

Ritesh Agarwal, University of Pennsylvania

Short Biography

Prof. Ritesh Agarwal is a Srinivasa Ramanujan Distinguished Scholar and Professor in the Department of Materials Science and Engineering at the University of Pennsylvania where he has been leading his research group (Nanoscale Phase Change and Photonics Group) since 2005 (<http://agarwal.seas.upenn.edu/>). He received his integrated BS/MS degree from the Indian Institute of Technology, Kanpur in 1996, and a master's degree from the University of Chicago in 1997. He earned his PhD in physical chemistry from the University of California at Berkeley in 2001 under the supervision of Prof. Graham Fleming researching liquid and protein solvation and photosynthesis via multiple-pulse coherent nonlinear optical techniques. After completing his PhD., he was a postdoctoral fellow at Harvard with Prof. Charles Lieber where he studied the optoelectronic properties of semiconductor nanowires. He started at Penn in 2005 as an Assistant Professor and was promoted to full Professor in 2014. Some of his key research accomplishments include nanowire injection lasers (*Nature* 2003) and avalanche photodiodes (*Nature Materials*, 2006) during his postdoctoral tenure, and from Penn, demonstration of 1D polaritons (*PNAS* 2011), room temperature polariton lasing in nanoscale cavities (*Science Advances*, 2019), nanoscale phase change memory (*Nature Nanotechnology* 2007; *Science* 2012, *Nature Comm* 2017), large Purcell enhancements in plasmonic nanocavities (*Nature Materials* 2011), optical emission from Si nanocavities (*Nature Photonics*, 2013), all-optical switching in nanowires (*Nature Nanotechnology* 2012), photon spin dependent photocurrents in Silicon (*Science* 2015), spatially-dispersive photogalvanic effect in Weyl semimetals (*Nature Materials*, 2019), photocurrent detection of the OAM of light (*Science*, 2020) tunable on-chip OAM microlaser (*Science* 2020), on-chip strain photodetector (*Nature Photonics*, 2020), topological polaritons (*Science* 2020) electric-field controlled nonlinear optical switches (*Nature Communications* 2017), optical nonlinear polarimetry of polar domains in phase change materials (*Nature Communications*, 2018) optoelectronics of 2D exciton-polaritons (*Nano Letters* 2015, 2016, 2017) and tunable optical metasurfaces (*Nano Letts* 2017 and 2018). He has been a recipient of the NSF CAREER award in 2007, NIH Director's New Innovator Award in 2010, SPIE Nanoengineering Pioneer Award in 2014, and the George H. Heilmeier Award for Faculty Excellence in 2022. He was elected a Fellow of the Optical Society of America in 2020. His research has been extensively covered in the media such as BBC, TIME magazine, National Geographic, Scientific American, Newsweek, MIT Technology Review, ABC News, Materials Today, Nano Today, Hindustan Times, Telegraph (Kolkata), Comcast Cable Network Channel and Philadelphia Inquirer. In 2017, he became the director of a Multi University Research Initiative on Phase Change Materials for Photonics, leading a team of six PIs from five universities. In the last 15 years, he has raised ~\$20 million in extramural research funding (mostly from NSF, DoD and NIH) including multiple instrumentation grants to enhance materials characterization, optics and photonics related research facilities at Penn.

CURRICULUM VITAE

Name: Ritesh Agarwal; Professor and Srinivasa Ramanujan Distinguished Scholar

Address: Department of Materials Science and Engineering, University of Pennsylvania
308 LRSM, 3231 Walnut St., Philadelphia PA 19104.

Citizenship: USA; India OCI

EDUCATION

- December 2001, Ph.D. in *Chemistry*, University of California, Berkeley.
Advisor: Prof. Graham R. Fleming. Thesis title: “One- and two-color three-pulse photon echo studies of protein and liquid dynamics”
- 1997, M.S. in *Chemistry*, University of Chicago
- 1996, M.Sc. (5yr Integrated) in *Chemistry*, Indian Institute of Technology, Kanpur

POSITIONS HELD

- July 1, 2022 – present, Srinivasa Ramanujan Distinguished Scholar, School of Engineering & Applied Science, University of Pennsylvania
- July 1, 2014 – present, Professor, Department of Materials Science and Engineering, University of Pennsylvania
- Sep 2016 – Aug 2019, Part time visiting Lecturer/Professor, Hunan University
- July 1, 2011 – June, 2014, Associate Professor, Department of Materials Science and Engineering, University of Pennsylvania
- Sep 1 2005 – present, Assistant Professor, Department of Materials Science and Engineering, University of Pennsylvania
- Jan 2002-Aug 2005, Postdoctoral Fellow, Department of Chemistry and Chemical Biology, Harvard University. (Advisor: Prof. Charles M. Lieber)

RESEARCH INTERESTS

Topological quantum materials; light-matter interactions with structured light; quantum geometrical effects in nanostructures; topological photonics and polaritonics; nonlinear optics; photogalvanic effects; nanoscale quantum phenomena; nanomaterial growth, transformations and assembly; nanoscale photonics and electronics; nanocavity plasmonics; light-matter interaction in nanostructures; metasurfaces; phase change electronics and optoelectronics; in situ microscopy; organic-inorganic photovoltaics; quantum biology in plants and bacterial systems.

