

# Curriculum Vitae

## Yong P. Chen

Karl Lark-Horovitz Professor of Physics and Astronomy and  
Professor of Electrical and Computer Engineering,  
Director of Purdue Quantum Science and Engineering Institute (PQSEI)  
Department of Physics and Astronomy, School of Electrical and Computer Engineering  
and Birck Nanotechnology Center, Purdue University, 525 Northwestern Ave, West  
Lafayette, IN 47907 USA

Villum Investigator and (part-time) Professor of Physics, Aarhus University, Denmark

Principal Investigator and consulting/visiting professor, WPI-AIMR (Advanced Institute  
for Materials Research), Tohoku University, Japan

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## Degree Education

- **Ph.D., Princeton University (1999–2005)**

*Major:* Electrical Engineering (Solid State Physics/Electronic Materials and Devices)

*Ph.D. Thesis:* Quantum Solids of Two Dimensional Electrons in Magnetic Fields

*Thesis Advisor:* Daniel C. Tsui (Nobel Laureate Physics'98)

- **M.Sc., MIT (1997–1999)**

*Major:* Mathematics (passed PhD qualifying exam) *Advisor:* Gian-Carlo Rota

*MS Thesis:* Model Order Reduction for Nonlinear Systems

*Thesis Advisor:* Jacob White

- **B.Sc., Xi'an Jiaotong University (1992–1996)**

*Major:* Applied Mathematics

*B.Sc. Thesis:* Dynamics of General Equilibria: Application of Global Analysis and  
Differential Geometry in Mathematical Economics

*Thesis Advisor:* Shou, Jilin

## Appointments

Purdue University, Karl Lark-Horovitz Professor of Physics and Astronomy, 08/2019-

Aarhus University, Department of Physics and Astronomy, Villum Investigator/Visiting  
Professor, 2019-2020; and Villum Investigator/Professor (part-time), 2021-

Purdue University, Director, Purdue Quantum Science and Engineering Institute,  
02/2019-01/2025

Visiting/Consulting Professor and MUST Chair Professor, Macau University of Science  
and Technology, 2020-2024

CEO and Co-founder (with S. Kais and D. Stewart), Quanta LLC, 2020-2023

AVS-Quantum Science (American Institute for Physics), Associate Editor in Quantum Materials and Devices, 2019-2023

Purdue University, Associate Director for Research, Birck Nanotechnology Center, 01/2018-07/2019

WPI (World Premier International Research Center)-AIMR (Advanced Institute for Materials Research), Tohoku University, Principal Investigator, 2017-2025 (renewable)

Purdue University, Professor of Physics and Astronomy and of Electrical and Computer Engineering, 08/2016-

Purdue University, Associate Professor of Physics and Astronomy and of Electrical and Computer Engineering, 08/2012-07/2016

Purdue University, Miller Family Assistant Professor of Physics and Nanoscience and Assistant Professor Courtesy of Electrical and Computer Engineering, 08/2007-07/2012

Rice University, J. Evans Attwell and Welch Postdoctoral Fellow, Richard Smalley Institute for Nanoscale Science and Technology and Department of Physics and Astronomy, 05/2005-08/2007

Princeton University, Department of Electrical Engineering, PhD Fellow and Graduate Research Assistant, 09/1999-04/2005

MIT, Department of Mathematics, PhD Fellow and Graduate Teaching Assistant, 09/1997-07/1999

### **Awards and Honors** (selected, since 1996)

Herbert Newby McCoy Award, Purdue University, 2021

Karl Lark-Horovitz Professorship, Purdue University, 2019

Villum Investigator, Villum Foundation, 2019

Fellow of American Physical Society, 2016

Masao Horiba Award, Honorable Mention on Nanoparticle Research, 2015

Purdue University Faculty Scholar, 2013

Purdue University, Excellence in Research Award, 2011 & 2012 & 2017

IBM Faculty Award, 2009

NSF CAREER Award, 2009-2014

DOD Defense Threat Reduction Agency (DTRA) Young Investigator Award, 2009-2011

American Chemical Society PRF Doctoral New Investigator Award, 2008-2010

Adjunct Professor (honorary title), Xi'an Jiaotong University, 2007-2010

Miller Family Professorship, Purdue University, 2007-2012

J. Evans Attwell-Welch Postdoctoral Fellowship in Nanoscience, Rice University, 2005-2007

National Nanotechnology Initiative (NNI) Scholarship for Early Career Scientists, 2005

International Union of Pure and Applied Physics (IUPAP) Young Author Best Paper Award in Semiconductor Physics, 2004

Sir Y.S. Gordon Wu Fellowship in Engineering and Applied Science, Princeton University, 1999-2003

M.I.T Applied Mathematics Fellowship, 1998

Y.T. Li Fellowship, M.I.T, 1997

Benefactor's Scholarship, St. John's College, and Part III Mathematical Tripos, Cambridge University, 1997 (declined)

Highest Scholarship and "Model of Outstanding Students" (5 out of 12,000), Xi'an Jiaotong University, 1996

### **Professional and Scholarly Associations**

American Association for the Advancement of Sciences (AAAS)

American Physical Society (APS)

IEEE

## **Research Areas**

### **Experimental condensed matter and nanophysics:**

Quantum materials (2D materials such as graphene, 2D magnets, 2D semiconductors; topological materials such as topological insulators/superconductors/semimetals); quantum devices/transport/photonics/spintronics

### **Experimental atomic, molecular, optical and quantum physics:**

Bose-Einstein condensation (synthetic quantum matter, quantum simulation); cold molecules (photoassociation, quantum chemistry and quantum control); quantum photonics

## **Research Grants**

51 grants (36 as PI) received since 2008, total funding (received at my institutions) >~\$48M (out of which >~\$20M to Chen);  
Average annual research expenditure of group: >~1M;  
Total capital equipment in group: ~\$5M

### *Current active grants:*

51) *NSF IUCRC (Industry University Cooperative Research Center): Center for Quantum Technologies (CQT)*, 09/2022-08/2027 (**PI: Yong Chen** [since 2024], Co-PI: David Stewart), \$1,150,000 [first quantum-focused IUCRC center funded by NSF; a consortium of Purdue University (lead), Indiana university, and University of Notre Dame, with 10+ company members; previous PI before 2024: Sabre Kais]

50) *Supporting Partnering for Advanced Research teamwork (SPARK) Program: Quantum Science Center renewal*, Purdue University Office of Research, 01/2024-12/2024, **PI: Yong Chen**, \$100,000

49) *Excitonic Rydberg Quantum Material*, a project funded by *Center for Quantum Technologies*, an Industry-University Cooperative Research Center (IUCRC) headquartered at Purdue University funded by NSF (grant 2224960), 09/2023-08/2024 (project PI: Hadiseh Alaeian, co-PI: Yong Chen, \$60,000)

48) *ExpandQISE: Track 2: Developing Research and Education Programs in Quantum Information Science and Engineering with Research on Locally Tunable 2D Topological Superconductors*, subcontract from University of Wyoming (lead institution) via National Science Foundation (NSF), 09/2022-08/2027 (project PI: Jifa Tian at U-Wyoming with several co-PIs from Wyoming and Purdue, project total: \$5M with Purdue subcontract ~\$1.5M)

47) *Quantum Science Center (QSC)*, a DOE Quantum Information Science (QIS) Research Center, subcontract from Oak Ridge National Lab (ORNL, lead institution) via DOE Office of Science, 10/2020-09/2025 (**Purdue PI: Yong Chen** with 13 other co-PIs; the whole QSC PI is David Dean from ORNL with numerous other co-PIs), \$12M (Purdue subcontract, total QSC center is \$115M) over five years.

46) *MURI: Novel Light-Matter Interactions In Topologically Non-Trivial Weyl Semimetal Structures And Systems*, subcontract from University of Southern California (USC, lead institution) via Air Force Office of Scientific Research (AFOSR)-DOD MURI program, 09/2020-08/2025 (Purdue PI: Alexandra Boltasseva, Purdue co-PI: Yong Chen; whole MURI project PI: Mercedeh Khajavikhan/USC with other co-PIs: Demetrios Christodoulides and Madhab Neupane/Univ. Central Florida, Arun Bansil/Northeastern; David Mandrus/Univ. Tennessee), \$2,480,000 (Purdue subcontract, total MURI project: \$7,500,000)

45) Villum Investigator, Villum Foundation. 07/01/2019-06/30/2025 (**PI: Yong Chen**), ~\$6,200,000, supporting establishing and leading a *Villum Center for Hybrid Quantum Materials and Devices* hosted at Aarhus University, Denmark

44) *Quantum Computing Algorithms and Applications for Coherent and Strongly Correlated Chemical Systems*, Department of Energy (DOE) Basic Energy Sciences, 09/2018-08/2025 (PI: Sabre Kais, Co-PIs: Yong Chen, Libai Huang/Purdue; David Mazziotti, John Anderson /U-Chicago), \$5,900,000

43) *Quantum Many-Body Physics in Spin-Orbit Coupled Bose Gases*, National Science Foundation (NSF) PHY# 2012185, 09/01/2020-08/31/2024 (**PI: Yong Chen**), \$360,000

42) *Applications of Quantum Materials in Nuclear Physics Experiments*, Department of Energy (DOE) Office of Nuclear Physics, Nuclear Physics Quantum Horizon Program, 11/2020-10/2024 (**PI: Yong Chen**), \$200,000

41) *Topological Insulator Based Coherence Battery*, Lockheed Martin Co. 11/01/2018-10/31/2024 (**PI: Yong Chen**), \$360,000

40) *Principal Investigator at WPI-AIMR International Center for Materials Research --- International Joint Research Lab and Program “Quantum Materials and Spintronics”*: staff/postdoc/visitors and collaborative research with World Premier International Research Center Initiative (WPI) Advanced Institute for Materials Research (AIMR), Tohoku University and JSPS, Japan. 10/01/2017-, (**PI: Yong Chen**, with multiple local co-PIs: Aki Kumatani et al.), valued at ~200,000/yr, main activity location & funds managed by: AIMR, Tohoku University; [note a new addition project starting in 2020 “quantum sensing: from materials to universe” (~80K/yr for 4.5 yrs, exploring quantum dots and sensing for materials research and high energy physics) funded by Tohoku “FriDUO (creation of new fields of research” program) (PI: Yong Chen, co-PIs: K.Inoue and T.Otsuka/Tohoku, Rafael Lang and P.Upadhyaya/Purdue as overseas partner)]

*Past grants:*

39) *Investigation of strain effect on graphene/ferroelectric PMN-PT hybrid systems*, FDCT Foundation-Macau hosted at Macau Univ. Science and Technology (MUST),

07/2021-06/2023 (**PI: Yong Chen**), ~\$100,000 with additional ~12,000 MUST internal seed support on AI and materials analysis

38) *NSF IUCRC Planning Grant*, Purdue University: Center for Quantum Technologies (CQT), 05/2021-04/2022 (PI: Sabre Kais, Co-PIs: David Stewart, Vlad Shalaev, Yong Chen, Andy Weiner), \$20,000 [the planning grant has since resulted in an NSF IUCRC Center grant awarded to Purdue-IU-Notre Dame consortium with Kais as PI]

37) *A milli-kelvin optical and microwave system for next generation quantum hybrids*, DOD-ONR DURIP, 05/2021-04/2022 (PI: Pramey Upadhyaya, Co-PIs: Vlad Shalaev, Yong Chen), \$228,000

36) *Quantum Light Emitting Defects*, Los Alamos National Laboratory, 11/2020-10/2021 (**PI: Yong Chen**), \$75,000

35) *EAGER: Enabling Quantum Leap: Electrically tunable, long-distance coherent coupling between room temperature qubits mediated by magnons in low-dimensional magnets*, National Science Foundation (NSF) DMR# 1838513, 07/2018-06/2021 (PI: Pramey Upadhyaya, Co-PIs: Yong Chen, Vlad Shalaev), \$300,000

34) *Dynamics and Excitations of Spin-Orbit-Coupled Bose-Einstein Condensates*, National Science Foundation (NSF) PHY# 1708134, 09/01/2017-08/31/2021 (**PI: Yong Chen**), \$300,000

33) *Collaborative Research: Strain Based Devices for Switches and Memory Applications*, National Science Foundation (NSF) ECCS#1711332, 07/01/2017-06/30/2021 (**PI: Yong Chen**), \$210,000 [Prof. Vidya Madhavan of UIUC is the lead-PI and Collaboration Partner is funded under a separate collaborative grant]

32) *EFRI NewLaw: Controlling Thermal Transport with Topologically Guided Heat Carriers*, National Science Foundation (NSF) EFMA #1641101, 09/01/2016-08/31/2021 (**PI: Yong Chen**, Co-PIs: Zubin Jacob, Xianfan Xu, Qian Niu/UT-Austin), \$1,964K

31) *Machine Learning for Data Analytics and Optimization*, Purdue University Discovery Park Data Sciences Initiative, 05/01/2018-04/30/2020 (PI: Sabre Kais, co-PIs: Yong Chen, Ashraf Alam, Alex Pothen), \$300,000

30) *Photonics Science and Technologies for Bio Security, Food Safety and other Health Applications*, Discovery Park Big Idea Challenge Program, Purdue University, 04/01/2017-03/31/2019, (**PI: Yong Chen**, Co-PIs: Mike Ladisch, Vlad Shalaev, Sasha Boltasseva, Young Kim, David Nolte), \$300,000

29) *Quantum Electronic Metrology in Graphene Nanostructures*, National Institute of Standards and Technology (NIST), 01/01/2010-8/31/2019 (**PI: Yong Chen**), \$500K

28) *Acquisition of an Optical MicroCryoStat with Magnet*, Provost's Major Scientific Equipment Program, Purdue University, 08/01/2017-07/31/2018 (PI: **Yong Chen**), \$72,189

27) *Acquisition of a tunable-wavelength CW Ti:S laser*, EVPRP Laboratory and University Core Facility Research Equipment Grants Program, 04/01/2018-05/31/2018, (PI: **Yong Chen**, Co-PIs: Mike Ladisch, Vlad Shalaev, Sasha Boltasseva, Gary Cheng, Tongcang Li, Yulia Pushkar), \$300,000

