Chitraleema Chakraborty, Ph.D.

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Research Interests

Nanophotonics, Quantum Optics, Two-dimensional Materials, *Ab initio* Methods

Professional Appointments

University of Delaware, Newark, DE, USA

Assistant Professor
Department of Materials Science and Engineering (Primary)
Department of Physics and Astronomy 2020-Present

Harvard University, Cambridge, MA, USA

Postdoctoral Fellow, Computational Materials Science 2019-2020

- Project: First-Principles Design of Quantum Materials
- Advisor : **Prineha Narang**, Harvard John A. Paulson School of Engineering and Applied Sciences

Massachusetts Institute of Technology, Cambridge, MA, USA

Postdoctoral Research Associate, Research Laboratory of Electronics 2018-2020

- Project: Photonic Integration of Solid-State Quantum Emitters
- Advisor: **Dirk Englund**, Electrical Engineering and Computer Science

Education

University of Rochester, Rochester, N.Y., USA

Ph.D., Materials Science 2012-2018

- Thesis: Flatland Nanophotonics: A Study of Quantum-Confined Excitons in 2D Materials
- Advisor: **Nick Vamivakas**, The Institute of Optics

M.S., Materials Science

Joseph Fourier University, Grenoble, France

M.S., Nanophysics and Nanostructures 2010-2011

- Thesis: Spatial Light Modulators
- Advisor: **Rossini Umberto**, Laboratory of Electronics and Information Technology /Commissariat a l'Energie Atomique (CEA)

University of Delhi, Delhi, India

M.Tech., Nanoscience and Nanotechnology 2009-2012

- Thesis: Probing the metal-insulator phase transition in vanadium dioxide nanowires by nanoelectromechanical resonators
- Advisor: **Mandar Deshmukh**, Tata Insitute of Fundamental Research, Mumbai

Jadavpur University, Kolkata, India

B.Sc., Honors in Physics 2006-2009

Awards and Honors

- **Outstanding Doctoral Thesis, American Physical Society, DC, USA** 2019
  Carl E. Anderson Division of Laser Science, Finalist.
- **MIT Rising Star in EECS, University of Illinois, UC, IL, USA** 2019
- **Outstanding Dissertation Award, University of Rochester, NY, USA** 2018
- **Best Student Speaker, MRS Fall Meeting, Boston, MA, USA** 2017
  NM04 symposium on Atomically Thin Materials, Boston, MA, USA.
- **Department of Science and Technology Fellow**, Govt. of India 2009-2012
  Selected by the Indian Institute of Technology (IIT)- joint admission to Masters program to receive research scholarship and attend graduate school for M. Tech. degree at University of Delhi.
- **Egide Scholar**, Govt. of France 2010-2011
  Selected by French government to receive graduate scholarship, travel and book grant for MS at Joseph Fourier University Grenoble I, France.

Publications

Link to google scholar

[25] **Chakraborty, C.**, Utzat, H., Peng, C., Ginterseder, M., Bawendi, M., and Englund, D. Electrical control of lead halide perovskite quantum dots in a mixed dimensional van der Waals heterostructure. **Submitted** (2020)

[24] Ciccarino., C. J., Delmedico, N., **Chakraborty, C.**, Englund, D., and Narang, P. *Ab initio* strain dependent valley dynamics in monolayer transition metal dichalcogenides. **Submitted** (2020)

[23] **Chakraborty, C.**, Ciccarino, C. J., Narang, P. Dynamic modulation of phonon-assisted transitions in quantum defects in monolayer transition-metal dichalcogenide semiconductors. **Arxiv: Materials Science**, 2007.14399 (2020)

[22] Moon, H., Grosso, G., **Chakraborty, C.**, Peng, C., Taniguchi, T., Watanabe, K., and Englund, D. Dynamic exciton funneling by local strain control in a monolayer semiconductor. **Nano Letters**, (2020)