HONORS/DISTINCTIONS

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| 2022 | George Heilmeier Award for Faculty Excellence, School of Engineering and Applied Science, University of Pennsylvania |
| 2020 | Fellow, Optical Society of America |
| 2018- | Penn Fellow |
| | Keynote lecture; Asia Nano 2018; Nano China 2015; |
| | Plenary lecture, ICONSAT, 2016; |
| | Plenary lecture-International conference on Nano for Energy, 2017; |
| | Keynote, 4 th International Graphene Symposium, 2017, Shenzhen, China |

2017-2019	Participant, China Thousand Talent Program, Hunan University
2015	Speaker, TEDxPSU (Si Nanophotonics)
2014	SPIE Nano-Engineering Symposium Pioneer Award
2014	Penn Engineering Fellow
2013	Invited speaker, US-China Frontiers of Engineering Symposium (Organized by NAE, USA and CAE, China)
2010	NIH Director's New Innovator Award
2007	NSF CAREER Award
2007	Phase Change Nanowire Memory work included in Top 5 biggest advance in Nanoscience in 2007 by MIT Technology Review magazine
1996	Proficiency Medal for Best Overall Performance, Department of Chemistry, Class of 1996, Indian Institute of Technology, Kanpur
1994-95	Best Academic Performance, Indian Institute of Technology, Kanpur

TEACHING EXPERIENCE

Quantum Physics of Materials (MSE 570)

Experimental Methods in Materials Science (MSE 500)

Special Topics: Optics of Advanced Materials (MSE 790)

Thermodynamics of Materials (MSE 530)

Introduction to Functional Nanoscale Materials (MSE 215)

Nanoscale Materials Laboratory (MSE 250)

Graduate Students supervised (PhD thesis awarded)

Yeonwoong Jung (Associate Professor, University of Central Florida); Stein Prize for
best thesis, UPenn

Christopher Rodd (United States Patent Office)

Brian Piccione (Argo AI (Ford)

Carlos Aspetti (Accenture)

Pavan Nukala (Assistant Professor, IISc Bangalore); Stein Prize for best thesis, UPenn

Rahul Agarwal (Lam Research)

Joohee Park (Intel)

Jacob Berger (Lam Research)

Daksh Agarwal (Lam Research)

Wenjing Liu (Assistant Professor, Peking University)

Gerui Liu (ASML)

Zhurun Ji (Stanford Fellow, postdoc)

Gaurav Modi (Micron)

Harshwardhan Jog (Sony)

Graduate students (currently supervising)

Yuhui Wang, Yiwen Wang, Yicong Chen, Shupeng Xu, Utkarsh Khandelwal, Jia-Chen Shi

Postdoctoral Fellows (past)

Chang-Hee Cho (Associate Professor, DGIST, Korea)
Doocho Choi (Principal Researcher, Korea Railroad Research Institute)
Hee-Suk Chung (Principal Researcher, Korea Basic Science Institute)
Sajal Dhara (Assistant Professor, IIT Kharagpur)
H. S. Ee (Assistant Professor, Kongju National University, Korea)
Moon Hyung Jang (Phil Parrish Fellow, University of Virginia)
Bumsu Lee (Assistant Professor, Southern Illinois University, Carbondale)
S.H. Lee (Senior Manager, SK Hynix, Korea)
Mukut Mitra (Applied Materials)
Sung-Wook Nam (Assistant Professor, Kyungpook National University)
Ming-Liang Ren (Mellon Bank)
Lambert van Vugt (Utrecht University)
Liaoxin Sun (Shanghai Institute of Technical Physics)
Bin Zhang (Professor, Tianjin University)
Xiaopeng Fan (Assistant Professor, China)
Minsoo Hwang (Korea University)
Young Chul Leem (Korea University)

SERVICE (TO DEPARTMENT/SCHOOL/UNIVERSITY OR RESEARCH COMMUNITY)

RESEARCH COMMUNITY SERVICE

Editorial Board, *Scientific Reports*, 2014-2020
Editorial Board, *Nanomaterials & Energy*; 2013-present
Invited speaker and participant for Army Strategy Planning Meeting on Integrated Photonics, 2020
Speaker and participant for Microscale Adaptability Army Science Planning & Strategy Meeting, 2015
Keynote Speaker and participant for Army Science Planning & Strategy Meeting on Nanophotonics, 2011
Invited speaker and Participant, Optical Society Incubator and Research Planning Meeting on Nanolasers, 2016

Symposium Organizer on 2D materials and devices, Photonics West (2018-present; annual conference)

International Advisory Board, Symposium on “Multifunctional Inorganic One-dimensional Nanostructures: Status and Potential” CIMTEC 2014 and 2016, Italy

Program committee for the Phase Change Symposium for Electronics Materials Conference in 2019

Program Committee: 6th ACM International Conference on Nanoscale Computing and Communication Dublin, Ireland, 2019

Co-organizer, Optoelectronic and Photonic Materials Symposium, IUMRS 2014, Singapore

Co-organizer, Nanowire symposium, Pacificchem 2011 and 2015, Hawaii

Co-organizer of a symposium titled “Phase-Change Materials for Data Storage, Cognitive Processing and Photonics Applications”, Spring MRS, April 2015, San Francisco.

Co-organized a symposium titled “Nanowires: Growth and Device Assembly for Novel Applications” at the Fall MRS meeting in December 2010.

Co-organized a symposium titled “Nanowires: Novel Assembly Concepts and Device Integration” at the Fall MRS meeting in December 2007.