26) *Acquisition of a Cryogen-free High Field Magnet for Magneto-transport and Magneto-optical Experiments*, EVPRP Laboratory & University Core Facility Research Equipment Program, Purdue University, 04/01/2017-03/31/2018 (PI: **Yong Chen**), \$98,350

25) *Large Scale Nanomanufacturing of Novel Inhomogeneous Strained Two-Dimensional Materials with Tunable Electronic and Optical Properties*, National Science Foundation (NSF) CMMI #1538360, 09/01/2015-08/31/2018 (PI: Gary Cheng, Co-PI: **Yong P. Chen**), \$300K

24) *Majorana particles in topological insulator quantum wires*, National Science Foundation (NSF) DMR #1410942, 09/01/2014-08/31/2017 (PI: **Yong Chen**, Co-PI: Leonid Rokhinson), \$420K

24) *Optically synthesizing novel atomic and molecular quantum matter --- an emerging research in atomic, molecular and optical (AMO) physics*, Purdue University OVPR (Office of Vice President for Research) Research Incentive Grant, 09/2013-03/2016 (PI: **Yong Chen**, Co-PIs: Chris Greene, Dan Elliott, Yuli Lyanda-Geller), \$300K

25) *Acquisition of Wide Wavelength Range, Nanosecond Optical Parametric Oscillator System for Condensed Matter and Biophysics Applications*, Purdue University OVPR (Office of Vice President for Research) University Core Facility Research Equipment Program, 01/2015-05/2015 (PI: Oana Malis, Co-PIs: **Yong Chen**, Yulia Pushkar, Sergei Savikhin), \$100K

22) *MESO: Topological Insulator based Coherent Energy Devices*, DARPA, 07/01/2011-06/30/2015 (PI: **Yong Chen**, Co-PIs: Supriyo Datta, Mark Lundstrom, Peide Ye, Xianfan Xu, Anant Ramdas, Zahid Hasan/Princeton, Li Shi/UT-Austin, Marcel Franz/Univ. British Columbia, Rama Venkatasubramanian/RTI International), \$6.2M

21) *Thermal Interface Materials Based on Graphene Networks*, National Science Foundation (NSF) Cooling Technology Research Center (CTRC) at Purdue University, 01/01/2014-12/31/2015 (PI: **Yong Chen**, Co-PI: Xiulin Ruan), \$80K

19) *Hybrid superconductor/topological insulator devices with quasi-1D Bi<sub>2</sub>Te<sub>3</sub> nanowires*, Purdue Center for Topological Materials (PCTM) Seed Grant, 09/2012-08/2014 (PI: **Yong Chen**, Co-PIs: Leonid Rokhinson, Yue Wu, Gerhard Klimeck), \$36K

- 18) *Graphene optical modulators for high energy physics*, Argonne National Lab, 01/2013-12/2014 (PI: **Yong Chen**), \$23K
- 17) *CAREER: Table-top high energy physics in graphene*, NSF CAREER Award, National Science Foundation (NSF) DMR #0847638, 09/01/2009-08/31/2014 (PI: **Yong Chen**), \$550K
- 16) *Topological Insulator based Field Effect Transistors*, Intel, 01/01/2011-12/31/2013 (PI: **Yong Chen**, Co-PIs: Yue Wu, Gerhard Klimeck), \$450K
- 15) *MRI: Acquisition of Self-Referenced Frequency Comb for Atomic-Molecular-Optical Physics and Optical Signal Processing Research*, NSF #1126314, 09/2011-08/2012 (PI: Andy Weiner, Co-PIs: **Yong Chen**, Dan Elliott), \$270K
- 14) *Compliant Thermal Interface Materials Using Graphene*, Cooling Technology Research Center (CTRC), Purdue University, 01/01/2012-12/31/2013 (PI: Xiulin Ruan, Co-PIs: **Yong Chen**, John Blendell, Jeff Youngblood), \$80K
- 13) *Spin Transport and Spin Logic in Topological Insulator Nanowires*, Nanoelectronics Research Initiative (NRI)-Midwest Institute for Nanoelectronics Discovery (MIND) Seed Grant from Indiana Economic Development Corporation (IEDM), 08/01/2010-07/31/2011 (PI: **Yong Chen**, Co-PIs: Yue Wu, Gerhard Klimeck, Supriyo Datta), \$60K
- 12) *Graphene-based materials for solar energy applications*, Day & Associate LLC, 09/01/2010-08/31/2011 (PI: **Yong Chen**), \$15K
- 11) *Instrumentation for Parallel and Localized Coherent Optical Control of Ultracold Polar Molecules*, Defense University Research Instrumentation Program (DURIP) Award, Army Research Office (ARO), 08/01/2010-07/31/2011 (PI: **Yong Chen**, Co-PI: Daniel S. Elliott), \$160K
- 10) *Graphene-based thermal interface materials*, Cooling Technology Research Center (CTRC), Purdue University, 01/01/2010-12/31/2011 (PI: Xiulin Ruan, Co-PIs: **Yong Chen**, Tim Fisher), \$80K
- 9) *IBM Faculty Award*, IBM, 10/01/2009-09/30/2010 (PI: **Yong Chen**), \$30K
- 8) *Interaction of radiation with graphene based nanomaterials*, Young Investigator Award, Defense Threat Reduction Agency (DTRA) #HDTRA1-09-1-0047, 08/01/2009-07/31/2013 (PI: **Yong Chen**), \$400K
- 7) *ARI-MA: Graphene-based sensors for detecting special nuclear materials*, National Science Foundation (NSF) ECCS # 0833689, 09/01/2008-08/31/2009 and Department of Homeland Security (DHS) #2009-DN-077-ARI036-02, 09/01/2009-08/31/2013 (PI: **Yong Chen**, Co-PI: Igor Jovanovic/Penn State University), \$2M



6) *Nanoelectronics Research at Birck Nanotechnology Center*, Matching Fund from Indiana Economic Development Corporation (IEDM) to support Nanoelectronics Research Initiative (NRI)-Midwest Institute for Nanoelectronics Discovery (MIND), 09/01/2008-08/31/2010 (PI: Alan Rebar, Co-PIs: Gerhard Klimeck, Joerg Appenzeller, Peide Ye, Yong Chen), \$300K

5) *Thermal transport and thermal logic gates in graphene nanostructures*, project funded by Nanoelectronics Research Initiative (NRI) via Midwest Institute for Nanoelectronics Discovery (MIND, NERC contract #2008-NE-1806, Center PI: Alan Seabaugh), 09/01/2008-08/31/2011 (Project **PI: Yong Chen**, Co-PI: Zhigang Jiang/Geogia Tech), \$250K

4) *Quantum control of polar molecules for quantum information and quantum computing*, National Science Foundation (NSF) CCF #0829918, 09/01/2008-08/31/2011 (**PI: Yong Chen**, Co-PI: Daniel S. Elliott), \$320K

3) *Quantum gases with tunable interaction and disorder in optical lattices*, Defense University Research Instrumentation Program (DURIP) Award, Army Research Office (ARO) #W911NF-08-1-0265, 08/01/2008-07/31/2010 (**PI: Yong Chen**), \$150K

2) *Experimental studies of graphene: material properties and hydrogen adsorption*, Doctoral New Investigator Award, American Chemical Society PRF#48010-G10, 05/01/2008-04/30/2010 (**PI: Yong Chen**), \$50K

1) *NEMS fluid sensors based on suspended nanotubes and nanowires*, National Science Foundation (NSF) ECCS#0702766, 05/01/2007-04/30/2010 (PI: Jun Lou/Rice University, Co-PI: Yong Chen), \$300K

## **Publications**

(all publications & preprints at: <http://www.physics.purdue.edu/quantum/publications>)

Published or accepted journal papers include, for example:

10 Nature Physics/Materials/Electronics/Nanotechnology [including 2 invited reviews];  
8 Nature Communications;  
2 Science Advances;  
18 Physical Review Letters;  
23 Nano Letters; 3 ACS Nano  
4 Advanced Materials;  
27 Applied Physics Letters etc.

Total citations: >13,000 (ISI Web of Science); >19,000 (Google Scholar)  
H-index= 57 (Web of Science); 67 (Google scholar) as of 8/2024 [increase from H=6 in 2007 at a rate of >~3/year]

ISI/Web of Science Citation Profile (Researcher ID: K-7017-2012) [linked to ORCID: [orcid.org/0000-0002-7356-4179](https://orcid.org/0000-0002-7356-4179)]

Publications	Citing Articles	Times Cited	H-Index
224 Total From 1900 to 2024	11,084 Analyze Total 10,935 Analyze Without self-citations	13,272 Total 12,900 Without self-citations	59.25 Average per item 57 H-Index

Google Scholar Citation Profile:

<http://scholar.google.com/citations?user=9EBAemEAAAAJ>

Cited by	VIEW ALL	
	All	Since 2019
Citations	19617	8218
h-index	67	48
i10-index	180	137

Representative Research Achievements include [References listed on p.13-32]:

#### Two-dimensional semiconductors

- **Pentagonal 2D materials** --- first synthesis of a metastable pentagonal 2D materials (PdTe<sub>2</sub>, with pentagons as building blocks, and with a bandgap >1eV) using symmetry-assisted epitaxy [J196] (see also discussion of our work in: "News and Views", Nature Mater. 23, 1305 (2024))
- **Elemental ferroelectrics** --- demonstration of Te as a single-element ferroelectric [J195]

#### Two-dimensional magnets

- **Stacked/twisted (antiferro)magnets** --- realization of Moire magnetismwisted layered antiferromagnets (twisted double bilayer CrI<sub>3</sub>) [J180]; observation of exchange-bias like emergent interfacial ferromagnetism in stacked hetero-antiferromagnets (CrI<sub>3</sub>/CrCl<sub>3</sub>) [J175]

#### Topological insulators (TI) and related ---

- **Topological Josephson Junctions** --- Demonstration of topological transport in Superconductor(S)-Topological Insulator (TI)-S Josephson junctions [J156, J149];
- **Topological spintronics** --- discovered “**topological spin battery effect**”, suggesting current-induced nuclear *and* electronic spin polarizations with *exceptional long lifetime* in TIs (a rare experimental demonstration of “topological protection” in transport) [J131]; among the first to demonstrate characteristic **spin-helical current** (*current induced electron spin polarization*) in TI due to topological surface states [J104, J151], distinguished from contributions from other bulk-related states [J162];

- **Topological phase transition:** demonstrated thickness and magnetic field tuned TI-insulator-semimetal transitions (Dirac gap opening/closing) in TI thin films with tunable inter-surface hybridization [J153]
- **Half-integer Aharonov-Bohm effect:** demonstrated in 3D TI nanoribbons the half-integer Aharonov-Bohm effect, a unique transport fingerprint of 3D TIs [J112]
- **Bulk-insulating topological insulators (TI) exhibiting topological transport and half-integer quantum Hall effect** --- demonstrated record-quality “true” 3D TIs free from bulk conduction, realizing the sought-after half-integer quantum Hall effect due to topological surface state (TSS) Dirac fermions, a key topological transport fingerprint unique to 3D TIs [J93, cited>300 times] [J115];

#### **Graphene and related materials ---**

- **CVD graphene** --- pioneering studies of synthesizing high-quality graphene using chemical vapor deposition (CVD) and material/electronic properties of such CVD graphene [J17, cited>1500 times][J23, cited>100 times][J24, cited >200 times] (see also discussion of our work in: "Search and Discovery", Phys. Today 63 (8), 15, (2010); "News and Views", Nature Nano. 4, 212, (2009); news.bbc.co.uk/2/hi/science/nature/7827148.stm; Nobel physics lecture'2010 etc.]
- **Graphene single crystals and grain boundaries** --- pioneering studies of (CVD) graphene single crystals and grain boundaries, including the first measurement of electronic transport across a single grain boundary in graphene [J35, cited>1400 times] and first STM image of atomic structure and electronic scattering at such single crystal *graphene edges* [J42, cited 100 times];
- **Graphene-based optoelectronics and plasmonics:** demonstrated “graphene phototransistors” (optically-actuated graphene field effect transistors) for potential applications in radiation/photo detection [J132]; application of CVD graphene for tunable plasmonics [J61, cited>200 times] [J78, cited>100 times] [J127].
- **Twisted bilayer graphene:** CVD synthesis of twisted bilayer graphene (tBLG) and observation of novel low-energy Raman modes [J72, cited>100 times]; elucidation of electron-phonon coupling in tBLG by gate-tunable Raman [J96] and transport measurements [J143];
- **Irradiated graphene:** creation of artificially-disordered graphene (through irradiation) and studies of rad-hardness of graphene devices [J32, cited>100 times] [J34, cited >100 times].
- **Graphene thermotronics:** pioneering computational study and design of thermal transport and control in graphene nanoribbons (revealing, e.g., chirality and direction dependent thermal transport) [J21, cited >800 times] [J31, cite >100 times]
- **Graphene composites and thermal interfaces:** development of graphene/graphene-oxide based composites and thermal interface materials [J82, J110, J129]

#### **Quantum Hall physics and 2D electrons ---**

- **“bulk quantum Hall effect”** --- demonstrated a novel “(3D) bulk quantum Hall effect” due to many parallel 2D electrons in a layered conductor (heavily doped Bi<sub>2</sub>Se<sub>3</sub>) [J54, cited > 100 times]
- **New solid phases of 2D electrons:** discovered new types of solid phases (Wigner crystals) of 2D electrons formed by quasiparticles around integer quantum Hall states

[J3, cited >100 times] and by fractionally-charged particles around  $1/3$  fractional quantum Hall state [J29], and two other different solid phases in higher magnetic fields [J7], all measured with microwave spectroscopy;

- **Quantum nature and melting of Wigner crystals:** demonstrated the melting of the magnetic-field Wigner crystal phase in the quantum Hall system is controlled by quantum correlation (wavefunction overlap) between 2D electrons [J11];

