

Sudeep Mandal

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EDUCATION:

Ph.D. Candidate – Cornell University, Ithaca, NY August 2009 (expected)
School of Applied and Engineering Physics
Dissertation: “Photonic Crystals for Optofluidic Transport, Nanoscale Trapping and Biosensing”
Advisor: Prof. David Erickson
GPA: 4.05/4 (A+=4.3)

M.S. – Cornell University, Ithaca, NY May, 2008
School of Applied and Engineering Physics

B.Tech. – Indian Institute of Technology (IIT) Bombay, INDIA May. 2005
Department of Engineering Physics

RESEARCH EXPERIENCE:

Ph.D. Research

Cornell University, School of Applied and Engineering Physics, Ithaca, NY
Advisor: Prof. David Erickson

Manipulation of Nanoparticles and Biomolecules in Optically Resonant Point Traps:

- Demonstrated optical trapping of nanoparticles (50-500 nm) in sub-wavelength optical traps
- Resonant 1-D photonic crystal trap enhances trapping forces while lowering threshold optical power for trapping
- Novel design enables handling functionalities such as particle storage on resonator, transport along waveguide or release into fluid flow
- Performed Maxwell Stress Tensor calculations using 3D Finite Difference Time Domain (FDTD) and Finite Element Method (FEM) numerical simulations

Nanoscale Optofluidic Sensor Arrays for Biosensing: March, 2007 - present

- Designed a novel, evanescently coupled 1-D photonic crystal resonator architecture for a highly sensitive, multiplexable biosensor platform
- Designed and simulated silicon photonic structures using Finite difference time domain (FDTD)
- Demonstrated the detection of antibody-antigen bindings using this sensor architecture
- Conducted interdisciplinary research combining nano-photonics, micro and nano-fluidics and bio-chemistry
- Experience with nucleic acid detection and assays

Optofluidic Transport in Liquid Core Waveguiding Structures: February, 2006 – March, 2007

- Demonstrated particle transport in liquid-core waveguiding structures for the first time
- Tuned optical properties of Photonic Bandgap Microfibers to achieve liquid-core waveguiding
- Established foundation for moving towards extremely size sensitive Optical Chromatography

Research Intern

University of Regensburg, Molecular Computing Group, Regensburg, Germany

Advisor: Prof. Gianarelio Cuniberti

Dissipative effects in the electronic transport through DNA molecular wires: May – July, 2004

- Developed numerical simulations to model electronic transport in a dissipative quantum ladder based system
- Published two refereed journal articles on this research

Undergraduate Research Assistant

Indian Institute of Technology (IIT) Bombay, Engineering Physics, Mumbai, INDIA

Advisor: Prof. R. Vijaya

Erbium doped fiber ring lasers: August, 2004 – July, 2005

- Performed extensive device simulations to characterize the lasing wavelength of the laser

AWARDS:

Trevor R. Cuykendall Memorial Award

2006

Outstanding Teaching Assistant, 2005-2006

School of Applied and Engineering Physics

PUBLICATIONS: Manuscripts available at <http://www.sudeepmandal.com/publications>

Articles currently under review by refereed journals

1. Goddard, J., **Mandal, S.**, Nugen, S., Baeumner, A., Erickson, D. “Patterning of Nucleic Acid Probes in Optical Nanocavities” Submitted (2008).

Articles published in refereed journals

2. **Mandal, S.**, Goddard, J., Erickson, D., “A Multiplexed Optofluidic Biomolecular Sensor for Low Mass Detection” Accepted, *Lab on a Chip* (2009).
3. **Mandal, S.**, Erickson, D., “Nanoscale Optofluidic Sensor Arrays” *Optics Express*, 16, 1623-1631 (2008).
4. Erickson, D., **Mandal, S.**, Cordovez, B., Yang, A., “Nanobiosensors: Optofluidic, electrical and mechanical approaches to biomolecular detection at the nanoscale.” *Journal of Microfluidics and Nanofluidics*, 4, 33-52 (2008).
5. **Mandal, S.**, Erickson D., “Optofluidic Transport in Liquid Core Waveguiding Structures” *Applied Physics Letters*, 90, 184103 (2007).
6. Gutierrez, R., **Mandal, S.**, Cuniberti, G., “Dissipative effects in the electronic transport through DNA molecular wires” *Physical Review B*, 71, 235116 (2005).
7. Gutierrez, R., **Mandal, S.**, Cuniberti, G., “Quantum transport through a DNA wire in a dissipative environment” *Nanoletters*, 5, 1093 (2005).