Session Chair, ACS National Meeting, MRS, ICON2013, IEEE-Photonics and other meetings.

DEPARTMENTAL SERVICE

Chair, Faculty Search Committee in electronic, photonic and quantum materials (2016, 2017, 2021, 2022)

Chair, Mentorship Committee, Prof. Liang Feng (Sep 2017 -2022)

MSE Faculty Diversity Search Advisor, Aug 2014-2016; 2020 -Jan 2021

Chair, Graduate student admissions, committee, MSE department. Sep 2013-2015

Member, Graduate student admissions, committee, MSE department. Sep 2006-present

Materials Science and Engineering, ABET Committee (Spring 2007-2012)

Assistant Professor Mentorship Committee (Ertugul Cubukcu): September 2011-Dec 2015

Undergraduate curriculum evaluation committee, 2015

MSE Chair Selection Committee: April 2010, May 2012, Nov 2015

MSE faculty recruiting committee: 2011, 2012, 2014, 2015, 2016, 2017, 2019, 2020, 2021

Chair, Committee for determining the criteria for secondary appointments (faculty) in Materials Science and Engineering, Fall, 2012

Seminar Series Organizer, Penn Materials Science and Engineering (AY: 2007-08, Spring 2013)

SERVICE TO SCHOOL

Co-Chair, Quantum Information Science & Engineering Faculty Search Committee, 2021

Co-lead, Quantum Information Science & Engineering Steering Committee, 2021

SEAS Personnel Committee, Alternate member (2018, 2019, 2020, 2021)

Penn Engineering Undergraduate Curriculum Review Committee (2017)

SEAS Faculty Council, 2016-2018

Blue Sky Committee, Strategic vision for the future of SEAS; SEAS2020 vision

UNIVERSITY SERVICE

SAS Energy cluster hiring committee (2015 and 2016)

Advisory Committee, Wolf Nanotechnology Facility

Hearing Panel for the Student Disciplinary System

OUTREACH ACTIVITIES

Presented lectures to high school students as a part of Penn Summer Science Initiative (PSSI) program on “Nanotechnology” (2006-2018)

Speaker on “The Wonderful World of Nanotechnology” twice a year at MSE Undergraduate Open House to attract freshman to our program.

Presented lectures to high school teachers as a part of Penn monthly high school teacher lecture series program on “Nanowire Optics and Devices”

Presented lectures to REU students as a part of Penn lecture series program on “Nanowire Optics”

Presented a television program on Philadelphia Science Television on “Nanotechnology”, October 2007.

REVIEWED ARTICLES/PROPOSALS FOR THE FOLLOWING JOURNALS AND AGENCIES

Nature, Nature Photonics, Science, Science Advances, Nature Nanotechnology, Nature Physics, Nature Communications, Scientific Reports, Nano Letters, ACS Nano, Applied Physics A, Journal of Physical Chemistry A, Journal of Physical Chemistry B, Journal of Physical Chemistry C, Advanced Materials, Advanced Functional Materials, Biomacromolecules, Small, IEEE Transactions on Nanotechnology, IEEE Transactions on Electron Devices, Langmuir, J. Amer. Chem. Soc., Nanotechnology, Nanoscale, Applied Physics Letters, J. Appl. Phys., Materials Research Bulletin, Physica Status Solidi - Rapid Research Letters, Inorganic Chemistry, Journal of Materials, Crystal Growth and Design, Chemistry of Materials, Optics Letters, Optics Express, Optica, Advanced Optical Materials

NSF-GRFP panel, NSF (ECCS) proposal review panelist, NSF (DMR) panelist, NSF-CBET review panelist, NSF-Chemistry panelist, NSF (International Research and Education) program reviewer, NRC (Canada), FONDAP (Chile) reviewer, DoE-SunShot Program (review panel), AAAS-Saudi Arabia Solar Centers (panel), ARPA-E Concept paper reviewer, European Research Council, NASA postdoctoral fellowship application reviewer.

PATENTS

Agarwal R, C.H. Cho and Aspetti C.O., “Emission in Nanoscale Structures Via Nanocavity Plasmons”, patent disclosure filed by Penn CTT; CT/US2012/066184 filed November 21, 2012

Agarwal R, Mitra M, Jung Y, “System and Method for the Relaxation of Stress in Phase Change Memory Devices”, International patent application, PCT/US2010/050134

C. M. Lieber, X. Duan, Y. Huang, and R. Agarwal, “Nanoscale Coherent Optical Components”, 10/624,135, U.S. patent pending; 10/734,086 U.S. Continuation Patent, Pending of 10/624,135.

D.G. Grier, R. Agarwal, G. Yu, K. Ladavac, and C. M. Lieber, “System and Method for Processing Nanowires with Holographic Optical Tweezers”, U.S. Provisional Patent, awarded 2009.