#### **Cold atom physics and quantum chemistry ---**

- **“Atomtronic Spintronics”:** one of the few labs to realize a **spin-orbit-coupled (SOC) Bose-Einstein condensate (BEC)**, demonstrated *spin-dependent quantum transport* and **matter-wave beam splitter** in momentum space, realizing tunable and spin-resolved Landau-Zener tunneling [J89, cited >100 times] and Landau-Zener-Stueckelberg interferometry [J130]; realized a “quantum gas collider” between spinor BECs by performing a quantum quench in a SOC BEC, enabling a “quantum simulator” to study spin transport in interacting SOC systems [J148].
- Demonstration of a synthetic Hall cylinder (in curved space) and symmetry protected topological band crossing, measured via quantum transport (mimicking Mobius strip in momentum space) [J169]
- Realized a disorder-induced superfluid-insulator transition in a Bose-Einstein condensate (BEC) and tracked the evolution of phase coherence cross the transition [J13, cited >100 times]
- **Quantum chemistry interferometer:** demonstrated (in photoassociation of cold atoms) a new approach for quantum control of chemical reactions by preparing reactants in quantum superposition states, with interference between multiple reaction pathways [J145]
- Among the first laser spectroscopy of LiRb molecules [J40] and synthesized **first LiRb cold molecules** using photoassociation (and demonstrating highest, near-unity photoassociation rates in bi-alkali molecules) [J81, J76]

## Top cited papers by Chen (each cited>300 times (Google Scholar, as of 04/2024))

TITLE	CITED BY	YEAR
<a href="#">Graphene segregated on Ni surfaces and transferred to insulators</a> Q Yu, J Lian, S Siriponglert, H Li, YP Chen, SS Pei Applied Physics Letters 93 (11), 113103	1811	2008
<a href="#">Control and characterization of individual grains and grain boundaries in graphene grown by chemical vapour deposition</a> Q Yu, LA Jauregui, W Wu, R Colby, J Tian, Z Su, H Cao, Z Liu, D Pandey, ... Nature materials 10 (6), 443-449	1712	2011
<a href="#">Thermal conductivity and thermal rectification in graphene nanoribbons: a molecular dynamics study</a> J Hu, X Ruan, YP Chen Nano Letters 9 (7), 2730-2735	926	2009
<a href="#">Raman spectroscopy of graphene and related materials</a> I Childres, LA Jauregui, W Park, H Cao, YP Chen New developments in photon and materials research 1, 1-20	689	2013
<a href="#">Polycrystalline graphene and other two-dimensional materials</a> OV Yazyev, YP Chen Nature nanotechnology 9 (10), 755-767	523	2014
<a href="#">Observation of topological surface state quantum Hall effect in an intrinsic three-dimensional topological insulator</a> Y Xu, I Miotkowski, C Liu, J Tian, H Nam, N Alidoust, J Hu, CK Shih, ... Nature Physics 10 (12), 956-963	475	2014
<a href="#">Electrically tunable damping of plasmonic resonances with graphene</a> NK Emani, TF Chung, X Ni, AV Kildishev, YP Chen, A Boltasseva Nano letters 12 (10), 5202-5206	364	2012
<a href="#">Extreme Tunability of Interactions in a Li 7 Bose-Einstein Condensate</a> SE Pollack, D Dries, M Junker, YP Chen, TA Corcovilos, RG Hulet Physical review letters 102 (9), 090402	352	2009
<a href="#">Rational synthesis of ultrathin n-type Bi2Te3 nanowires with enhanced thermoelectric properties</a> G Zhang, B Kirk, LA Jauregui, H Yang, X Xu, YP Chen, Y Wu Nano letters 12 (1), 56-60	333	2011
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### **Book Chapters:**

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## **Patents**

Vladimir M. Shalaev, Pramey Upadhyaya, Abhishek Bharatbhai Solanki, Simeon I. Bogdanov, Yong P. Chen, Mohammad Mushfiquur Rahman, Avinash Rustagi, Nanodevice, "method of making the same, and method of using the same" (a patent on a nanodevice that includes a ferroelectric substrate, a ferromagnetic material, and a nanodiamond including nitrogen-vacancy (NV) spins to sense electric fields), US Patent number 11802921 (2023) <https://patents.justia.com/patent/11802921>

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## **Provisional Patent Filed:**

"Epitaxial Synthesis of Graphene on Sapphire Using Chemical Vapor Deposition", with Hao Li (University of Missouri) and Qingkai Yu (University of Houston) (03/2008)

## **Media Interviews/Reports/News Story on Research** (selected)

Work on 2D electron Wigner crystal featured in *Bell-labs cond-mat journal club*, May 2006

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Work on CVD graphene featured in the *News and Views* story in *Nature Nanotechnology*, April 2009.

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Work on nonlinear thermal transport in graphene selected as *Research Highlights* in *Nature Nanotechnology*, October 2011

Work on nano-machining of graphene mentioned in a “*News from Field*” on *National Science Foundation* (NSF) Website, August 2012

Work on graphene based thermal interface materials selected in “*Industry-Nominated Technology Breakthroughs of NSF Industry/University Cooperative Research Centers*” 2012

Work on cold molecules reported on Purdue News, Science Daily, Physorg etc., 2014

Work on topological insulators reported on Purdue News, Science Daily, Physorg etc. and Nanotechweb, 2014

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Work on graphene photodetectors enhanced by fractal golden 'snowflake' reported on Phys.Org etc., Jan. 2017, and featured on the cover of Feb. 2017 Issue of APS News (<https://www.aps.org/publications/apsnews/201702/research-news.cfm>)

Work on graphene phototransistors reported on *IEEE Spectrum*, Purdue News, phys.org etc. Apr. 2017

Work on spin battery reported on Purdue News, phys.org, nextbigfuture.com etc. Apr.2017

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Work on synthetic Hall cylinder (quantum matter in curved space) reported on Purdue news, phys.org etc., Feb 2022

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Work on pentagonal 2D materials featured in *News and Views*, Nature Materials 23, 1305 (2024)

### **Selected current/recent research collaborators/co-authors (past 4 years)**

<b>Collaborator</b>	<b>Institution [Department]</b>	<b>Area of Collaboration</b>
Arnab Banerjee	Purdue [Physics]	Quantum spin liquid
Alexandra Boltasseva	Purdue [ECE]	Plasmonics/nanophotonics
Rudro Biswas	Purdue [Physics]	Condensed Matter Theory
Zhihong Chen	Purdue [ECE]	Nano Devices
Gary Cheng	Purdue [Industrial Engineering]	Nanomaterials/fabrication
Haiping Cheng	Univ. of Florida [Physics]	Materials/device modeling
Supriyo Datta	Purdue [ECE]	Spin transport/device modeling
Michael Flatte	Univ. Iowa [Physics]	Spintronics/theory
M. Zahid Hasan	Princeton Univ. [Physics]	ARPES (angle resolved photoemission spectr.)
Rui He	Univ. Northern Iowa [Physics]	Raman spectroscopy
Han Htoon	Los Alamos National Lab	Optical measurements of 2D materials, quantum emitters
Philip Hofmann	Aarhus University [Physics]	ARPES
Libai Huang	Purdue [Chemistry]	Ultrafast/pump-probe measurements
Yucheng Jiang	Suzhou Sci. Tech. Univ.	Nanomaterials
Sabre Kais	Purdue [Chem]	Quantum computing
Alexander Kildishev	Purdue [ECE]	Nanophotonics/modeling
Young Kim	Purdue [Biomedical Eng.]	Biophotonics
An-ping Li	Oak Ridge National Lab	Scanning probe
Tong-cang Li	Purdue Univ. [Physics/ECE]	Color centers, quantum photonics
Yuli Lyanda-Geller	Purdue [Physics]	Condensed matter theory
David Mandrus	Univ. Tennessee [Materials Sci.]	Quantum materials crystals
Zhiqiang Mao	Penn State Univ. [Physics]	Quantum materials crystals

Robert McDermott	Univ. Wisconsin [Physics]	Superconductor devices
Shigemi Mizukami	Tohoku University [AIMR]	Spintronics/magnetics
David Newell	NIST	Metrology
Chunlei Qu	Stevens Institute of Technology	Cold atoms physics theory
Leonid Rokhinson	Purdue [Physics]	Low temperature transport; nano/Josephson devices
Vladimir Shalaev	Purdue [ECE]	Plasmonics/nanophotonics
Katsumi Tanigaki	Tohoku Univ. [Physics/AIMR]	Quantum materials
Takashi Taniguchi	NIMS, Japan	h-BN (boron nitride)
Pramey Upadhyaya	Purdue [ECE]	Spintronics theory
Søren Ulstrup	Aarhus Univ. [Phys]	(nano/micro)ARPES
Dieter Weiss	Regensburg Univ. [Phys]	Quantum transport
Jukka Väyrynen	Purdue Univ. [Phys]	Condensed matter theory
Xianfan Xu	Purdue [Mechanical Eng.]	Thermal transport/optical measurements
Qi-kun Xue & Xu-cun Ma	Tsinghua Univ. [Physics]	MBE/topological insulators
Chuan-wei Zhang	Univ. Texas at Dallas [Physics]	Cold atoms physics theory
Qi Zhou	Purdue [Physics]	Cold atoms physics theory

## **Presentations**

### **Invited Conferences Talks:**

[159] “Introduction to Quantum Materials”, Tutorial at Quantum Science Technology and Engineering at Purdue (QSTEP) Workshop, Purdue University, West Lafayette, IN (10/13/2024)

[158] “(Magnetic) Sensing with 2D/vdW quantum materials – from electrical to optical”, tutorial given at Workshop on Ultrasensitive Biomagnetometers with Macro to Nano Resolution (BIO-MAG), Copenhagen, Denmark (09/24/2024)

[157] “Light-matter interactions in spintronic Quantum Matters”, NSF NEXUS User Workshop, held at Ohio State University, Columbus Ohio (07/23/2024)

[156] “In-operando spectroscopy and microscopy on twisted 2D materials: from graphene to magnets”, Attocube 2D Materials Conference, Munich, Germany (06/05/2024)

[155] “Quantum Materials meet Quantum Information”, Quantum Campus Aarhus kick-off symposium, Aarhus University, Aarhus, Denmark (05/23/2024)

[154] “Probing quantum magnets with spin-sensitive transport and devices”, Workshop on “Progress in 2D Kitaev Materials”, Washington University at St. Louis, St. Louis, Missouri, USA (05/15/2024)

[153] “How to measure and use spintronic quantum materials: from topological insulators

to quantum magnets”, DOE Quantum Science Center (QSC) Summer School, Purdue University, West Lafayette, IN (04/30/2024)

[152] “Quantum Materials/Matters for Quantum Information/Technologies”, NSF Workshop on Post-Quantum AI, Indianapolis (04/01/2024)

[151] “Quantum sensing: from materials to universe”, Frontiers Research in DUO Symposium (online), Tohoku University (3/25/2024)

[150] “Topological Superconductors: from materials/physics to devices”, Quantum Science Center Device Workshop, online (01/17/2024)

[149] “2D/topological quantum materials, heterostructures and devices: towards in-operando microscopy and spectroscopy”, ARPES@ASTRID Workshop, Aarhus University, Denmark, 12-12-2023

[148] “Multimodal characterizations of 2D/topological quantum materials and devices: towards in-operando microscopy and spectroscopy”, The 13<sup>th</sup> International Conference on Advanced Materials and Devices (ICAMD) 2023- Session “Recent Progress in Extreme Quantum Matter and Functionality”, Jeju Island, Korea (12/05/2023)

[147] “Quantum Materials meets Spintronics”, The 7<sup>th</sup> Symposium for Core Research Clusters for Materials Science and Spintronics, Tohoku University, Sendai, Japan (11/29/2023)

[146] Advanced Institute for Materials Research (AIMR) Workshop, Tohoku University, Sendai, Japan (11/27/2023)

[145] “Van der Waals Magnets and Heterostructures: platforms to realize and probe novel magnetism”, MANA International Symposium, NIMS, Tsukuba, Japan (11/09/2023)

[144] “Quantum dynamics and quantum transport in a spintronic Bose-Einstein condensate in synthetic spaces”, Workshop on Criticality, Dynamics, and Nonequilibrium Behavior in Quantum Systems, Évora, Portugal (10/03/2023)

[143] “Spintronic Quantum Materials and Hybrids”, Purdue-India Quantum workshop, online, 07/14/2023

[142] “Boron Nitride (h-BN): A Two-dimensional Material for Quantum Technologies”, Special Session “Quantum Chip”, PIERS (Photonics and Electromagnetics Research Symposium), Prague, Czech (07/2023)

[141] “Spintronic quantum matter”, Molecular Quantum Information Discussions, Copenhagen, 06/30/2023

- [140] “Emerging quantum materials for (bio)magnetometry(?) – from topological materials to defects in insulators”, Workshop on Ultrasensitive Biomagnetometers with Macro to Nano Resolution (BIO-MAG), Copenhagen, 06/21/2023
- [139] “Atomic BEC as platform for quantum transport, quantum simulation and quantum chemistry”, Quantum Science Center (QSC) Summer School, held at Purdue University, West Lafayette, USA (04/29/2023)
- [137] “Emerging platforms for topological superconductor qubits”, Workshop “Emerging platforms for quantum computing”, Tohoku University, Sendai, Japan (04/10/2023)
- [136] “Emerging magnetism in stacked vdW heterostructures between layered antiferromagnets”, in invited session “Novel Emergent Magnetism in Moiré Superlattices”, American Physical Society (APS) March Meeting 2023, Las Vegas, 03/06/2023
- [135] “Methods and Progresses for Manipulating and Measuring Topological Superconductor Materials & Devices”, kick-off meeting and workshop for NSF ExpandQISE project “Developing Research and Education Programs in Quantum Information Science and Engineering with Research on Locally Tunable 2D Topological Superconductors” at Univ. of Wyoming, 02/10/2023
- [134] “Optical Characterizations of twisted 2D materials”, Physical Quantum Electronics (PQE) 2023, Snowbird, Utah, USA (01/11/2023)
- [133] “Pursuing Topological Superconductivity in Topological Insulator/Superconductor Hybrids”, Pioneer Symposium “Topological superconductivity and correlated topological phases”, KPS (Korean Physical Society) 70th Anniversary and 2022 Fall Meeting (talk given online), Busan, Korea, 10/20/2022
- [132] “Topological Insulator based quantum devices”, DOE Center for Integrated Nanotechnologies (CINT) user conference (online, 09/20/2022)
- [131] “Transport Probes of (Candidate) Non-Abelian-Anyon Materials”, 1st International Conference on Physics under Synergetic Extreme Conditions held jointly with the Summer School of SECUF (SECUF-2022), organized by the Synergetic Extreme Condition User Facility (SECUF), Institute of Physics, Chinese Academy of Sciences (online, 07/19/2022)
- [130] “Charge Density Waves (CDW) & Topological Quantum Materials”, 9th International Charge Density Meeting (ICDM9), held at Aarhus Univ., Aarhus, Denmark (06/13/2022)
- [129] “Emerging Materials for Quantum Information Sciences”, Quantum Science Center (QSC) Summer School, held at Purdue University, West Lafayette, USA (05/08/2022)