[21] Mukherjee, A., **Chakraborty, C.**, Qiu, L., Vamivakas, N. Electric field tuning of deterministically created quantum dots in WSe_2. **AIP Advances**, 10, 075310 (2020)

[20] **Chakraborty, C.**, Mukherjee, A., Moon, H., Kumarasiri, K., Qiu, L., Hou, W., Pena, T., Watson, C., Wu, S.M., Englund, D., and Vamivakas, N. Strain-tuning of the optical properties of localized emitters in an atomically thin semiconductor. **Optica**, 7, 580 (2020)

[19] Moon, H., Bersin, E., **Chakraborty, C.**, Lu, A.Y., Grosso, G., and Englund, D. Strain-correlated Localized Exciton Energy in Atomically Thin Semiconductors. **ACS Photonics** 7, 1135 (2020)

[18] Ciccarino., C. J., **Chakraborty, C.**, Englund D., and Narang, P. Carrier Dynamics and Spin-Valley-Layer Effects in Bilayer Transition Metal Dichalcogenides. **Farady Discussions**, 214, 175 (2019)

[17] Peyskens, F., **Chakraborty, C.**, Muneeb, M.,Thourhout, D. V., Englund, D. Integration of Single Photon Emitters in 2D Layered Materials with a Silicon Nitride Photonic Chip. **Nature Communications**, 10, 4452 (2019)

[16] **Chakraborty, C.**, Vamivakas, N., and Englund, D. Advances in quantum light emission from 2D materials. **Nanophotonics** (Review), 8, 2017 (2019)

[15] **Chakraborty, C.**, Jungwirth, N. R., Fuchs, G. D., and Vamivakas, N. Electrical manipulation of the fine-structure splitting of WSe_2 quantum emitters . **Phys. Rev. B**, 99, 045308 (2019)

[14] Qiu, L., **Chakraborty, C.**, Dhara, S., and Vamivakas, N. Room-Temperature Valley Coherence in a Polaritonic System. **Nature Communications**, 10, 1513 (2019)

[13] Kumarasiri, K., **Chakraborty, C.**, Mathur, N., Qiu, L., Mukherjee, A., Fuchs, G., and Vamivakas, N. Rabi oscillations and resonance fluorescence from a single hexagonal boron nitride quantum emitter. **Optica**, 6, 542 (2019)

[12] **Chakraborty, C.**, Mukherjee, A., Qiu, L., and Vamivakas, N. Electrically tunable valley polarization and valley coherence in monolayer WSe_2 embedded in a van der Waals heterostructure. **Optical Materials Express**, 9, 1479 (2019)

[11] Dhara, S.*, **Chakraborty, C.***, Qiu, L., Goodfellow, K., Oloughlin T., Wicks G, and Bhattacharjee S., and Vamivakas, N. Anomalous dispersion of microcavity trion-polaritons. **Nature Physics**, 14, 130 (2018)

[10] **Chakraborty, C.**, Qiu, L., Kumarasiri, K., Mukherjee A., Dhara, S., and Vamivakas, N. 3D localized trion in monolayer WSe_2 in a charge tunable van der Waals heterostructure. **Nano Letters**, 18, 2859 (2018)

[9] **Chakraborty, C.**, Goodfellow, K. M., Dhara, S., Yoshimura, A., Meunier, V., and Vamivakas, N. Quantum-confined Stark effect of individual defects in a van der Waals heterostructure. **Nano Letters**, 17, 2253 (2017)

[8] **Chakraborty, C.**, Goodfellow, K. M., and Vamivakas, A. N. Localized emission from defects in $MoSe_2$ layers. **Optical Materials Express**, 6, 2081 (2016)

[7] Goodfellow, K. M., **Chakraborty, C.**, Waduge, P., Sowers, K., Wanunu, M., Krauss, T., Driscoll, K., and Vamivakas, A. N. Distance-dependent energy transfer between CdSe/CdS quantum dots and a two-dimensional semiconductor. **Applied Physics Letters**, 108, 021101 (2016)