INVITED/PLENARY/KEYNOTE TALKS

6/2023 “Three-Dimensional Twistronic Photogalvanic Effect - A New Paradigm of Light-Matter Interaction”, 2D Transition Metal Dichalcogenides 2023, University of Cambridge

4/2023 “Three-Dimensional Twistronic Photogalvanic Effect - A New Paradigm of Light-Matter Interaction”, MRS Spring Meeting, San Francisco

1/2023 “Utilizing Geometry and Topology for Designing On-Chip Chiral Photonic Infrastructure”, Department of Physics, Indian Institute of technology, Delhi

10/2022 “Utilizing Quantum Geometry and Topology for Enabling Integrated Chiral Photonics”, George H. Heilmeier Faculty Award Lecture, School of Engineering & Applied Science, University of Pennsylvania

10/2022 “Three-Dimensional Twistronic Photogalvanic Effect - A New Paradigm of Light-Matter Interaction”, Frontiers in Optics + Laser Science (Fio LS), Rochester, NY

7/2022 “Utilizing Geometry and Topology for Enabling Integrated Chiral Photonics” 20th International Symposium on the Physics of Semiconductors and Applications (ISPSA 2022), Jeju, Korea (virtual)

6/2022 “On-chip OAM photodetectors: topological light meets topological material”, 6th International Conference on Optical Angular Momentum (ICOAM), Tampere, Finland (virtual).

5/2022 “Utilizing Geometry and Topology for Designing On-Chip Chiral Photonic Infrastructure”, Joint College of Engineering and College of Science, Northeastern University (virtual).

4/2022 “Utilizing Geometry and Topology for Designing On-Chip Chiral Photonic Infrastructure”, MSE department, University of Wisconsin, Madison

4/2022 “Helical Topological Polaritons”, *Pioneer Session*, Korean Physical Society Virtual Annual Meeting

3/2022 “Nonlocal quadrupolar photogalvanic spectroscopy as a probe of complex matter: topological light meets topological materials”, *R. S. Krishnan Memorial Lecture*, Department of Physics, Indian Institute of Science, Bangalore

3/2022 “Helical Topological Polaritons”, Centre for Nano Science and Engineering, IISc Bangalore

2/2022 “Nonlocal quadrupolar photogalvanic spectroscopy as a probe of complex matter”, Programmable Quantum Materials seminar, Columbia. University (virtual)

2/2022 “Utilizing Geometry and Topology for Designing On-Chip Chiral Photonic Infrastructure”, *Distinguished Speaker Series*, ECE department, Duke University

2/2022 “Helical Topological Polaritons”, Virtual Online Workshop - Light-Matter Interactions in Low Dimensional and Topological Photonic Materials, SPARC, IISc Bangalore (virtual)

12/2021: “Utilizing vacancies and disorder for designing highly energy efficient phase change materials”, Materials Research Society of India Annual International Conference (virtual)

11/2021: “Helical Topological Polaritons”; Nanophotonics of 2D Materials (N2D 2021), Benasque, Spain (virtual talk)

7/2021: “Utilizing Geometry and Topology for Designing On-Chip Quantum Hyperentanglement Photonic Infrastructure”, Indian Institute of Science Quantum Technology Initiative Talk (Quantalk). Virtual

7/2021; “Novel photogalvanic effects in quantum materials: topological light meets topological materials”, Army Research Labs (virtual)

6/2021 “Utilizing Geometry and Topology for Enabling Integrated Chiral Photonics”, IEEE Photonics Conference; Virtual

6/2021 “Integrated Chiral Photonics”, Summer Topicals 2021; Virtual

3/2021; “Helical topological polaritons”, Polariton Chemistry Webinars, Virtual

11/2020; “Utilizing Geometry and Topology for Enabling Integrated Chiral Photonics”, MRS Spring/Fall, 2020; Virtual

11/2020; “Generation of helical topological polaritons for integrated photonics “Army Science Planning and Strategy Meeting on Integrated Nanophotonics”, Virtual

1/2020; “Light Matter Interactions in Layered Materials with Conventional and Topological Band Structures”, Lund University, Lund, Sweden

1/2020; “Controlling light-matter interactions in chalcogenide-based topological semimetals: Novel physics to devices”, Electronic Materials and Applications 2020, Orlando, FL

1/2020; “Controlling nonlinear light-matter interactions in topological semimetals: Novel physics to chiral devices”, The 50th Winter Colloquium on the Physics of Quantum Electronics (PQE-2020), Snowbird, Utah

12/2019; “Topological Semimetals: A new platform for next generation optoelectronics”, IWPSD, Kolkata, India

12/2019; “Controlling Light Matter Interactions in Layered Materials with Conventional and Topological Band Structures”, Department of Physics, IIT-Kharagpur, India

12/2019; “Light Matter Interactions in Layered Materials: from Trivial to Topological Band Structures”, The 11th International Conference on Advanced Materials and Devices (ICAMD), Jeju, South Korea

12/2019; “Controlling Light-Matter Interactions in Chalcogenide-Based Topological Semimetals—Novel Physics to Devices’, MRS Fall Meeting, Boston

11/2019; “Light Matter Interactions in Layered Materials with Conventional and Topological Band Structures”, National Center for Nanoscience and Technology, Beijing, China

11/2019; “Controlling light-matter interactions in topological semimetals: Novel physics to devices”, Sino-German Bilateral Symposium on Nanophotonics and Optoelectronic Integration, Hunan University, Changsha, China

10/2019; “Light Matter Interactions in Layered Materials with Conventional and Topological Band Structures”, Materials Science and Engineering, Northwestern University, Evanston, IL

9/2019; “Controlling Light Matter Interactions in Layered Materials with Conventional and Topological Band Structures”, Department of Physics, University of Michigan, Ann Arbor, MI

9/2019; “Light Matter Interactions in Layered Materials with Conventional and Topological Band Structures”, Brookhaven National Laboratory, NY