- [128] “Spintronic quantum material hybrids: from nonlinear transport to noncollinear magnetism”, NORDITA program “Light-Matter Interaction in Two-Dimensional Nonlinear Materials”, Stockholm, Sweden (04/13/2022)
- [127] “Three questions on Quantum Materials”, Villum Investigators Gathering, Klitgården, Skagen, Denmark (11/9/2021)
- [126] “Quantum materials”, iMAT (Aarhus Centre for Integrated Materials) review meeting, Aarhus University, Denmark (11/1/2021)
- [125] “Quantum sensing, from materials to universe”, Frontier Research in DUO (FriDUO) Symposium, Tohoku University, Japan (online, 09/28/2021)
- [124] “Van der Waals (vdW/2D) materials for spintronics and quantum technologies”, Danish Physics Society Annual Meeting, Middelfart, Denmark (06/21/2021)
- [123] “Two-dimensional (2D)/Van der Waals (vdW) quantum materials”, SMART Lighthouse Summer School/Workshop, Sandbjerg, Sønderborg, Denmark (06/15/2021)
- [122] “Atomtronic Spintronics: from Quantum Chemistry to Quantum Transport”, Online School and Discussion Meeting on Trapped Atoms, Ions and Molecules, organized by International Center for Theoretical Sciences, Tata Institute for Fundamental Research, India (05/21/2021)
- [121] “Two-dimensional materials for biosensing applications”, AIMR-Fraunhofer ENAS Institute Joint Workshop (online), 04/22/2021
- [120] “Exploration of quantum AI for COVID diagnosis”, AIMR-IFS-ISM Joint Workshop, online, 04/21/2021
- [119] “Van der Waals magnets based heterostructures --- platforms to engineer and probe novel magnetism”, American Physical Society (APS) March Meeting, (online) 03/28/2021
- [118] “New opportunities for surface science and sensor devices with two-dimensional materials and hybrids”, iNano International Symposium, Aarhus University, Denmark (online, 01/13/2021)
- [117] “Photocurrent as probe for Topological Semimetals”, Workshop for Kakenhi New Science Program, Japan -- 2nd Meeting of Discrete Geometric Analysis for Materials Design (online, 01/09/2021)
- [116] “Recent Experimental Studies on 2D/topological material hybrids”, mini-workshop held by Los Alamos National Laboratory (online, 12/21/2020)
- [115] Topological and 2D materials for/using spintronic and quantum devices, OIST-

Tohoku Joint Quantum Meeting (online, 11/24/2020)

[114] “How to measure “topology” in topological/quantum materials (using optical/optoelectronic methods)”, Workshop for Kakenhi New Science Program, Japan -- 1st Meeting of Discrete Geometric Analysis for Materials Design (online, 06/17/2020)

[113] “Quantum Measurements of Quantum Matter”, 2<sup>nd</sup> Purdue-IU joint workshop on quantum science, Indiana Univ. Bloomington, IN (03/09/2020)

[112] “Purdue Quantum Science and Engineering Institute”, Northwest Quantum Nexus Workshop – “Quantum Computing, Sensing, and Simulation with Cold Atoms”, Washington State Univ., Pullman WA (02/20/2020)

[111] “Hybrid Quantum Materials and Devices -- a case study: Topological Josephson Junctions”, Quantum Community Denmark Conference, Aarhus Institute for Advanced Studies (AIAS), Aarhus, Denmark (01/09/2020)

[110] “Quantum Matters for sensing applications”, Quantum-life Workshop, Novo Nordisk Foundation, Hellerup, Denmark (11/06/2019)

[109] “Quantum Materials for sensing applications”, Quantum Technologies and Sensing Workshop, IEEE Nuclear Science Symposium (NSS) and Medical-Imaging Conference (MIC), Manchester, UK (10/27/2019)

[108] “Spin-helical Particles: An Enabling Platform for Quantum Matter and Quantum Technologies”, 66th AVS (American Vacuum Society) International Symposium, Columbus, Ohio (10/22/2019)

[107] “Topological protection in topological insulator based spintronic and Josephson devices”, SPP1666 DFG Workshop on Topological Insulators, Potsdam, Germany (09/09/2019)

[106] “Spin-orbit-coupled Bose-Einstein Condensate as playground to explore quantum collision and chemistry”, 24th European Conference on Few-Body Problems in Physics, Surrey, UK (09/06/2019)

[105] “Manipulating Dirac Cones - from *twisted* bilayer graphene to *hybridized* topological insulator”, CarbonHagen 2019, Copenhagen, Denmark (08/22/2019)

[104] “Towards Topological Superconductors and Topological Semimetals from Topological Insulators”, Quantum Matter Workgroup, Los Alamos National Lab., Los Alamos, USA (07/31/2019)

[103] “Topological Josephson Junctions”, AIMR Workshop “quantum materials and spintronics --- spin, topology and superconductivity”, Sendai, Japan (07/12/2019)

- [102] “Realization of a symmetry protected bosonic topological state in a synthetic space”, AIMR Workshop “quantum materials and spintronics --- spin, topology and superconductivity”, Sendai, Japan (07/11/2019)
- [101] “Topological insulator based quantum devices: from spin batteries to Josephson junctions”, Workshop on topological quantum information sciences, held in Argonne National Lab, Argonne, IL (05/08/2019)
- [100] “New “spins” in quantum matter and technologies”, International Symposium on Quantum Science and Technology, Purdue University, West Lafayette, IN (04/23/2019)
- [99] New “spins” in quantum technologies, Purdue-IU Workshop on Quantum Science and Technologies, Purdue Univ. (02/26/2019)
- [98] New “spins” in quantum technologies, Quantum Materials Workshop, Oak Ridge National Lab. (02/18/2019)
- [97] Topological Quantum Matter (3 lectures), Workshop on Topological Quantum Matter, held in University of Tokyo, Tokyo, Japan (02/10-12, 2019)
- [96] “Controlling Thermal Transport with Topologically Guided Heat Carriers”, NSF EFRI Review, San Diego (10/18/2018)
- [95] “What Are Unique Transport Signatures of Topological Insulators”, International Union of Materials Research Society – International Conference on Electronic Materials 2018 (IUMRS-ICEM 2018), Daejeon, South Korea, 08/25/2018
- [94] “Quantum+ Technologies Research at Purdue Quantum Center”, US Army Netcom Briefing Workshop on Quantum Technologies, Siesta Vista, Arizona (04/18/2018)
- [93] “Field effect photoconductivity in graphene on undoped semiconductor substrates” (talk presented by PhD student T-F. Chung), SPIE Micro- and Nanotechnology Sensors, Systems, and Applications, Ultrafast Bandgap Photonics Conference, Orlando, FL, (04/18/2018)
- [92] “What are topological insulators good for?” (given via video conference), Symposium “highlights in condensed matter physics”, Ulm, Germany (04/12/2018)
- [91] “Topological Insulator based Josephson Junctions: a platform to probe topological superconductivity”, Quantum Materials Symposium (QMS 2018), Muju, South Korea, 02/26-03/01/2018
- [90] “Topological quantum transport and phase transitions– from topological insulators to semimetals and superconductors”, AIMR (Advanced Institute for Materials Research) International Symposium, part of Kick-off Symposium for World Leading Research

Centers in Materials Science and Spintronics, Tohoku University, Sendai, Japan,  
2/21/2018

[89] “Spintronics meets Topological Insulators & other quantum materials”, Tohoku-Purdue Joint Spintronics Workshop, Sendai, Japan, 2/18/2018

[88] “Driving topological transitions in topological insulators by manipulating surface Dirac cones”, BIRS Workshop, "Relativistic Fermions and Nodal Semimetals from Topology", Banff International Research Station for Mathematical Innovation and Discovery (BIRS), Banff, Canada (02/11-02/16/2018)

[87] “Current induced electronic and nuclear spin polarizations in topological insulators”, Symposium on *Magnetic Frontiers: Topological Insulators and outlook for technology*, Nancy, France (09/21/2017)

[86] “Observation of current-induced, long-lived persistent spin polarization in a topological insulator: a rechargeable spin battery”, Spintronics X Symposium, SPIE Optics & Photonics Conference, San Diego, CA, 8/10/2017

[85] “How to measure topology in transport?”, Mini Workshop Mathematical Aspects of Topological Phases of Matter and Quantum Computing, held at Tohoku University, Sendai, Japan (07/25/2017)

[84] “Quantum transport in 3D topological insulators under high magnetic fields”, 2017 Workshop on Novel Phenomena in High Magnetic Fields, High Magnetic Field Laboratory (CHMFL) of the Chinese Academy of Science (CAS), Hefei, China , 06/04/2017

[83] “Raman Spectroscopy of Graphene-based Materials & beyond”, RamanFest 2017 Symposium, a conference on advanced and applied Raman spectroscopy organized by Horiba Inc., Purdue University (06/01/2017)

[82] “Quantum Coherent Transport in Atoms & Electrons”, Workshop on Coherence Effects in Physics and Chemistry, Purdue University (04/28/2017)

[81] “Charge, Spin and Thermal Transport in Topological Insulators: Some New Surprises”, The KITS 2017 Forum: New Horizons in Condensed Matter Physics, Inauguration Conference for Kavli Institute of Theoretical Sciences (KITS), Beijing (03/27/2017)

[80] “Topological insulators as electrically controlled sources of spin polarization”, International Symposium on Spintronics, Japan Society of Applied Physics Meeting, Niigata, Japan (09/15/2016)

[79] “Topological Insulators: Materials and Transport”, Symposium on Quantum Materials Synthesis (QMS), co-organized by Moore Foundation and Rutgers Univ., New



York (08/30/2016)

[78] “Probing and manipulating Dirac electrons in graphene and topological insulators”, Oak Ridge National Lab Center for Nanophase Materials Sciences (CNMS) User Meeting, Oak Ridge Tennessee (08/11/2016)

[77] “Magnetotransport in topological insulator nanowires: spin-helical Dirac fermions on a cylinder”, 22nd International Conference on High Magnetic Fields in Semiconductor Physics, Hokkaido, Japan (07/26/2016)

[76] “Magnetotransport in topological insulator nanowires: spin-helical Dirac fermions on a cylinder”, International Workshop on Nanomaterials and Nanodevices, Changchun, China (07/12/2016)

[75] “Dirac on Dirac” van der Waals heterostructures”, International Workshop on Nanomaterials and Nanodevices, Beijing, China (07/09/2016)

[74] “Quantum transport of topological surface states in bulk- insulating topological insulators”, NSF Frontiers of Condensed Matter Physics Workshop on Topological Phases of Matter, NSF, Arlington, VA (05/24/2016)

[73] “Electrically controlled spin polarization in topological insulators”, Workshop on “Topological Spintronic Devices”, organized by SRC C-SPIN Center, held at the University of Minnesota in Minneapolis, Minnesota, (5/12/2016)

[72] “Electronic Transport in Topological Insulators”, 2016 APS March Meeting, Baltimore (03/2016)

[71] “Dirac Fermion Quantum Hall Effects in Topological insulators”, 6<sup>th</sup> international workshop on Emergent Phenomena in Quantum Hall Systems (EPQHS-6), held in Tata Institute of Fundamental Research, Mumbai, India (01/07-01/09/2016)

[70] “Quantum Transport of Spin-helical Dirac Fermions in Topological Insulators”, International Symposium on Nanoscale Transport and Technology (ISNTT) 2015, NTT (Atsugi), Japan (11/2015)

[69] “Raman spectroscopy and microscopy of graphene and other nanomaterials”, Award talk at 2015 Masao Horiba Award Ceremony, held in University of Kyoto, Japan (10/16/2015)

[68] “Electrically generated spin polarization in topological insulators: where are the spins from?”, Topological Spintronics & Skyrmionics Workshop, Grenoble, France, (10/05/2015)

[67] “Transport Experiments in Topological Insulators”, Banff Workshop on “Strongly Interacting Topological Phases”, Banff International Research Station for Mathematical

Innovation and Discovery (BIRS), Banff, Canada (09/24/2015)

[66] “Topological insulators: from Dirac fermions to Majorana fermions”, 4<sup>th</sup> International Quantum Science Symposium, Waltham, MA (09/21/2015)

[65] “Lecture 1: Graphene; Lecture 2: Topological Insulators; Lecture 3: Other topics – thermoelectric and superconducting devices”, Instructor for ICQM (International Center for Quantum Materials) Summer School on 2D Materials, Beijing (07/2015)

[64] “Topological insulator for spintronics: Current Induced Spin Polarization”, International Workshop on Nanomaterials and Nanodevices, Hohhot, China (07/04/2015)

[63] “Topological Surface Transport of Spin-Helical Dirac Fermions in Topological Insulators”, Gordon Research Conference (GRC) “Topological and Correlated Matter”, Hong Kong (06/28-07/03/2015)

[62] “Thermoelectric transistors based on 2D materials”, CMOS Emerging Technologies Research Conference, Vancouver, Canada (05/20/2015)

[61] “Topological insulator energy efficient devices”, DARPA MesoDynamic Architectures (MESO) Review Meeting, Tyson Corner, VA (04/08/2015)

[60] “Topological insulator energy efficient devices”, DARPA MesoDynamic Architectures (MESO) Review Meeting, Monterrey, CA (08/19/2014)

[59] “Topological insulator devices and applications in spintronics (TBD)”, CMOS Emerging Technologies Symposium, Grenoble, France (07/08/2014)

[58] “Physics and applications of novel structures with CVD graphene: edges, grain boundaries, twisted bilayers, and hybrids” (Focus Session on Graphene), APS March Meeting, Denver, CO (03/2014)

[57] “The material science of graphene and beyond”, Tutorials for American Physical Society (APS) March Meeting, Denver, CO (03/2014)