[6] **Chakraborty, C.**, Kinnischtzke, L., Goodfellow, K. M., Beams, R., and Vamivakas, A. N. Voltage-controlled quantum light from an atomically thin semiconductor. **Nature Nanotechnology**, 10, 507 (2015)
Selected as cover article for the issue of Nat. Nano, June 2015

[5] Kinnischtzke, L., Goodfellow, K. M., **Chakraborty, C.**, Lai,Y., Badolato, A., and Vamivakas, A. N. Graphene mediated Stark shifting of quantum dot energy levels. **Applied Physics Letters**, 108, 211905 (2015)

[4] Goodfellow, K. M.*, **Chakraborty, C.***, Beams, R., Novotny, L., and Vamivakas, A. N. Direct On-Chip Optical Plasmon Detection with an Atomically Thin Semiconductor. **Nano Letters**, 15, 5477 (2015)

[3] **Chakraborty, C.**, Beams, R., Goodfellow, K. M., Wicks, G. W., Novotny, L., and Vamivakas, A. N. Optical antenna enhanced graphene photodetector. **Applied Physics Letters**, 105, 241114 (2014)

[2] Goodfellow, K. M., Beams, R., **Chakraborty, C.**, Novotny, L., and Vamivakas, A. N. Integrated nanophotonics based on nanowire plasmons and atomically thin material. **Optica**, 1, 149 (2014)

[1] Parikh, P.*, **Chakraborty, C.***, Abhilash, T. S., Sengupta, S., Cheng, C., Wu, J., and Deshmukh, M. M. Dynamically Tracking the Strain Across the Metal-Insulator Transition in VO_2 Measured Using Electromechanical Resonators. **Nano Letters**, 13, 4685 (2013)

INVITED PRESENTATIONS

- Flatland Quantum Emitters,
  Quantum Science and Technology, **ETH Zurich**, Switzerland (2020)
- Next Generation Quantum Emitters for Scalable Quantum Technology, Materials Science, Electrical Engineering, **University of Maryland**, College Park, MD, USA (2020)
- Next Generation Quantum Emitters for Scalable Quantum Technology,
  Photonics Center, **Boston University**, Boston, MA, USA (2020)
- Next Generation Quantum Emitters for Scalable Quantum Technology,
  Chemistry and Physics, **Purdue University**, West Lafayette, IN, USA (2020)
- Flatland Quantum Emitters,
  Physics, **Queens University**, Kingston, ON, Canada (2020)
- Flatland Quantum Emitters,
  Electrical Engineering, **State University of New York**, Buffalo, NY, USA (2020)
- Next Generation Quantum Emitters for Scalable Quantum Technology,
  Physics, **University of California**, Merced, CA, USA (2020)
- Flatland Quantum Emitters,
  Chemistry, **University of New Mexico**, Albuquerque, NM, USA (2020)
- Flatland Quantum Emitters,
  Materials Science, **University of Delaware**, Newark, DE, USA (2020)
- Flatland Quantum Emitters,
  Physics, **University of Iowa**, Iowa City, IA, USA (2020)
- Flatland Quantum Emitters,
  The Institute of Optics, **University of Rochester**, Rochester, NY, USA (2019)
- Flatland Nanophotonics: A Study of Quantum-Confined Excitons in 2D Materials,
  Frontiers in Optics, Washington, DC, USA (2019)
- Quantum confined Stark effect of lead halide perovskite quantum dots in a mixed dimensional van der Waals heterostructure,
  Conference on Lasers and Electro-Optics (CLEO), San Jose, USA (2019)
- Flatland Nanophotonics
  Harvard-Smithsonian Center for Astrophysics, Harvard University, USA (2018)
- Quantum-confined emitters in atomically thin semiconductors
  Laboratory for Integrated Science and Technology, Harvard University, USA (2017)
- Quantum-confined emitters in atomically thin semiconductors
  Research Laboratory of Electronics, MIT, Cambridge, USA (2017)
- Quantum light from individual defects in atomically thin semiconductor
  Frontiers in Optics, 100^{th}year, Rochester, USA (2016)
- Quantum nanophotonics with localized excitons in atomically thin semiconductor,
  Conference on Lasers and Electro-Optics (CLEO), San Jose, USA (2016)
- Integrated nanowire photonics,
  Metamaterials congress, Oxford, UK (2015)
- Voltage controlled quantum light from a monolayer semiconductor
  SPIE Student Chapter, University of Rochester, Rochester, USA (2015)
- Probing the Metal-Insulator Phase Transition in Vanadium Dioxide Nanowires by Nano-electromechanical Resonators
  International Max Planck Research School Workshop, Halle, Germany (2012)