6/2019; ““Light Matter Interactions in Layered Materials with Conventional and Topological Band Structures”, Department of Chemistry, NUS Singapore

6/2019; “Controlling Light-Matter interactions in Topological Semimetals: Novel Physics to Devices”, 10th International Conference on Materials for Advanced Technologies (ICMAT), Singapore

6/2019; “Active control of collective excitations of exciton-polaritons in two-dimensional systems”, 10th International Conference on Materials for Advanced Technologies (ICMAT), Singapore

5/2019; “Controlling Light Matter Interactions in Layered Materials with Conventional and Topological Band Structures”, Department of Physics, King Abdullah University of Science and Technology, Saudi Arabia

4/2019; “Light Matter Interactions in Layered Materials: from Trivial to Topological Band Structures”, Electrical and Computer Engineering, University of Washington, Seattle

4/2019; “Light Matter Interactions in low dimensional materials: from Trivial to Topological Band Structures”, CML Symposium in honor of Prof. Charles Lieber’s 60th birthday, Harvard University, Cambridge MA

4/2019, “Defect engineering of phase-change materials for ultralow-power electronics and optoelectronics”, SPIE Defense + Commercial Sensing 201, Baltimore, MD

4/2019; “Light Matter Interactions in Layered Materials: from Trivial to Topological Band Structures”, University of Delaware, Newark

2/2019 “Active control of collective excitations of exciton-polaritons in two-dimensional systems”, Photonics West 2019, San Francisco

2/2019 “Light-Matter interactions in topological semimetals: novel physics to devices”, Photonics West 2019, San Francisco

12/2018 “Active control of light-matter interactions in low-dimensional systems, Facets of Photonics, IISER Pune, India

12/2018 “Active control of collective excitations of exciton-polaritons in two-dimensional systems”, The Excitonics and Polaritonics International Conference, NTU Singapore

11/2018 Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, MRSEC Seminar, Columbia University, NY

10/2018 *Keynote*: “Active control of collective excitations of exciton-polaritons in two-dimensional systems”, Asia Nano, Qingdao, China

10/2018 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, RPI, NY

10/2018 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Nano-Optics Seminar, Columbia University, NY

9/2018 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Department of Physics (Special Seminar), City College, NY

9/2018 “Utilizing Geometry and Topology for Enabling Integrated Chiral Photonics”, 5th ACM International Conference on Nanoscale Computing and Communications (NanoCom), Reykjavik, Iceland

8/2018 “Active control of light-matter interactions in one- and two-dimensional systems”, 15th International Conference on Near Field Optics, Nanophotonics and Related Technologies, Troyes, France

6/2018 “Light Matter Interactions in Layered Materials: from Trivial to Topological Band Structures”, Department of Physics, IIT Delhi, India

5/2018 “Electrical control of exciton-plasmon polaritons in two-dimensional systems”, Physics of Light Matter Interactions in Nanostructures, PLMCN19, Chengdu, China

5/2018 “Light Matter Interactions in Layered Materials: from Trivial to Topological Band Structures”, Workshop on Semiconductor Nanostructures and Integrated Devices, Hunan University, Changsha, China

4/2018 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Department of Electrical and Computer Engineering, University of Minnesota, Minneapolis

4/2018 “Active control of exciton-polaritons in one- and two-dimensional systems”, Strong Coupling in Organic Molecules, SCOM-2018; Eindhoven, Netherlands

1/2018 “The role of disorder on electronic, domain and structural changes in phase change materials”, Photonics West, San Francisco

12/2017 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, IWPSD, New Delhi, India

10/2017 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Department of Nanoengineering, University of California San Diego

10/2017 Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, 232nd (Annual) meeting of the Electrochemical Society, National Harbor, MD

9/2017 “The role of disorder on electronic, polar domain and structural changes in phase change materials”, E/PCOS 2017, Aachen, Germany

8/2017 “Circular Photogalvanic Effect in Silicon and Weyl Semimetals”, New Horizons in Photovoltaics, University of Pennsylvania

9/2017 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Department of Materials Science & Engineering, Penn State University

8/2017 “The role of disorder on electronic, ferroelectric and structural changes in phase change materials”, XXVI International Materials Research Congress 2017, Cancun Mexico

5/2017 “Novel Classical and Quantum Photonic Devices by Manipulating Light-matter Interactions in One and Two-Dimensional Systems”, CLEO 2017, San Jose

4/2017 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Department of Nanoengineering, University of California San Diego

4/2017 *Plenary talk*; “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, 4th International Graphene Symposium, Shenzhen, China

4/2017 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Beijing Institute of Technology, China

2/2017 “Manipulating light-matter interactions in two-dimensional materials with plasmonic nanolattice array”, IIT-Delhi, India

2/2017 *Keynote talk*: Novel photonic devices by manipulating light-matter interactions in low-dimensional systems for energy”, International conference for nano for energy, UPES DehraDun, India

11/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, MRS Fall Meeting, Boston

11/2016 “Active control over light-matter interactions in 2D excitonic crystals”, Multidisciplinary workshop on low-dimensional semiconductor materials and technologies, Changsha, China

10/2016 "The Role of Defects, Disorder and Ferroelectric Domains in Electronic and Structural Phase Transitions in Phase Change Materials", NVMTS-2016, CMU Pittsburgh, PA

9/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems” OSA Incubator Meeting on Science and Applications of Nanolasers, Washington DC

9/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems” Institute for Advanced Materials, Devices, and Nanotechnology, Rutgers University

9/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems” Institute of Optics, University of Rochester

9/2016 "The Role of Defects, Disorder and Ferroelectric Domains in Electronic and Structural Phase Transitions in Phase Change Materials", 7th Annual Workshop on Memory Characterization and Modeling, Milan, Italy.