[56] “Bose-Einstein condensates in synthetic gauge fields and spin-orbit coupling: transport and dynamics (TBD)”, Frontiers in Optics 2013/ Laser Science XXIX (the combined annual meeting of the Optical Society of America and the American Physical Society's Division of Laser Science), Orlando FL (10/06-10/10/2013)

[55] “Manipulation of spin-orbit coupled Bose-Einstein condensates (SOBEC) & Observation of Landau-Zener transitions”, 7<sup>th</sup> Cross-Strait and International Conference on Quantum Manipulation, Beijing, China (06/29/2013)

[54] “Thermal Transport in Graphene and Graphene-Based Composites”, Graphene/III-V Symposium, 223rd Electrochemical Society (ECS) Meeting, Toronto ON Canada

(05/2013) [invitation transferred to graduate student Jiuning Hu [G], who will present this talk]

[53] Material Research Society (MRS) Spring Meeting 2013, Symposium H “Nanoscale Thermoelectrics—Materials and Transport Phenomena - II”, San Francisco CA (04/2013)

[52] Material Research Society (MRS) Spring Meeting 2013, Symposium P “Graphene and Related Carbon Nanomaterials”, San Francisco CA (04/2013)

[51] 2013 EMN (Energy Materials Nanotechnology) West Meeting on Topological Insulators, Houston, TX (01/07-01/10/2013) [invitation transferred to postdoc Jifa Tian, who will present this talk]

[50] “Purdue Updates --- BEC, Gauge fields, spin-orbit coupling, and photo-association”, Midwestern Cold Atom Workshop (MCAW 2012), University of Illinois at Urbana-Champaign (11/03/2012) [talk given by graduate student Abraham Olson]

[49] “Graphene-semiconductor hybrid as radiation sensors and phototransistors”, Crystal & Graphene Science Symposium-2012-USA, Waltham, MA (09/05/2012)

[48] “Topological insulator energy efficient devices”, DARPA MesoDynamic Architectures (MESO) Review Meeting, San Diego, CA (08/21/2012)

[47] “Interaction of Radiation with Graphene-based Nanomaterials”, Defense Threat Reduction Agency (DTRA) review meeting, Springfield, VA (08/01/2012)

[46] “Graphene based radiation detectors”, Department of Homeland Security (DHS) Academic Research Initiative (ARI) Grantee’s Conference, Leesburg VA (07/23/2012)

[45] “Large scale transferrable graphene for device and sensing applications”, 2012 CMOS (Communications, Microsystems, Optoelectronics, Sensing) Emerging Technology Meeting, Vancouver, Canada (07/19/2012)

[44] “Graphene and Topological Insulator Based Transistors for Beyond Computing Applications”, Device Research Conference (DRC) 2012, State College, PA (06/18/2012)

[43] “Synthetic graphene: material properties and applications”, Virtual Conference on Nanoscale Science and Technology 2012, Chengdu, China (06/04/2012) [invitation transferred to graduate student Jiuning Hu, who presented this talk]

[42] “Graphene” (2 lectures), Canadian Institute for Advanced Research (CIFAR) Nanoelectronics Summer School 2012, McGill University, Montreal, Canada (05/23/2012) (lectures scheduled but not delivered due to canceled trip)

[41] “Graphene for Radiation Sensing and Rad-hard Electronics”, SPIE Defense Science Symposium (DSS), Focus Session on “Novel micro/nano approaches for radiation

sensors and sensing materials”, Baltimore, MD (04/23/2012)

[40] “Topological Insulator Coherent Energy-Efficient Devices”, SPIE Defense Science Symposium (DSS), Focus Session on Topological Insulator Devices, Baltimore, MD (04/23/2012)

[39] “Graphene-based materials for potential energy applications”, Symposium on Nanomaterials for Energy, Purdue University, IN (04/16/2012)

[38] International Conference and Workshop on Nanostructured Ceramics and other Nanomaterials, New Dehli, India (03/2012) [invited but declined]

[37] “Molecules and BEC at Purdue: An Update”, Midwestern Cold Atom Workshop (MCAW) -2011, Northwestern University (11/05/2011)

[36] “Charge and Spin Transport Experiments in Topological Insulator Materials”, Workshop on Topological aspects of quantum coherent states in new materials, University of Chicago. Chicago, IL (10/14/2011)

[35] “CVD Graphene: Electronic Properties and Applications”, International Workshop on Recent Progress in Graphene Research (RPGR) 2011, Suwon, Korea (10/06/2011)

[34] “Transport Experiments in Topological Insulator Materials”, Summer Program on “New Topological States of Quantum Matter”, Aspen Center for Physics, Aspen CO (08/17/2011)

[33] “Interaction of Radiation with Graphene Based Nanomaterials”, Defense Threat Reduction Agency review meeting, Springfield, VA (07/20/2011)

[32] “Topological Insulator Based Coherent Energy Devices”, DARPA MESO Program Review and Kickoff Meeting (07/07/2011)

[31] “Transport experiments in topological insulator  $\text{Bi}_2\text{Se}_3$ ”, International Workshop on Physics Driven by Spin-orbit Coupling in Transition Metal Compounds, Beijing, China (06/20/2011)

[30] “Graphene transistors: from rad-hardness to radiation detection”, SPIE Defense, Security, and Sensing Conference (DSS-2011), Orlando, FL (04/2011)

[29] “Graphene based radiation detectors”, NSF-DHS Academic Research Initiative (ARI) grantee conference, Washington DC (04/2011)

[28] “Structural and electronic properties of graphene grown by chemical vapor deposition (CVD)”, American Physical Society (APS) March Meeting, Dallas, TX (03/2011)

- [27] “CVD Graphene single crystal islands and grain boundaries”, 2010 Workshop on Innovative Devices and Systems (WINDS), Kohala, Hawaii (12/2010)
- [26] “Experiments on LiRb Molecules and cold Rb gases”, Midwest Cold Atom Workshop (MCAW)-2010, University of Michigan (11/2010)
- [25] “Electronic properties of chemical vapor deposited graphene”, American Vacuum Society (AVS) 57<sup>th</sup> International Symposium, Albuquerque, New Mexico (10/2010)
- [24] International Workshop on Quantum Coherence and Correlations in Condensed-matter and Cold-atom Systems, Evora, Portugal (10/2010) (trip canceled)
- [23] “Interaction of Radiation with Graphene-based Nanomaterials for Sensing Fissile Materials”, Defense Threat Reduction Agency (DTRA) Annual Technical Review Meeting, Springfield, Virginia (08/12/2010)
- [22] “Thermal Transport and Thermal Logic in Graphene Nanostructures”, Midwest Institute for Nanoelectronics and Discovery (MIND) review meeting, South Bend (Notre Dame), Indiana (08/10/2010)
- [21] “Thermal FET”, Nanoelectronics Research Initiative (NRI) Architecture & Device Benchmarking Workshop, Notre Dame, IN (08/09/2010)
- [20] “Graphene nanoelectronics and thermionics”, University Government Industry Micro/Nano (UGIM) Symposium, Purdue, IN (06/30/2010)
- [19] “Chemical vapor deposited graphene: material and electronic properties”, Electronic Materials Conference (EMC), Notre Dame, IN (06/2010)
- [18] “Thermal transport in graphene nanostructures”, Electrochemical Society (ECS) 217<sup>th</sup> Meeting, Vancouver, Canada (04/2010)
- [17] “Graphene sensors for detecting special nuclear materials”, NSF-DHS ARI grantee meeting on radiation detection of special nuclear materials, Washington DC (04/2010)
- [16] “Research on cold atoms and molecules: ultra-cold molecules and low dimensional atomic gases for quantum information and simulation”, 4<sup>th</sup> Midwestern Cold Atom Workshop, Chicago, Illinois (11/21/2009)
- [15] “Interaction of Radiation with Graphene-based Nanomaterials for Sensing Fissile Materials”, Defense Threat Reduction Agency (DTRA) Annual Technical Review Meeting, Springfield, Virginia (10/21/2009)
- [14] “Graphene: materials and physics of a unique 2D electron system”, Frontiers of Quantum Transport and Quantum Computation (FQTQC'09), Huangshan, China (09/05-09/08/2009)

- [13] “Thermal Transport and Thermal Circuits in Graphene Nanostructures”, NRI-Midwest Institute for Nanoelectronics and Discovery (MIND) review meeting, South Bend, Indiana (08/19/2009)
- [12] “Graphene-based functional devices: from macroelectronics to nanosensors”, Workshop on Graphene Electronics, Army Research Laboratory (ARL), Adelphi, MD (08/12-08/13/2009)
- [11] “Graphene: material, physics and devices”, 55<sup>th</sup> Midwest Solid State Conference, University of Iowa, Iowa City, Iowa (04/19/2009)
- [10] “Graphene sensors for detecting special nuclear materials”, NSF-DHS ARI grantee meeting on radiation detection of special nuclear materials, Washington DC (04/08/2009)
- [9] “Controlling interactions in cold atoms and molecules”, Third Midwestern Cold Atom Workshop, Argonne National Laboratory, Illinois (11/15/2008)
- [8] “Graphene thermal interface materials”, Cooling Technology Research Center (CTRC) Annual Meeting held at Purdue Univ. (10/29/2008)
- [7] International Workshop on “Correlations and Coherence in Quantum Matter”, Evora, Portugal (11/10-11/14/2008) (trip canceled)
- [6] Third International Symposium on Cold Atom Physics (ISCAP-III), Wuhan, China (07/10-07/12/2008) (trip canceled)
- [5] “Graphene Thermal Circuits”, Semiconductor Research Corporation (SRC) – Nanoelectronics Research Initiative (NRI) Kickoff Meeting for Midwest Institute for Nanoelectronics and Discovery (MIND), South Bend, Indiana (06/05/2008)
- [4] “Transport and Phase Coherence in a Disordered Bose-Einstein Condensate”, International Workshop “Conductor-Insulator Quantum Phase Transitions” (CIQPT), Columbus, Ohio (01/10/2008)
- [3] “Superfluid to Insulator Transition in a Disordered Bose-Einstein Condensate”, International Workshop “Bose-Einstein Condensates and Coherent Backscattering” (BECBS’07), Schloss Thurnau, Germany (09/10/2007)
- [2] “Microwave Spectroscopy of Wigner crystals in 2DES and Bilayer Systems: Many-body correlation in electronic quantum solids”, American Physical Society March Meeting, Denver, Colorado (03/09/2007)
- [1] “Probing Disorder Physics with a Bose-Einstein Condensate of Li-7 Atoms”, Interdisciplinary Workshop “Material Simulation Using Ultracold Atomic Gases”, Houston TX (09/15/2006)

### **Invited Seminars/Colloquia:**

[130] “Making and measuring quantum matters”, Institute for Basic Science, Daejeon, Korea (8/22/2024)

[129] “Emerging Materials for Quantum Technologies”, Quantum Research Institute (QRI)/Midwest Quantum Collaboratory (MQC) Seminar, University of Michigan, Ann Arbor, MI (11/02/2023)

[128] “Emerging Materials for Quantum Information Sciences”, MSNE (Materials Science and Nano Engineering) Department Seminar, Rice University, Houston, TX (10/05/2023)

[127] “Van der Waals Magnets based Heterostructures: platforms to engineer and probe novel magnetism”, Seminar at 2D materials Center, Aachen Univ, Aachen, Germany (07/04/2023)

[126] “New twists in magnetism”, Physics Colloquium, Univ. of North Carolina, Chapel Hill, NC, USA (04/03/2023)

[138] “Emerging materials for majoranas and non-Abelian anyons”, Nordic virtual condensed matter seminar series (03/31/2023)

[125] “Stories of Graphene and How it May Change Our Life”, guest lecture (online) for high school students in AOPE (Arts of Physics Education) program (1/22/2023)

[124] “New spins in 2D materials”, Seminar at Dept. of Physics, Technical University of Denmark (DTU), Denmark, 12/09/2022

[123] “Emerging Materials and Devices for Quantum Information Science (QIS)”, Inauguration lecture, Dept. of Physics and Astronomy, Aarhus University (06/20/2022)

[122] “Making Quantum Matter”, Herbert Newby McCoy Award Distinguished Lecture, Purdue University (online, 11/19/2021)

[121] “Quantum sensing with hybrid quantum materials”, Center for Complex Quantum Systems (CCQ) Colloquium, Aarhus University (10/07/2021)

[120] “Using Josephson Junctions to Measure Topology”, Condensed Matter Physics Seminar, Univ. California at San Diego (online, 06/09/2021)

[119] “New opportunities for surface science and sensor devices with two-dimensional materials and hybrids”, Seminar at Institute of Functional Nano and Soft Materials, Suzhou University, Suzhou, China (01/07/2021)

- [118] Basic Introduction to Quantum Science and Technology, Lecture at Jinan University, Zhuhai, China (12/03/2020)
- [117] “Spin-helical Particles: An Enabling Platform for Quantum Matter and Quantum Technologies”, Physics Colloquium, Washington State Univ. (02/21/2020)
- [116] “Spin-helical Particles: An Enabling Platform for Quantum Matter and Quantum Technologies”, Center for Quantum Research and Technology (CQRT) Seminar, Univ. of Oklahoma (12/5/2019)
- [115] “Spin-helical Particles: An Enabling Platform for Quantum Matter and Quantum Technologies”, Seminar at Fermi National Lab (10/30/2019)
- [114] “Quantum materials for sensing applications”, ECE (Electrical and Computer Engineering) Seminar, Texas Tech University (10/04/2019)
- [113] “Optically synthetic spin-helical particles: an enabling platform for colliding, reacting and engineering novel quantum matters”, Physics Colloquium, Penn State University (09/19/2019)
- [112] “Topological protected quantum devices: from spin batteries to Josephson Junctions”, CAMP (Condensed matter and Atomic/molecular physics) seminar, Penn State University (09/18/2019)
- [111] “Quantum synthesis and quantum transport in an optically dressed atomic BEC”, Quantum Optics Seminar, University of Copenhagen, Denmark (08/23/2019)
- [110] “Topological Josephson Junctions and Topological Superconductivity --- experimental studies of topological insulator/superconductor hybrid quantum devices”, Seminar, RIKEN, Japan (07/08/2019)
- [109] “Topological insulator based quantum devices: spin batteries and Josephson Junctions”, Seminar at Center for Quantum Devices, Univ. of Copenhagen, Denmark (05/03/2019)
- [108] “Spin-helical particles: an enabling platform for quantum matter and quantum technologies”, Physics Colloquium, University of Texas at Dallas (04/12/2019)
- [107] “Spintronic” Quantum Transport, Chemistry and Interferometry in an atomic BEC, AMO Physics Seminar, University of Michigan (03/19/2019)
- [106] New “spins” in quantum technologies, Colloquium, Oak Ridge National Laboratory (02/18/2019)
- [105] “Hybrid Quantum Materials”, Villum Fonden, Copenhagen, Denmark (02/05/2019)



