring children (grades 6-8) with a focus on developing their engineering intuition
- Helping to build a robot (designing, programming and problem solving) for the 'First Lego League' competition

**Volunteer, New York NanoDays - NSF Nano Sci. & Engg. Center, Columbia Univ.** Jan 2011 - Apr 2011
- Building an interactive demonstration experiment with audio modulation of electric discharge
- Visiting high schools in New York City to increase science awareness science among students

**Graduate Teaching Assistant, Columbia University** Sep 2008 - Dec 2009
- Creating problem set solutions, grading homework and helping students with conceptual understanding for both undergraduate and graduate level electromagnetics courses

## Work Experience

**DJ for WKCR 89.9 FM New York** Sep 2009 - present
- Researching and presenting informative radio broadcasts about Indian classical music (both live and recorded)
- Organizing and promoting South Asian events in the New York metropolitan area, including a live 24-hour marathon radio broadcast in July 2012
- Recording and mastering music for archival as well as public and commercial release

**Columbia Technology Ventures Fellow** Sep 2009 - Jan 2012
- Analyzing new technologies from both technological and marketing feasibility points of view
- Generating technical and marketing reports for patent attorneys for physical science intellectual properties (IP) being produced and licensed by Columbia University

## Leadership Experience

*Social Chair* for Engineering Graduate Student Council - Columbia University Sep 2009 - Dec 2010
*Peer Advisor* for international students & scholars - Columbia University Jan 2009 - Dec 2009
*Fundraising Chair* for Indian Classical Music Association - Purdue University May 2007 - Aug 2008
*Coordinator* for 'Shaastra', a National-level technical competitive event- IIT Madras Jan 2005 - Dec 2005

## Professional Activities

*Graduate student member* – American Physical Society Sep 2009 - present
*Session organizer and graduate student member* – Society for experimental mechanics Jun 2012 - present
*Referee* – JACS and Chem. Phys. Chem. Jan 2013 - present

## Skills

**Experimental:** Atomic force microscope (AFM), Scanning electron microscope (SEM), Scanning tunneling microscope (STM), X-ray photoelectrom spectroscope (XPS), micro- and nano- fabrication techniques, laser optics and precision instrumentation
**Scientific computing:** Igor Pro, Matlab, Abinit, CoventorWare, Ansys Multi-Physics, AutoCAD, Pro/E
**General computing:** HTML, Python, C, opensource bitmap and vector graphics packages (VMD, Avogadro, Inkscape)

## Publications – Journal

1. *Single-molecule junctions beyond electronic transport*
S. V. Aradhya and L. Venkataraman
**Nature Nanotechnology**, 8(6), 399-410, (2013)
[Invited Review Article]
[Featured as cover illustration for the Focus issue on molecular electronics]

2. *Correlating Structure, Conductance, and Mechanics of Silver Atomic-Scale Contacts*
S. V. Aradhya, M. Frei, A. Halbritter, and L. Venkataraman
**ACS Nano**, 7(4), 3706-3712, (2013)

3. *Van der Waals interactions at metal/organic interfaces at the single-molecule level*
S. V. Aradhya, M. Frei, M. S. Hybertsen, and L. Venkataraman
**Nature Materials**, 11(10), 872-876, (2012)
[Highlighted by Brookhaven National Lab, Columbia University, Phys.Org etc.]
[Featured in 'News & Views' of Nature Materials]

4. *Dissecting contact mechanics from quantum interference in single-molecule junctions of stilbene derivatives*
S. V. Aradhya, J. S. Meisner, M. Krikorian, S. Ahn, R. Parameswaran, M. L. Steigerwald, C. Nuckolls and L. Venkataraman
**Nano Letters**, 12(3), 1643-1647, (2012)
[Featured on NanoTechWeb.org]

5. *Electronic transport and mechanical stability of carboxyl linked single-molecule junctions*
S. Ahn, S. V. Aradhya, R. S. Klausen, B. Capozzi, X. Roy, M. L. Steigerwald, C. Nuckolls and L. Venkataraman
**Phys. Chem. Chem. Phys.**, 14(40), 13841-13845, (2012)
[Selected for themed issue on Electron Transfer]

6. *Linker dependent bond rupture force measurements in single-molecule junctions*
M. Frei, S. V. Aradhya, M. S. Hybertsen, and L. Venkataraman
**JACS**, 134(9), 4003-4006, (2012)