Invited articles and book chapters

8. Goddard, J., **Mandal, S.**, Erickson, D., “Optically Resonant Nanophotonic Devices for Label-Free Biomolecular Detection” in *Innovative Photonic Structures for Bio/Chemical Detection* (X. Fan Ed.) Springer (2008)

Other refereed technical publications

9. **Mandal, S.**, Erickson, D., “Optofluidics: Applications” *Encyclopedia of Microfluidics and Nanofluidics*. Springer (2006).

Contributed Conference Publications/Presentations

10. **Mandal, S.**, Goddard, J., Erickson, D., “Optofluidic Sensor Arrays for Biomolecular Detections” *Conference on Lasers and Electro-Optics (CLEO) – Symposium on Optofluidics*, Baltimore, MD, May 2009.
11. **Mandal, S.**, Goddard, J., Erickson, D., “Nanoscale Optofluidic Sensor Arrays for Dengue Virus Detection” *IEEE/LEOS Summer Topical on Optofluidics*, Acapulco, Mexico, July 2008.
12. Goddard, J.M., **Mandal, S.**, Erickson, D., "Targeted Patterning of Nucleic Acid Probes on Optical Nanostructures" *Micro-Total Analysis Systems (μ TAS)*, San Diego, Oct. 2008.
13. **Mandal, S.**, Goddard, J., Erickson, D., “Nanoscale Optofluidic Sensor Arrays for Dengue Virus Detection” *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, May 2008.
14. **Mandal, S.**, Goddard, J., Erickson, D., “Biomolecular Detection using Nanoscale Optofluidic Sensor Arrays” *IEEE MEMS*, Tucson, Jan. 2008.
15. Yang, A., **Mandal, S.**, Erickson, D., “Optofluidic Transport – Optical Waveguides as Microfluidic “Train Tracks” *ASME International Mechanical Engineering Congress and Exposition*, Seattle, Nov. 2007.
16. **Mandal, S.**, Akhmechet, R., Chen, L., Nugen, S., Baeumner, A., Erickson, D. “Nanoscale optofluidic sensor arrays for Dengue virus detection” *SPIE Optics and Photonics*, Section on Optofluidics, San Diego, August 2007.
17. **Mandal, S.**, Erickson, D., “Optofluidic Transport in Liquid Core Photonic Crystal Fibers” *Conference on Lasers and Electro-Optics (CLEO)*, Baltimore, May 2007.
18. Yang, A., **Mandal, S.**, Erickson, D., “Micro and Nanofluidic Transport Using Advanced Photonic Devices.” *ASME International Mechanical Engineering Congress and Exposition*, Chicago, Nov. 2006.
19. **Mandal, S.**, Erickson, D., "Optical Chromatography in Hollow Core Photonic Crystal Fibers" *Micro-Total Analysis Systems (μ TAS)* Tokyo, Japan, Oct. 2006.
20. **Mandal, S.**, Erickson, D., “Particle Transport in Liquid Core Photonic Crystal Fibers” *IEEE/LEOS Summer Topical on Optofluidics*, Quebec City, July 2006.

PATENTS:

1. Erickson, D., **Mandal, S.**, “Nanoscale Optofluidic Devices for Biomolecular Detection” Patent Pending, Submitted September 2, 2008.
2. Erickson, D., **Mandal, S.**, “Optically driven separations in photonic crystal fibers” Application No: 12143952, Filed on June 23, 2008.

REFERENCES:

Prof. David Erickson

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Prof. Michal Lipson

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School of Electrical and Computer Engineering
214 Philips Hall, Cornell University,
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Prof. Harold Craighead

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