- [104] Colloquium, “Three new materials paradigms for solid state electronics”, Paul-Drude-Institute for Solid State Electronics, Berlin, Germany (01/14/2019)
- [103] “How to measure and use topology in electronic transport and devices”, Physics Colloquium, Emory University, Atlanta, 10/23/2018
- [102] “Quantum Matter Interferometry in Synthetic Spaces”, Physics Colloquium, Georgia Tech, Atlanta, 10/22/2018
- [101] “How to measure and use ‘topology’ in electronic transport and devices”, Physics Colloquium, Iowa State University, 09/24/2018
- [100] “Surface sciences and chemical processes with optical and scanning probes: some case studies”, Seminar at KAIST (Korea Advanced Institute of Science and Technology), Daejeon, South Korea, 08/23/2018
- [99] “What are unique and useful about topological insulators?”, Physics Colloquium, University of Regensburg, Germany (07/04/2018)
- [98] “Two-pathway interference measurements in quantum matters: from quantum transport to quantum chemistry”, Zhong Guan Cun Forum for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences (06/15/2018)
- [97] “How to engineer, measure and use topological quantum matter – with new spins and surprises”, Physics Colloquium, University of Waterloo, Canada (05/08/2018)
- [96] “Novel two-dimensional (2D) electron systems in topological and 2D materials: new playground for physics and devices”, Physics Seminar, University of Vienna, Austria (03/01/2018)
- [95] “Topological and 2D materials: new playground for physics and devices”, Physics Colloquium, Carnegie Mellon University, Pittsburgh, PA (11/20/2017)
- [94] “Topological and two-dimensional materials: new playground for physics and devices”, Ole Roemer Colloquium, Department of Physics and Astronomy, Aarhus University, Denmark (10/09/2017)
- [93] “Topological and 2D materials for electronic and nuclear spintronics”, G-Spin Seminar, Tohoku University, 07/21/2017
- [92] “Novel two-dimensional (2D) electron systems in topological and 2D materials: new playground for physics and devices”, Joint AIMR-IMR-TopoMat Seminar, Tohoku University, 07/18/2017
- [91] “What are unique charge and spin transport signatures of 3D topological insulators?”, RIKEN Seminar, RIKEN, Wako, Saitama, Japan (07/14/2017)

- [90] “Two-dimensional crystals: building blocks for new materials and sensing/energy applications”, Seminar at NIMS (National Institute for Materials Science), Tsukuba, Japan (06/29/2017)
- [89] “Quantum transport in a spin-orbit coupled Bose-Einstein Condensate”, AMO Physics Seminar, Rice University (05/26/2017)
- [87] “Topological and 2D materials: new playground for physics and devices”, Physics Colloquium, University of California at San Diego (01/26/2017)
- [86] “Stacking up new materials”, Joint Seminar in Department of Chemical and Biochemical engineering and Department of Physics, Hong Kong University of Science and Technology, Hong Kong (12/16/2016)
- [85] “Quantum dynamics and transport in an atomic Bose-Einstein condensates with Raman-induced synthetic band structures and spin-orbit-coupling”, AMO Physics Seminar, Northwestern University, Chicago (12/12/2016)
- [84] “Electronic transport in topological insulators”, Condensed matter physics seminar, Texas A&M University (11/11/2016)
- [83] “Electronic transport in topological insulators”, Condensed matter physics seminar, Michigan State University (10/10/2016)
- [82] “Optically synthetic quantum matter: from new molecules to novel condensates”, AMO Physics Seminar, University of California at Berkeley (05/04/2016)
- [81] “Updates on transport experiments in topological insulators”, Condensed Matter Physics Seminar, University of Illinois, Urbana (04/22/2016)
- [80] “Topological insulators: the more insulating, the better conduction?”, Physics Colloquium, Virginia Tech (04/01/2016)
- [79] “What are unique “topological” electronic transport signatures in topological insulators?”, Dahlem Center for Complex Quantum System Colloquium, Freie Universität Berlin (Fu-Berlin), Berlin, Germany (02/16/2016)
- [78] “Electronic transport in topological insulators”, Condensed Matter Physics Seminar, Carnegie Mellon University (2/11/2016)
- [77] “Topological surface electronic transport in topological insulators”, Condensed Matter Physics Seminar, UCLA (01/27/2016)
- [76] “What are topological insulators good for?”, RQMP Seminar, University of Montreal, Canada (01/18/2016)

- [75] “What are topological insulators good for?”, EE Seminar, Indian Institute of Technology (IIT) Bombay (01/06/2016)
- [74] “Topological Quantum Matter”, Physics Colloquium, University of Buffalo (12/10/2015)
- [73] “Spin-helical surface Dirac fermions in topological insulators: quantum transport and potential applications”, Condensed matter physics seminar, Rutgers University, NJ (12/01/2015)
- [72] “Topological Quantum Matter”, Herb Condensed Matter Seminar, University of Wisconsin-Madison (11/12/2015)
- [71] “Topological Quantum Matter”, Physics Colloquium, Purdue University (10/22/2015)
- [70] “Raman spectroscopic studies of Graphene and related materials”, Physical Chemistry Seminar, Department of Chemistry, Purdue University (09/09/2015)
- [69] “Topological Surface State Spin-Helical Dirac Fermions: Quantum Transport and Potential Applications”, IAS (Institute for Advanced Studies) Seminar, Tsinghua University, Beijing (07/10/2015)
- [68] “Quantum Transport of Surface Dirac Fermions in Topological Insulators – from “half-integer” quantum Hall effect to “half-integer” AB oscillations”, ICQM (International Center for Quantum Materials) Seminar, Peking University, Beijing (07/07/2015)
- [67] “Electronic Transport in Topological Insulators”, Condensed Matter and Nanophysics Seminar, University of Delaware (04/28/2015)
- [66] “Quantum Dynamics in a Bose-Einstein Condensate with Synthetic Gauge Fields”, Physics Colloquium, Miami University (04/01/2015)
- [65] “Topological surface transport in topological insulators”, Center for Complex Quantum Systems Seminar, Department of Physics, University of Texas at Austin (03/24/2015)
- [64] “What are topological insulators good for?”, Solid State Sciences and Electronics Laboratory Seminar, Department of Electrical and Computer Engineering, University of Michigan (02/17/2015)
- [63] “Atomic Lego with 2D materials: a new playground for condensed matter physics and nanotechnology”, Physics Colloquium, University of Washington (02/02/2015)

[62] “Transport and Dynamics in Spin-Orbit Coupled BECs”, Seminar at the BEC Center, University of Trento, Trento, Italy (11/17/2014)

[61] “Electronic Properties of Dirac Materials: From Graphene to Topological Insulators”, Seminar in SNS (Scuola Normale Superiore)-NEST (National Enterprise for nanoScience and nanoTechnology), Pisa, Italy (11/06/2014)

[60] “Experimental studies of spin orbit coupled BEC and LiRb cold molecules”, AMO Physics Seminar, Dept. of Physics, Tsinghua University, Beijing, China (07/31/2014)

[59] “Physics and Applications of Novel Structures with CVD Graphene --- edges, grain boundaries, twisted bilayers; hybrids”, Seminar in Department of Physics, Beijing Normal University, Beijing China (07/30/2014)

[58] “Electronic Properties of Dirac Materials: From Graphene to Topological Insulators”, Condensed Matter Physics Seminar, EPFL, Lausanne, Switzerland (07/09/2014)

[57] “Taming Topological Insulators”, Condensed Matter Physics Seminar, Northwestern University, Chicago, IL (05/22/2014)

[56] “Taming Topological Insulators”, Condensed Matter Physics Seminar, University of Oklahoma, Norman, OK (04/2014)

[55] "Stories of Graphene and Beyond", Seminar, Department of Chemistry and Physics, Indiana State University, Terre Haute, IN (04/08/2014)

[54] “Magnetotransport in Topological Insulators”, MSD Seminar, Argonne National Laboratory, Chicago, IL (03/27/2014)

[53] “Atomic LEGO with 2D materials: a new playground for condensed matter physics”, Physics Colloquium, University of Texas at Dallas, 12/04/2013

[52] “Quantum Hall physics in layered/2D materials: from graphene to topological insulators”, Dept. of Physics, McGill University, Montreal CA (11/07/2013)

[51] “Atomic Lego with 2D Materials: A new playground for condensed matter physics”, Condensed Matter Physics Seminar, Dept. of Physics, Ohio State University (09/26/2013)

[50] “Graphene with controlled disorder: a rich physics playground”, Seminar at Institute of Semiconductors, Chinese Academy of Sciences, Beijing, China (05/31/2013)

[49] “Quantum Transport in Spin-Orbit Systems”, Seminar at Institute for Advanced Studies, Tsinghua University, Beijing, China (05/24/2013)

[48] “Topological insulators: electronic transport and device applications”, Intel Corporation, Science and Technology Center Seminar, Portland OR (11/27/2012)

- [47] “Graphene and Topological Insulator Based Transistors for Non-computing Applications”, Applied Physics Seminar (Solid State and Optics Seminar Sponsored by the Flint Fund Series on Quantum Devices and Nanostructures), Yale University, New Haven, CO (11/07/2012)
- [46] “Electronic Transport in Topological Insulators”, Condensed Matter Physics Seminar, University of Illinois at Urbana-Champaign, Urbana, IL (11/02/2012)
- [45] “Graphene Based Radiation Detectors and Rad-hard Electronics”, Special Physics Seminar and Nuclear and High Energy Physics Seminar, Purdue University, West Lafayette, IN (09/19/2012)
- [44] “Electronic Properties of Topological Insulators”, Condensed Matter Physics Seminar, Indiana University, Bloomington, IN (08/31/2012)
- [43] “Electronic properties of topological insulators”, Special Condensed Matter Physics Seminar, Penn State University, State College, PA (06/19/2012)
- [42] “Chasing Dirac particles in condensed matter systems”, Physics Colloquium, Sun Yat-Sen University, Guangzhou China (05/31/2012)
- [41] “Graphene based radiation detectors and rad-hard electronics”, High Energy Physics Seminar, Argonne National Laboratories, Argonne IL (01/2012)
- [40] “Graphene: adventures in quantum mechanics, relativity and nanotechnology”, Wabash College, Crawfordville IN (11/16/2011)
- [39] “Making Dirac particles in the lab”, Physics Colloquium, Purdue University, West Lafayette IN (10/20/2011)
- [38] “Making Dirac Particles in the Lab”, Physics Colloquium, Rice University, Houston TX (09/21/2011)
- [37] “Experimental studies of electronic properties of graphene and topological insulators”, Seminar in Department of Mechanical Engineering and Microelectronics Research Center, University of Texas at Austin, Austin TX (09/14/2011)
- [36] “Quantum Transport in Graphene and  $\text{Bi}_2\text{Se}_3$ ”, Tsinghua University, Beijing China (06/16/2011)
- [35] “Stories of Graphene and How it might change our life”, Xi’an Jiaotong University, Xi’an, China (06/09/2011)

- [34] “Stories of Graphene and How it might change our life”, University of Macao, Macao, China (06/02/2011)
- [33] “Topological insulators for nanoelectronic devices”, Nanoelectronics Research Initiative (NRI) e-workshop (2/22/2011)
- [32] “Stories of large scale graphene”, Condensed Matter Physics Seminar, University of Notre Dame (01/20/2011)
- [31] “Stories of large scale graphene”, Condensed Matter Physics Seminar, Case Western Reserve University (11/15/2010)
- [30] “Graphene: materials, physics and devices of a novel 2D electron system”, Seminar at Network for Computational Nanotechnology (NCN), Purdue University (04/02/2010)
- [29] “Graphene: materials and physics of a novel 2D electron system”, Department of Physics Seminar, Hong Kong University of Science and Technology, Hong Kong, China (03/12/2010)
- [28] “Nanoscale thermal engineering and thermal circuits with graphene”, Nanoelectronics Research Initiative (NRI) e-workshop (12/16/2009)
- [27] “The carbon story of nanoscience”, Physics Seminar Series, Indiana University at South Bend (11/05/2009)
- [26] “Is carbon the new silicon? ---- Toward graphene integrated circuits: issues and perspectives”, Condensed Matter Physics Seminar, University of Oklahoma, Norman, OK (10/30/2009)
- [25] “Graphene: Adventures of a Condensed Matter Experimentalist with ‘High Energy’ Physics”, Physics Department Colloquium, University of Oklahoma, Norman, OK (10/29/2009)
- [24] “Graphene: physics, materials and devices”, Quantum Electrical Metrology Division Seminar, National Institute for Standard and Technology (NIST), Gaithersburg MD (10/12/2009)
- [23] “Graphene: materials and physics of a unique 2D electron system”, Condensed Matter Physics Seminar, Indiana University, Bloomington IN (10/12/2009)
- [22] “Controlling Interactions in Cold Atoms and Molecules”, Physical Chemistry Seminar, Purdue University, West Lafayette IN (10/29/2008)
- [21] Physics Colloquium, University of Toledo (09/25/2008) [trip canceled]
- [20] “Graphene Based Functional Nanomaterials and Devices”, Center for Nanoscale

Materials (CNM) Colloquium, Argonne National Laboratory (07/16/2008)

[19] “Disordered Bose-Einstein Condensates: Probing Quantum and Density Fluctuations in Superfluid-to-insulator transitions”, Nuclear Theory/RIKEN Seminar, Brookhaven National Laboratory (05/23/2008)

[18] “Quantum Coherence and Superfluid-Insulator Transitions in Electronic and Atomic Systems”, Physics Colloquium, Indiana University-Purdue University at Indianapolis (04/24/2008)

[17] “Superfluid-Insulator Transition and Phase Coherence in Atomic and Solid State Systems”, Condensed Matter Physics Seminar, Northwestern University (02/14/2008)

[16] “Quantum Science and Technology”, Lecture at Xi’an Jiaotong University, Xi’an, China (12/12/2008)

[15] “Quantum Correlation and Quantum Coherence”, Lecture at Key Laboratory of Quantum Information, University of Science and Technology of China and Chinese Academy of Sciences, Hefei China (12/06/2007)

[14] “Quantum Solids of Two Dimensional Electrons”, Lecture at Key Laboratory of Quantum Information, University of Science and Technology of China and Chinese Academy of Sciences, Hefei China (12/05/2007)

[13] “From Alchemy to Laser Show: A Journey to Understand Interaction and Disorder in Quantum and Nano Systems”, Richard E. Smalley Institute Seminar, Rice University (09/21/2007)

[12] “Quantum Coherence in Insulators”, Physics Department Seminar, University of Texas, El Paso (04/18/2007)

[11] “UltraCold Atoms: Interaction, Disorder and Quantum Phase Transition”, Physics Seminar, University of Houston at Clear Lake (03/29/2007)

[10] “Nanoscience and Quantum Devices with Electrons, Atoms and Photons”, Special Seminar, California Nanosystems Institute (CNSI), University of California, Los Angeles (03/28/2007).