7. *Importance of direct metal-π coupling in electronic transport through conjugated single-molecule junctions*
J. S. Meisner, S. Ahn, S. V. Aradhya, M. Krikorian, R. Parameswaran, M. Steigerwald, L. Venkataraman, and C. Nuckolls
**JACS,** 134(50), 20440-20445, (2012)

8. *Mechanics and chemistry: single molecule bond rupture forces correlate with molecular backbone structure*
M. Frei, S. V. Aradhya, M. S. Hybertsen, M. Koentopp, and L. Venkataraman
**Nano Letters**, 11(4), 1518-1523, (2011)
[Featured on NanoTechWeb.org]

9. *Electrothermal bonding of carbon nanotubes*
S. V. Aradhya, S. V. Garimella, and T. S. Fisher
**J. Electrochem. Soc.**, 155(9), K161-K165, (2008)
[Featured in Vir. J. Nano Sci. & Tech.]

***Manuscripts in preparation:***

1. *Probing interfacial energy alignment through single-molecule junction mechanic*s (in preparation)
S. V. Aradhya, T. Kim, H. Vazquez, M. S. Hybertsen and L. Venkataraman

2. *Potential energy landscape reconstruction from single-molecule experiments* (in preparation)
S. V. Aradhya, M. S. Hybertsen and L. Venkataraman

## Publications – Other

1. *Simultaneous measurement of force and conductance across single-molecule junction*
S. V. Aradhya, M. F. Frei, M. S. Hybertsen and L. Venkataraman
MEMS and Nanotechnology (Springer New York), 6, 75-84, (2012)
[Selected for the Best Paper Award at SEM conference]

2. *Electrothermal bonding of carbon nanotubes to glass*
S. V. Aradhya, S. V. Garimella, T. S. Fisher
Proc. IEEE Conf. on Thermal and Thermomechanical Phenomena in Electronic Systems, 1071-1077, (2008)

3. *MEMS flow sensor: design and modeling challenges*
S. V. Aradhya and P. Thakre
Technical Information Series of GE Global Research, 414, (2005)

## Presentations

***Conference talks and poster presentations:***

1. [Talk] '*Van der Waals Interactions at Single-Molecule Organic-Metal Interfaces*', Society for Experimental Mechanics (SEM), Chicago, IL (June 2013).
2. [Talk] '*Measuring van der Waals Interactions at Metal-organic Interfaces at the Single-molecule Level Using a Conducting Atomic Force Microscope*', Materials Research Society (MRS), San Francisco, CA (April 2013).
3. [Poster] *'Unraveling van der Waals interactions at metal/organic interfaces at the single-molecule level'*, New York Academy of Science – Gotham Metro Condensed Matter Meeting, New York, NY (Nov 2012).
4. [Poster] *'Feeling the invisible: probing quantum interference at the single molecule level'*, Gordon Research Conference and Gordon-Kenan Seminar on Electron Donor-Acceptor Interactions, Newport, RI (Aug 2012).
5. [Talk] '*Simultaneous measurement of force and conductance across single-molecule junctions*', Society for Experimental Mechanics (SEM), Costa Mesa, CA (June 2012).
6. [Talk] '*Simultaneous conductance and mechanical measurements on single-molecule junctions reveal enhanced binding due to van der Waals interactions*', American Physical Society (APS), Boston, MA (Feb 2012).
7. [Talk] '*Measuring the force to toggle a single-molecule switch using conductive atomic force microscope*', Seeing at the Nanoscale, Santa Barbara, CA (July 2011).
8. [Talk] '*Measurements of bond breaking forces in single atom contacts and single molecule junctions*', American Physical Society (APS), Portland, OR (March 2010).
9. [Talk] '*Electrothermal bonding of carbon nanotubes to glass*', IEEE Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems, Orlando, FL (May 2008).

***Invited talks:***

1. Materials Research Society, Graduate Student Award Finalist Session, San Francisco, CA (April 2013)
2. Rice University, Dept. of Physics/condensed matter seminar, Houston, TX (Mar 2013)
3. Cornell University, Dept. of Physics/LASSP seminar, Ithaca, NY (Feb 2013)
4. Harvard University, Dept. of Physics, Cambridge, MA (Jan 2013)
5. Dr. Reddy's Laboratory, Analytical R&D division, Hyderabad, India (Nov 2012)
6. MIT, Young Investigator Meeting, Boston, MA (Oct 2012)
7. California Institute of Technology, Dept. of Applied Physics, Pasadena, CA (Jun 2012)
8. Columbia University, Dept. of Applied Physics Seminar, New York, NY (Jan 2012)
9. Asylum Research Inc., Santa Barbara, CA (July 2011)