9/2016 "The Role of Defects, Disorder and Ferroelectric Domains in Electronic and Structural Phase Transitions in Phase Change Materials", CNR-INFN, Micronix, Milan, Italy.

8/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in two-dimensional systems”, SKKU Forum on 2D materials, Suwon, S. Korea.

8/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, IVC-2016, Busan, S. Korea.

7/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Advanced Photonics Congress, Optical Society of America, Vancouver, Canada

6/2016 "The Role of Defects, Disorder and Ferroelectric Domains in Electronic and Structural Phase Transitions in Phase Change Materials", CIMTEC-2016, Perugia, Italy

5/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Hunan University, China

5/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Fudan University, China

5/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, University of Science and Technology of Beijing, China

5/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Beijing Center for Nanoenergy and Nanosystems, China

4/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Sino-German Photonics Meeting, Tuebingen, Germany

2/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, IIT-Delhi, India

Plenary talk; 2/2016 “Novel classical and quantum photonic devices by manipulating light-matter interactions in nanowires”, ICONSAT 2016, Pune India

Keynote talk: 9/2015 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, Nano China, Beijing 2015

12/2015 “Novel classical and quantum photonic devices by manipulating light-matter interactions in nanowires”, PACIFICHEM-2015, Hawaii

11/2015 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, POSTECH, S. Korea

11/2015 “Novel classical and quantum photonic devices by manipulating light-matter interactions in low-dimensional systems”, DGIF (Global Forum)-Daegu, South Korea

10/2015 “Novel classical and quantum photonic devices by manipulating light-matter interactions in nanowires”, Nanowires-2015, Barcelona, Spain

7/2015 "The Role of Defects, Disorder and Ferroelectric Domains in Electronic and Structural Phase Transitions in Phase Change Materials", Gordon Research Conference on Crystal Growth and Assembly

3/15 “Silicon Nanophotonics: Turn Off the Dark”, TEDxPSU

12/14 “Disorder induced Metal-Insulator Transitions and Structural Transformations in Phase Change Materials”, IIT Delhi, India

12/14 “Tailoring Light-Matter Interactions in Semiconductor Nanowires with Plasmonic Nanocavities”, Conference on Optoelectronic and Microelectronic Materials and Devices (COMMAD), Perth, Australia

10/14 ““Direct Observation of Metal to Insulator Transitions in Phase Change Materials Prior to Amorphization and their Role in Ultralow Power Memory Switching”, Non-Volatile memory Technology Symposium (NVMTS-2014), Jeju Island, S. Korea

8/14 “Nanowire Optoelectronic Probes for Sub-Cellular Studies”, ACS National Meeting, San Francisco

7/14 “Tailoring Light-Matter Interactions in Semiconductor Nanowires with Plasmonic Nanocavities”, IEEE Summer Topicals Meeting, Montreal, Canada

7/14 “Tailoring Light-Matter Interactions in Semiconductor Nanowires with Plasmonic Nanocavities” Nano Korea, Seoul

6/14 “Tailoring Light-Matter Interactions in Semiconductor Nanowires with Plasmonic Nanocavities”, International Nanophotonics and Nanoenergy Conference (INPEC) 2014, Seoul, S. Korea

6/14 “Probing Size-dependent Light-Matter Interactions and Structural Phase Change Properties with Nanowires”, DGIST, S. Korea

4/14 “Tailoring Light-Matter Interactions in Semiconductor Nanowires with Plasmonic Nanocavities”, MRS Spring Meeting, San Francisco, CA

4/14 “The Role of Disorder on Electronic and Structural Phase Transitions in Phase Change Materials”, MRS Spring Meeting, San Francisco, CA

3/14 “Tailoring Light-Matter Interactions in Semiconductor Nanowires with Plasmonic Nanocavities”, ACS National Meeting, Dallas, TX

12/13 “Watching Nanoscale Phase Change Memory Work in Real Time via in situ Electron Microscopy”, 17th International Workshop on The Physics of Semiconductor Devices” (17th IWPSD), Noida, India

12/13 “Probing Size-dependent Light-Matter Interactions and Structural Phase Change Properties with Nanowires”, Indian Institute of Technology, Delhi

12/13 “Obtaining Visible Light Emission from “Bulk” Silicon by Nanocavity Plasmons”, Nano Today Conference, Singapore

12/13 “Probing Size-dependent Light-Matter Interactions and Structural Phase Change Properties with Nanowires”, National University of Singapore

12/13 “Probing Size-dependent Light-Matter Interactions and Structural Phase Change Properties with Nanowires”, Nanyang Technological University (NTU Singapore)

11/13 “Probing Size-dependent Light-Matter Interactions and Structural Phase Change Properties with Nanowires”, University of Oxford, UK

10/13 “Probing Size-dependent Light-Matter Interactions and Structural Phase Change Properties with Nanowires”, University of Chicago, IL

10/13 “Probing Size-dependent Light-Matter Interactions and Structural Phase Change Properties with Nanowires”, Drexel University