[9] “High Frequency Dynamics in Nanostructures: Physics, Materials and Devices”, Special Electrical Engineering Seminar, University of California, Los Angeles (03/15/2007).

[8] “Quantum Coherence in Insulators”, Special Condensed Matter Physics Seminar, Michigan State University (02/22/2007)

[7] “Quantum Coherence in Insulators”, Special Condensed Matter Physics/Nanoscience

Seminar, Purdue University (02/15/2007)

[6] “Quantum Coherence in Insulators”, Special Physics Colloquium, Texas A&M University (02/06/2007)

[5] “New Quantum Solids of 2DES in Magnetic Fields and Emergence of Supersolid-like Phases”, Seminar at Department of Physics, Pennsylvania State University (10/14/2005)

[4] “New Quantum Solids of 2DES in Magnetic Fields and Emergence of Supersolid-like Phases”, Seminar at Department of Physics, Rutgers University (10/12/2005)

[3] “Pinned Quantum Electron Solid—or Eletron Supersolid?”, Seminar in Condensed Matter Theory Group, MIT (05/16/2005)

[2] “New Solid Phases of Two Dimensional Electrons in Magnetic Fields”, Condensed Matter Brown Bag Seminar at Princeton University (09/21/2004)

[1] “Microwave Spectroscopy of Solid Phases in 2D Electron Systems under Magnetic Field”, joint Condensed Matter Physics-AMO Physics-Center of Nanoscale Science and Technology (CNST) Seminar, Rice University (05/20/2004)

### **Research Mentorship**

Mentees’ careers: 9 past group mentees including postdocs (3) and PhD students (5) have become professors in research universities worldwide including the US (4), China (3), Canada (1) or India (1); many have pursued careers in industry (both large companies such as Intel as well as start-up companies founded by themselves), government, etc. Many PhD students have also pursued postdocs.

### **Postdoctoral Research Associates (including Postdoctoral Visiting Scholars):**

*Current (7):*

Dr. Andres Allcca (PhD, Purdue Univ.) [Purdue]

Dr. Nithin Abraham (PhD, Indian Institute of Science) [Purdue]

Dr. Demid Sychev (PhD, Russia Quantum Center/ Moscow State Pedagogical University) [Purdue, Joint with Shalaev Group]

Dr. Jian Liao (PhD Physics, Institute of Physics - Chinese Academy of Sciences) [Purdue]

Dr. Lei Fu (PhD Chemistry, Wuhan Univ.) [Purdue]

Dr. Lina Liu (PhD Chemistry, Tsinghua Univ) [Aarhus Univ.]

Dr. Chuan-hsun Li (PhD Electrical Engineering, Purdue Univ.) [Purdue]

*Past (18):*

Dr. Kim-Khuong Huynh (PhD, Tohoku Univ.) [Aarhus Univ., joint with Bo Iversen];

Dr. Ying Yang (PhD. Tongji Univ.) [MUST, Macau Youth Scholar];

Dr. Subhdeep Das (PhD, Indian Institute of Science) [postdoc@ Aarhus Univ.] [Current position : staff engineer, Center for Quantum Device, Univ. Of Copenhagen]

Dr. Yaping Qi (PhD, Univ. of Hong Kong) [joint with K.Zou/Univ. British Columbia and Y.Liang, MUST][Current position : Research assistant professor at Tohoku Univ.]



Dr. Kimberly Hsieh (PhD, India Institute of Science) [postdoc @ Aarhus] [Current position: engineer in BlueFors]

Dr. Gavin Hester (PhD, Colorado State Univ.) [postdoc @Purdue, Joint with Banerjee Group] [Current position : **Assistant Professor**, Brock Univ., Canada]

Dr. Guanghui Cheng (PhD Physics, Univ. Science and Technology China) [Current affiliation: Univ. Science and Technology China]

Dr. Boyi Zhou (PhD Physics, Washington Univ. St. Louis) [Current affiliation: Columbia Univ.]

Dr. Esat Kondakci (PhD Physics, CREOL, University of Central Florida) [Current affiliation: UCSB]

Dr. Jifa Tian (PhD Physics, Institute of Physics, Chinese Academy of Sciences) [subsequent & current affiliation: **Assistant Professor**, Department of Physics, Univ. of Wyoming]

Dr. Biddut Sarker (current affiliation: Inficon)

Dr. Tailung Wu (current affiliation: Purdue University)

Dr. Ozhan Koybasi (current affiliation: SINTEF, Norway)

Dr. Tian Shen (current affiliation: Apple)

Dr. Amol Patil (current affiliation: Mirion)

Dr. Romaneh Jalilian (current affiliation: Nauga Needles LLC; awarded ASEE/NSF Small Business Postdoctoral Research Diversity Fellowship)

Dr. Ping Wang (current affiliation: **Professor**, Huazhong University of Science and Technology, China; awarded “Youth 1000 Talents Plan” Young Faculty Award in China)

Dr. Liyuan Zhang (current affiliation: **Professor** of Physics, South University of Science and Technology of China; awarded “Youth 1000 Talents Plan” Young Faculty Award in China)

**Research faculty or visiting scholars** (selected):

Assistant Prof. Yaping Qi (Tohoku Univ., 2023-)

Assistant Prof. Hirofumi Oka (Tohoku Univ., 2021-)

Assistant Prof. Richard Balog (Aarhus Univ., 2020-)

Assistant Prof. Xingchen Pan (AIMR, Tohoku Univ., 2020-, joint with Katsumi Tanigaki) ;

Assistant Prof. Kim-Khuong Huynh (AIMR, Tohoku Univ., 2020-, joint with Katsumi Tanigaki) ;

Assistant Prof. Guanghui Cheng (AIMR, Tohoku Univ., 2019-2021, again 2023-)

Assistant Prof. Jana Lustikova (Center for Spintronics and AIMR, Tohoku Univ., 2019-)

Associate Prof. Aki Kumatani (AIMR, Tohoku Univ., 2017-2022) [Current affiliation : Univ. of Tokyo]

Assistant Prof. Alka Sharma (AIMR, Tohoku Univ., 2021-2022) [Current affiliation : ASML];

Assistant Prof. Hiroshi Idzuchi (AIMR, Tohoku Univ., 2018-2021) [Current affiliation : University of Tokyo]

Dr. Irek Miotkowski (Purdue Univ., 2011-2015)

**Graduate Students:**

*Current PhD students (6):*

- Akshay Agarwal (Purdue ECE)
- Shi-wen Feng (Purdue Physics)
- Ihsan Ahmed Kolasseri (Aarhus Physics)
- Felicia Martinez (Purdue Physics)
- Mohammad Sadi (Purdue ECE)
- Sheng-wen Wendy Huang (Purdue Physics, joint with Alex Ma)

*Graduated (15 PhD+2 MSc):*

PhD students:

**Andres E Llacsahuanga Allica** (Purdue Physics, PhD'2023), Thesis: Heterostructure engineering in 2D van der Waals Materials: Unveiling magnetism and strain effects; Subsequent and current affiliation : Purdue University (postdoc)

**Chuanhsun Li** (ECE, PhD'2019), Thesis: Bose-Einstein Condensates in Synthetic Gauge Fields and Spaces : Quantum Transport, Dynamics and Topological States; Subsequent and current affiliation : Purdue University (postdoc)

**Yang Xu** (Physics, PhD'2018) [Awards: 2015 H. Y. Fan Award for outstanding graduate research in condensed matter physics from Purdue Physics Department], Thesis: Quantum transport in three-dimensional topological insulators, Subsequent affiliation: Cornell University (postdoc); current affiliation: PI (**Professor**) in Institute of Physics, Chinese Academy of Sciences

**David Blasing** (Physics, PhD'2018), Thesis: Photoassociation in  $^{87}\text{Rb}$  BECs and ultracold  $^7\text{Li}^{85}\text{Rb}$ , Subsequent affiliation: Navy (NSWC) Crane Research Center, and current affiliation: IPG Photonics

**Nirajan Mandal** (Physics, PhD'2018) [awards : 1st place in Birck graduate student research symposium, 2015], Thesis : Optical Studies of Novel electronic materials ; Subsequent & current affiliation: Intel

**Jack Ting-fung Chung** (Physics, PhD'2018) [awarded Bilsland PhD Dissertation Fellowship from Purdue Graduate School 2015; H. Y. Fan Award for outstanding graduate research in condensed matter physics from Purdue Physics Department in 2018], Thesis: Investigations of the electronic, vibrational and optical properties of graphene materials; Subsequent affiliation: Purdue University (short postdoc); Subsequent affiliation: University of California-Berkeley (postdoc); Current affiliation: KLA (Senior Research Scientist)

**Morteza Kayyalha** (ECE, PhD'2018), Thesis : “Electrical, Thermoelectric and Phase Coherent Transport in two-dimensional materials”, Subsequent affiliation: Penn State University (postdoc); Current affiliation: **Assistant Professor of Electrical Engineering**, Penn State Univ.

**Wonjun Park** (ECE, PhD'2017), Thesis: "Graphene composites and foams: synthesis, properties and applications", Current affiliation: Samsung

**Luis Jauregui** (ECE, PhD'2016), Thesis: "Electronic transport in nano devices based on graphene and topological insulators", [awarded Intel PhD Fellowship, 2012]  
Subsequent affiliation: Harvard University (postdoc) ; Current Affiliation: **Assistant Professor** of Physics, University of California, Irvine

**Robert Niffenegger** (Physics, PhD'2015), Thesis: "Experiments with synthetic spin-orbit coupling and spin transport in Bose-Einstein Condensates", Subsequent affiliation: Intel; Current affiliation: Univ. Massachusetts (**assistant professor**)

**Jiuning Hu** (ECE, PhD'2015), Thesis: "Transport studied in graphene based materials and structures", Subsequent affiliation: Purdue and NIST (joint postdoc), current affiliation: ASML

**Abraham Olson** (Physics, PhD'2015) Thesis: "The dynamics of ultracold atoms in light-induced synthetic gauge fields", [awarded NSF Graduate Fellowship, 2008; NDSEG Graduate Fellowship 2008; Dr. Warner Black Award for practical accomplishments by a Purdue physics graduate student, 2014], Current affiliation: Beckman Coulter

**Isaac Childres** (Physics, PhD'2014), Thesis: "Effects of energetic irradiation on materials and devices based on graphene and topological insulators", Current affiliation: Cephalofair Games Inc. (founder).

**Sourav Dutta** (Physics, PhD'2013), Thesis: "Experimental studies of LiRb: spectroscopy and ultracold molecule formation by photoassociation", [received Dr. Warner Black Award for practical accomplishments by a Purdue physics graduate student, 2012; Purdue Graduate School Bilsland Dissertation Fellowship, 2013; Pancharatnam Distinguished Postdoctoral Fellowship and D.S.Kothari Postdoctoral Fellowship, India, 2013; Karl Lark-Horovitz Award for outstanding research accomplishments by a Purdue physics graduate student (highest award for graduate students in Purdue physics), 2014], Current position/affiliation: **Assistant Professor**, Tata Institute for Fundamental Research (TIFR), India

**Helin Cao** (Physics, PhD'2013), Thesis: "Transport study in graphene and topological insulator", [awarded Grodzin's Summer Research Award, Purdue University, 2008; Karl Lark-Horovitz Award for outstanding research accomplishments by a Purdue physics graduate student (highest award for graduate students in Purdue physics), 2012], Subsequent affiliations: University of Washington (postdoc) and Intel (engineer); Current affiliation: Bosoniqs

Co-advised students:

John Lorenz (Physics, PhD'2014) [with Prof. Dan Elliott]  
Adeel Altaf (Physics, PhD'2014) [with Prof. Dan Elliott]  
Suprem Das (Physics, PhD'2014) [with Prof. David Janes]

M.Sc. Students:

**Dan Hu** (Innovation Engineering@MUST, M.Sc.'2023, joint with Y. Liang), Thesis  
“Deep Learning Assisted Raman Spectroscopy for Rapid Identification of 2D materials”

**Gabriel Lopez** (ECE, MS'2010), Thesis: “Graphene Field Effect Transistors for  
Applications in Radiation Detection”, Current affiliation: Sandia National Labs

**Undergraduate students:**

More than 40 undergraduate students have performed research in Chen's laboratory through REU (Research Experiences for Undergraduates), SURF (Summer Undergraduate Research Fellowship), DURIP (Discovery Park Undergraduate Research Internship) and other programs since 2007; many of these students have entered graduate schools such as Colorado-Boulder, Cornell, Duke, Harvard, MIT, Princeton, Purdue, Rice, Stanford, UCLA, UCSB, UT-Austin, Yale etc.