Contributed presenations

- The Role of Strain and Defects in 2D Materials,
  Materials Research Society, Boston, USA (2019)
- Quantum-Confined Stark Effect of Lead Halide Perovskite Quantum Dots in a Mixed Dimensional van der Waals Heterostructure,
  Materials Research Society, Boston, USA (2019)
- Strain dependent carrier properties in atomically thin semiconductors,
  Fundamental Optical Processes in Semiconductors, Banff, Canada (2019)
- Quantum-confined Stark effect in a mixed dimensional van der Waals heterostructure,
  Fundamental Optical Processes in Semiconductors, Banff, Canada (2019)
- Voltage controlled fine-structure splitting of single photon emitters in a two-dimensional semiconductor
  Conference on Lasers and Electro-Optics (CLEO), San Jose, USA (2019)
- Photonics at thermodynamic limit,
  EFRC meeting, Stanford, CA, USA (2019)
- Strain-tunable single-photon emission from an atomically thin semiconductor
  APS March Meeting, Boston, USA (2019)
- Electric-field tunable fine-structure splitting in monolayer semiconductors (Poster)
  APS March Meeting, Boston, USA (2019)
- Photonics at thermodynamic limit,
  EFRC meeting, Berkeley, CA, USA (2019)
- Quantum emitters in 2D materials,
  NSF-EFRI meeting, San Diego, CA, USA (2018)
- Strain tuning of quantum emitters in 2D materials,
  MURI meeting, Cambridge, MA, USA (2018)
- Quantum confined trions in a van der Waals heterostructure
  APS March Meeting, Los Angeles, USA (2018)
- Electrical manipulation of spin-valley states in TMDC quantum dots
  Materials Research Society Fall Meeting, Boston, USA (2017)
- Nanophotonics with 2D materials
  Quantum Nanophotonics, Monte Verita, Switzerland (2017)
- Tunable valley polarization from localized excitons in atomically thin semiconductors
  APS March Meeting, New Orleans, USA (2017)
- Quantum confined Stark effect of single photon emitters in atomically thin semiconductor
  APS March meeting, Baltimore, USA (2016)
- Voltage controlled quantum light from monolayer semiconductor
  APS March meeting, San Antonio, Texas, USA (2015)
- Optical antenna enhanced atomically thin photodetectors (Poster),
  Lester Eastman conference, IEEE, Ithaca, New York, USA (2014)

Teaching and Outreach

Teaching Assistant:

- Advances in 2D Materials MSEG667 — Spring 2021
  Primary instructor, University of Delaware.
- Introduction to Materials Science MSC202 — Spring 2013
  Primary instructor: Prof. David Quesnel, University of Rochester.
- Photon-camp, Institute of Optics, University of Rochester. — Summer 2017

Advising experience: Research mentor for high school, undergratuate and graduate students at University of Rochester, Massachusetts Institute of Technology and Harvard University.

Quantum Huddle Seminar Series organizer: Aimed to bring scientists together from fields who are dedicated to the goals of controlling and exploiting quantum systems. 2020

Guest Lecturer: Each One Teach One Foundation, India

Optical Society of America: Sharing and Inspiring via the *Celebrating All Member Video Lounge* organized by the Optical Society of America.