9/13 “Obtaining Visible Light Emission from “Bulk” Silicon by Nanocavity Plasmons”, CINT Users Conference, Santa Fe, NM

9/13 “Obtaining Visible Light Emission from “Bulk” Silicon by Nanocavity Plasmons”, International Conference on 1D Nanomaterials (ICON 2013), Annecy, France

9/13 “Obtaining Visible Light Emission from “Bulk” Silicon by Nanocavity Plasmons”, IEEE Photonics Conference, Seattle, WA

8/13 “Obtaining Visible Light Emission from “Bulk” Silicon by Nanocavity Plasmons”, International Conference on Nanomaterials, London, Ontario Canada

5/13 “Watching Nanoscale Phase Change Memory Work in Real Time via in situ Electron Microscopy”, US-China Frontiers of Engineering Symposium, Beijing, China;

4/13 “Engineering Visible Light Emission from “Bulk” Silicon by Nanocavity Plasmons”, Materials Research Society, San Francisco, CA

12/12 “Novel Size-Dependent Light-Matter Interaction and Phase Change Properties of Semiconductor Nanowire Devices”, 7th Singapore International Chemistry Conference (SICC-7), NUS Singapore

12/12 “Novel Size-Dependent Light-Matter Interaction and Phase Change Properties of Semiconductor Nanowire Devices”, Nanyang Technological University, Singapore

12/12 “Novel Size-Dependent Light-Matter Interactions and Phase Change Properties of Nanowire Devices”, Tata Institute of Fundamental Research, Mumbai, India

11/12, “Controlling Light-Matter Interaction in Semiconductor and Plasmonic Nanowires”, Materials Research Society, Boston, MA

10/12, “In situ Observation of Electric Wind Force Induced Amorphization in Phase Change Nanowire Memory Devices”, 3rd International Workshop on Resistive RAM, Stanford University, Palo Alto, CA

8/12 “Novel Size-Dependent Light-Matter Interaction and Phase Change Properties of Semiconductor Nanowire Devices”, Argonne National Labs, IL

4/12 “Tailoring absorption and emission properties in semiconductor nanowires with nanocavity plasmons for photovoltaic applications”, SPIE Defense, Security and Sensing Meeting, Baltimore, MD

4/12 “In situ Observation of Electric Wind Force Induced Amorphization in Phase Change Nanowire Memory Devices”, Materials Research Society Spring Meeting, San Francisco

1/12 “The Wonderful World of Nanowires”, Indian Science Congress, Bhubaneswar, India

12/11 “Probing Size-dependent Light-Matter Interactions with Nanowires”, Penn-NIMS Joint meeting, Tsukuba, Japan

11/11 “Controlling Light-Matter Interaction in Semiconductor and Plasmonic Nanowires”, *Plenary Lecture*, Strategic Planning Meeting, Army Research Office, Durham, NC

11/11 “Novel Size-Dependent Light-Matter Interactions and Phase Change Properties of Semiconductor Nanowire Devices”, Materials Research Society Fall Meeting, Boston

10/11 “Probing Size-dependent Light-Matter Interactions and Structural Phase Change Properties with Nanowires”, University of Exeter, UK

9/11 “In situ Observation of Electric Wind Force Induced Amorphization in Phase Change Nanowire Memory Devices”, E/PCOS, Zurich, Switzerland

8/11 “Probing Size-dependent Light-matter Interactions with Nanowires”, Pan-American Study Institute, San Jose, Costa Rica

6/11 “Probing Size-dependent Light-matter Interactions with Nanowires”, NANOWIRES Meeting, Lesvos, Greece

5/11 “Probing Size-dependent Light-matter Interactions and Structural Phase Change Properties with Nanowires”, Department of Materials Science and Engineering, Drexel University.

2/11, “Probing Size-dependent Light-matter Interactions and Structural Phase Change Properties with Nanowires”, Department of Materials Science and Engineering, University of Michigan.

2/11, “Nanowire Transformations and size-dependent properties”, TMS Society Meeting, San Diego, CA

2/11, “Probing Size-dependent Light-matter Interactions and Structural Phase Change Properties with Nanowires”, Department of Chemical Engineering, Stevens Institute of Technology, NJ.

12/10 “Growth and chemical transformation of Nanowires”, Pacific Chem, Honolulu, HI

11/10 “Probing Size-dependent Light-matter Interactions and Structural Phase Change Properties with Nanowires”, Department of Materials Science and Engineering, University of California, Berkeley

11/10 “Growth and Chemical Transformation of Nanowires and their Size-dependent Properties”, Nanowire Growth Workshop, Rome, Italy

10/10 “Probing Size-dependent Light-matter Interactions and Structural Phase Change Properties with Nanowires”, Department of Materials Science and Engineering, University of Pennsylvania, Philadelphia

10/10 “Nanowires: Size-dependent Optical and Structural Phase Change Properties”, Department of Materials science and Engineering, University of Alabama, Tuscaloosa

10/10 “Nanowires: Size-dependent Optical and Structural Phase Change Properties”, Department of Physics and Applied Physics, NYU-Poly, New York

9/10 “Extremely low temporal drift and field-induced nucleation and switching in phase change nanowire memory devices”, E/PCOS 2010, Milan, Italy.

4/10 “Novel Size-Dependent Chemical Reactivity, Light-Matter Interaction and Phase Change Properties of Semiconductor Nanowires”, MRS Spring Meeting, San Francisco

4/10 “Extremely low temporal drift in phase change nanowire memory devices”, MRS Spring Meeting, San Francisco

12/09 “Nanowires: Size-dependent Optical and Structural Phase Change Properties”, Department of Physics, University of Delhi, India

12/09 “Size-Dependent structural and optical properties of nanowires”, ICANN, Guwahati, India

11/09 “Nanowires: Size-dependent Optical and Structural Phase Change Properties”, Department of Materials Science and Engineering, Seoul National University, Seoul, Korea.

11/09 “Phase Change Nanowires”, Hynix Semiconductor Inc, South Korea

11/09 “Phase Change Nanowires”, Korea Institute of Science and Technology, Seoul, Korea

11/09 “Nanowires: Size-dependent Optical and Structural Phase Change Properties”, Department of Chemistry, Drexel University, Philadelphia, PA.

11/09 “Nanowire Phase Change Memory: Fundamental Size Effects”, Tenth Annual Non-Volatile memory Technology Symposium”, Portland, OR.

3/09 Size-Dependent Phenomena in Phase Change nanowires”, Semicon China, Shanghai

3/09 “Nanowires: Size-dependent Optical and Phase Change Properties”, Department of Materials Science and Engineering, University of Illinois at Urbana-Champaign.

11/08 “Nanowire Phase Change Memory: Fundamental Size Effects”, Ninth Annual Non-Volatile memory Technology Symposium”, Pacific Grove, CA.

10/8 “Nanowires; Size-dependent Optical and Phase Change Properties”, Department of Mechanical Engineering, Princeton University.

9/8 “Nanowires: Size-dependent Optical and Phase Change Properties”, Department of Materials Science and Engineering, Cornell University.

9/8 “Fundamental Size-Effects in Phase Change Nanowires, “European Symposium on Phase Change and Ovonic Science”, Prague, Czech Republic.

7/08 “Phase Transitions and Memory Switching in Self-Assembled Nanowires”, Gordon Research Conference (Nanostructure Fabrication), Tilton, NH.

5/08 “Nanowire Optoelectronics and Electronic Memory”, Department of Electrical Engineering and Computer Science, Carnegie Mellon University, Pittsburgh, PA.

11/07 “Nanowire Phase Change Memory”, Physical Sciences Seminar, IBM T. J. Watson Center, Yorktown Heights, NY.

11/07 “Nanowire Optoelectronics and Electronic Memory”, Department of Materials Science and Engineering, Rutgers, Piscataway, NJ.

9/07 “Nanowire Optoelectronics and Electronic Memory”, Joint Engineering Seminar, University of Pittsburgh.

9/07 “Nanowire Optoelectronics and Electronic Memory”, Optics East 2007, Boston.

8/07 “Phase Transitions and Memory Switching in $\text{Ge}_2\text{Sb}_2\text{Te}_5$ Self-assembled Nanowires”, American Chemical Society, Boston.

5/07 “Semiconductor Nanowires”, Department of Physics, University La Sapienza, Rome.

5/07 “Nanowire Optoelectronics and Electronic Memory”, European Materials Research Society, Strasbourg, France.

3/07 “Nanowire Optoelectronics and Electronic Memory”, Department of Materials Science and Engineering, Rensselaer Polytechnic Institute.

1/07 “Nanowire Optics and Photonic Devices”, Penn-Academia Sinica Joint Symposium on Frontiers of Materials Research, Taipei, Taiwan.

12/06 “Nanowire Optics and Optoelectronics”, Department of Chemistry, Indian Institute of Technology, Kanpur, India

12/06 “Nanowire Optics, Optoelectronics and Assembly with Tweezers”, Photonics 2006, Hyderabad, India

5/06 “Nanowire Optoelectronics and Nanowire Assembly with Optical Tweezers”, IBM, Yorktown Heights, NY

2/06 “Nanowire Optics and Optoelectronics”, Department of Chemistry, University of Pennsylvania

10/05, “Nanowire Optoelectronic Devices and Nanowire Assembly with Optical Tweezers”, Department of Chemical Engineering, Johns Hopkins University.

1/2005, “Single Nanowire Laser Optics and Optoelectronics”, Department of Materials Science and Engineering, University of Pennsylvania.

1/2005, “Single Nanowire Laser Optics and Optoelectronics”, Department of Materials Science and Engineering, University of California, Berkeley.

1/2005, “Single Nanowire Laser Optics and Optoelectronics”, Department of Chemistry, University of New Mexico, Albuquerque.

12/2004, “Single Nanowire Laser Optics and Optoelectronics”, Department of Chemistry, University of Pittsburgh.

1/2001, “Photosynthetic Light Harvesting: A three pulse photon echo peak shift study”, Department of Chemistry, Indian Institute of Technology, Kanpur, India

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BOOK CHAPTER

Nanowire Phase Change Memory, by Pavan Nukala and Ritesh Agarwal

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MEDIA COVERAGE OF RESEARCH

Research from the Agarwal group has featured in BBC, Time, National Geographic, Newsweek, Philadelphia Inquirer, Scientific American, MIT Technology Review, ABC News, Materials Today, Nano Today, Hindustan Times, Telegraph (Kolkata), Comcast Cable Network Channel, Physics World, Physics Today, IEEE Spectrum, Photonics Spectra, Laser Focus World and other news, media and magazine outlets.