**Teaching**

**Instructor:**

ECE201: “Linear Circuit Analysis”, Spring 2019, Fall 2015  
PHYS 342 “Modern Physics”, Purdue University, Fall 2017, Fall 2016,  
PHYS 545: “Solid State Physics”, Purdue University, Spring 2017  
PHYS 220: “General Physics”, Purdue University, Spring 2015  
PHYS 522: “Introduction to quantum optics and quantum photonics”, Purdue University,  
Spring 2014, Spring 2016  
PHYS 344: “Modern Physics”, Purdue University, Fall 2013  
PHYS 272: “Electric and Magnetic Interactions”, Purdue University, Fall 2010, Fall 2011,  
Spring 2013  
PHYS 570X: “Carbon nanophysics” (new course developed), Purdue University, Spring  
2009, Spring 2010  
PHY515: “Statistical physics”, Purdue University, Fall 2008, Fall 2009, Spring 2011,  
Spring 2012  
PHY330: “Intermediate electricity and magnetism”, Purdue University, Spring 2008

**Teaching Assistant:**

Statistical & Solid State Physics, Aarhus University, Fall 2024  
EE201: “Signals and systems”, Princeton University, Fall 2000  
18.085: “Advanced mathematical methods for engineers”, MIT, Fall 1998 & Spring 1999

**Professional Services (selected)**

**Editorial:**

Guest Editor for Special Collection “2D Materials for Quantum Science and Technology”,

npj 2D materials and applications, 2024-2025

Associate Editor, *AVS Quantum Science* (AQS), published by American Institute of Physics (AIP), 2019-2023

Editorial Board Member in Physics, “*Science Bulletin*” (Elsevier), 2018-2022

Editorial Board Member in Physics, Nature’s *Scientific Reports* (2011-2018)

Co-editor, Focus issue on “2D Stacked Devices”, 2D Materials, published under iop.org (2015)

**Grant and Proposal Reviewer:**

National Science Foundation (NSF) (DMR, PHYS and ECCS divisions)

Department of Energy (DOE)

Department of Defense (DOD) --- Army Research Office (ARO) and Defense Threat Reduction Agency (DTRA)

Department of Homeland Security (DHS)

Moore Foundation

Research Corporation

American Chemical Society-Petroleum Research Fund

Kentucky Science and Engineering Foundation (KSEF)

Grand Challenge institutional investment for a major US research university

European Research Council (ERC)

European Science Foundation (Graphene Flagship)

Austrian Science Fund (FWF)

German Research Foundation (DFG)

Swiss National Science Foundation (SNSF)

Netherland Organization for Scientific Research

Israeli Ministry of Science, Technology and Space

Israel Science Foundation

Chinese Academy of Sciences (CAS)

King Abdulaziz City for Science and Technology (KACST, the national science agency of Saudi Arabia) via American Association for the Advancement of Science (AAAS)’s

Research Competitiveness Program

Georgian Science Foundation

Singapore-MIT Alliance for Research and Technology Innovation Center Fund

Nazarbayev University Research Proposals

National High Magnetic Field Laboratory User Proposals

SLAC National Labs User Proposals

NASA Postdoctoral Program (NPP)

**Journal Reviewer:**

Nature

Nature Materials,

Nature Nanotechnology,

Nature Physics,  
Nature Communications,  
Nature's Scientific Reports  
Science,  
Science Advance,  
Proceedings for the National Academy of Sciences (PNAS),  
Physical Review Letters,  
Physical Review X,  
Physical Review A,  
Physical Review B,  
Nano Letters,  
ACS Nano,  
Applied Physics Letters  
Proceedings of IEEE  
IEEE Transactions of Nuclear Sciences,  
Nanotechnology,  
Chemical Physics Letters,  
Reports on Progress in Physics,  
Solid State Communications,  
Journal of American Vacuum Society B  
Journal of Physics A: Mathematical and Theoretical  
Journal of Physics B: Atomic, Molecular & Optical Physics  
Journal of Physics: Condensed Matter  
Journal of Physics and Chemistry of Solids,  
The Journal of Physical Chemistry,  
Nanoscale Research Letters,  
New Journal of Physics,  
Journal of Nanomaterials,  
Journal of Nanoengineering and Nanosystems,  
Jordan Journal of Physics,  
Semiconductor Science and Technology,

**Leadership positions:**

Inaugural Director, Purdue Quantum Science and Engineering Institute (PQSEI), 2019-2025

[main responsibilities include: help grow and coordinating interdisciplinary research/collaboration/funding as well as external industrial and international partnership for quantum research at Purdue; leading and coordinating Purdue participation in National Quantum Initiative (NQI); helping attracting large centers such as DOE Quantum Science Center (QSC) and NSF IUCRC Center for Quantum Technology (CQT); overseeing staff including managing director and admin assistant in support of center operations etc.; overseeing establishment and expansion of shared quantum research facilities]

Associate Director of Research, Birck Nanotechnology Center (2018-2019) [main responsibilities include: oversee staff scientists; help grow interdisciplinary

research/collaboration/funding as well as external industrial and international partnership for Birck Center]

**Boards, Committees and other leadership or advisory services:**

Scientific Advisory Committee, Argonne National Laboratory Center for Nanoscale Materials (CNM), one of the 5 DOE Nanoscale Science Research Centers (NSRCs), 2024-

DOE Quantum Information Science (QIS) Applications Roadmap Workgroup, 2024

Leadership council, Aarhus University iMAT (integrated Materials Sciences) Center, 2023-

Purdue University Birck Nanotechnology Center Leadership Council, 2022-2023

Advisor Board Member, Center for Intelligent Energy Systems (Purdue), 2022-

Founding board member, Midwest Quantum Collaboratory, a consortium between Purdue, Univ. of Michigan and Michigan State Univ., 2021-

Governance Advisory Board, Quantum Science Center, a Department of Energy (DOE) Quantum Information Sciences (QIS) Research Center headquartered at Oak Ridge National Lab, 2020-

Co-director, Tohoku Quantum Alliance (TQA), 2020-

Director of Purdue Quantum Center (2016-2019) [PQC becomes PQSEI in 2019]

**Professional Societies and Meetings:**

Commissioner and USA Representative (member of U.S. Liaison Committee), International Union for Pure and Applied Physics (IUPAP), Commission on Semiconductor Physics (C-8), 2017-2024

Chair, APS March Meeting Subcommittee for APS DAMOP (Div. Atomic Molecular Optical Physics), and Member of APS March Meeting Program Committee as DAMOP representative, 2017

Program Committee, APS DAMOP (Div. Atomic Molecular Optical Physics), 2015-2018

APS March Meeting Subcommittee for APS DAMOP (Div. Atomic Molecular Optical Physics), 2015-2018

Program Committee, Device Research Conference (DRC), 2013-2015

Organizer, Session Chair or Panelist for professional conferences/events:

Co-organizer (and chair of the session on AI meets quantum), Fast Machine Learning for Science Conference 2024, held at Purdue University, 10/15-10/18/2024

Panelist, “Panel discussion: Breaking down barriers to expedite innovation: how can we get all hands on deck to develop use cases and fault-tolerant computers?”, 3rd annual *Commercialising Quantum* Global 2024 organized by Economist, London, UK (06/05/2023) <https://events.economist.com/commercialising-quantum/agenda-2023/?RefID=EM01>

Panelist, “Quantum technologies and digital twins”, twitter space discussion (online), organized by Metaverse Institute (5/13/2023)

Organizer and co-chair, OIST-TU Joint Quantum Meeting (11/24/2020)

Organizer and chair, 2nd Joint Purdue-Tohoku workshop on spintronics, held at Purdue University (09/11/2019)

Organizer and chair, “AIMR Workshop on Quantum Materials and Spintronics: Spin, Topology and Superconductivity” in WPI-AIMR International Center for Materials Research, Tohoku Univ., Sendai, Japan (07/11-12/2019)

Session Chair, International Workshop “Topology”, held at WPI-MANA, NIMS, Tsukuba, Ibaraki, JAPAN (06/11/2019)

Organizer and chair, International Symposium for Quantum Science and Technology, Purdue University (04/21-23/2019)

Invited participant and panelist, “Catalyzing Industry-University Collaboration in Quantum Technologies”, an NSF-sponsored UIDP (University-Industry Demonstration Partnership) Workshop, Los Angeles, 03/14-15/2018

Co-organizer, Focus Topic “Topological Materials: Synthesis, Characterization and Modeling”, APS March Meeting 2018

Organizer for tutorial “quantum photonics”, APS March Meeting, 2017

Co-organizer, Focus Topic on “2D materials Beyond Graphene” (sponsored by Div. Material Physics) for APS March Meeting, 2014-2016

Session Chair, Session on “Spin-orbit Coupled and Low Dimensional Gases”, American Physical Society (APS) Division of Atomic Molecular and Optical Physics (DAMOP) Annual Meeting, Madison, Wisconsin, (06/2014)

Organizer and Chair of 2013 Midwestern Cold Atom Workshop (MCAW) held at Purdue University, 11/16/2013 (~100 attendees from ~10 universities)



Panelist for Rump Session “Transistors: the next 50 years?” at Device Research Conference (DRC) (06/25/2013)

Co-organizer, Short-course on “2D Materials beyond graphene”, Device Research Conference (DRC), Notre Dame (IN) (06/2013)

Chair, Session on “Nanowires and Nanotubes I”, MRS Spring Meeting, San Francisco, CA (04/2013)

Chair, Session on 2D Topological Insulators, APS March Meeting, Baltimore (2013)

Technical Program Committee, Symposium on Photonics and Optoelectronics (SOPO 2012), Shanghai, China (05/2012)

Chair, Focus Session on Graphene Structure, Dopants, and Defects: Nanoribbons, American Physical Society March Meeting, Dallas (2010)

Chair, Session on Graphene and 2D Nanostructures, American Vacuum Society (AVS) 57<sup>th</sup> International Symposium, Albuquerque (2010)

Co-chair, Session on Graphene Transport, Symposium E-7 Graphene, Ge/III-V, and Emerging Materials for Post-CMOS Applications, Electrochemical Society (ECS) 217<sup>th</sup> Meeting, Vancouver (2010)

Chair, Session on Quantum Optics and Quantum Many-body Physics in Optical Lattices, American Physical Society March Meeting, Portland (2010)

Organizer and Chair, Invited Session on Disordered Quantum Gases, American Physical Society March Meeting, Denver (2007)

**Other University/College/Departmental service (selected):**

Faculty and Leadership Search and related committees

Chair, Purdue University Quantum Information Science (QIS) Cluster Hiring Search Committee (joint between College of Science and College of Engineering), 2023-2024

Computational Science and Engineering Faculty Search Committee, School of Electrical and Computer Engineering, 2018-2019

Experimental Condensed Matter Physics Junior Faculty Search Committee (2017-2019)

Committee member for “Spintronics” preeminent team initiative (2014-)

Search Committee for the Director of Bindley Biosciences Center (2017-2018)

Search Committee for the Head of School of Nuclear Engineering (2016)

College of Science Strategic Plan Working Group on Faculty Hiring (2015-2016)

Theoretical AMO or Condensed Matter Physics Junior Faculty Search Committee (2015)

Physics Department Head Search Advisory Committee (2014-2015)

Committee member for “Quantum photonics” preeminent team initiative (2013-2017)

Experimental AMO Physics Junior Faculty Search Committee (2013-2014)

Theoretical AMO Physics Senior Faculty Search Committee (2013)

Birck Nanotechnology Center Director Search Committee (2010-2011)

Other university/college/departamental services (selected):

Physics Colloquium Committee, Purdue University, 2021-

Purdue University FLAIR (Faculty Leadership Academy for Interdisciplinary Research)  
Inaugural Fellow, 2019

Hubert James Distinguished Lectures Committee, Purdue Physics, 2018-

School of Electrical and Computer Engineering Qualify Exam Grading Committee, 2018

Physics Graduate Qualify Exam Auxiliary Committee (2007-)

Birck Nanotechnology Center Operations Committee (2016-2017)

University Task Force on Applied Physics/Engineering Physics Program (2014-2017)

Physics Graduate Admission Committee (2011-2014, 2016)

Safety Committee (2010-2015)

Condensed Matter Physics Seminar Co-chair (2010)

Graduate committee members for >30 graduate students from physics, ECE, CHEM, ME, NuclE etc.

## **Miscellaneous Activities (selected)**

### **Extended Academic/Summer Visits:**

Visiting and Specially Appointed Professor at large, Macau University of Science and Technology, 2020 & 2021

Visiting/Consulting Professor and Foreign Principal Investigator, Advanced Institute for Materials Research (AIMR), Tohoku University, Sendai, Japan (2017-)

NEST (National Enterprise for nanoScience and nanoTechnology) and SNS (Scuola Normale Superiore), Pisa, Italy (10/14-11/14/2014)

Tsinghua University, Department of Physics (07/18-08/04/2013)

Institute of Physics, Chinese Academy of Sciences, Beijing China (06/2018; 8/2016; 06/28-07/10/2013; 06/13-06/24/2011) and Member of Center for International Collaboration (IOPCIC, 2018-2020)

Tsinghua University, Institute for Advanced Studies and Dept. of Physics (05/22-05/31/2013)

Aspen Physics Institute (08/14-08/21/2011; 06/01/2009-06/07/2009)

Physics Department, Brookhaven National Laboratory (05/21-05/23/2008)

Condensed Matter Theory Group, MIT Physics Department (05/10-5/14/2005)

Condensed Matter Group, National High Magnetic Field Laboratory, Tallahassee FL (02/2002–04/2005)

Grenoble High Magnetic Field Laboratory, Max-Planck Institute of Solid State Research and Centre National de la Recherche Scientifique (CNRS), Grenoble, France (08/2000)

IBM Zurich Research Laboratory, Switzerland (08/1999, 07–08/1998)

### **Other Coursework/Educational Experiences:**

American Association of Physics Teachers (AAPT) Faculty Workshop (03/2016)

Boulder Summer School for Condensed Matter and Materials Physics “Quantum coherence in atomic and condensed matter systems”, University of Colorado at Boulder (07/2004)

Harvard University, Cross-registered student in the departments of physics and mathematics (1998-1999)

Institute of Mathematics, Fudan University, graduate-level coursework in pure mathematics (1996-1997)

**Interdisciplinary Activities** (selected):

Affiliated Faculty and Director, Purdue Quantum Science and Engineering Institute

Affiliated and Residential Faculty, Birck Nanotechnology Center, Purdue University

Affiliated faculty: Semiconductors@Purdue; LEAPS (Leading Energy-Transition Advances and Pathways to Sustainability), Purdue Engineering; Purdue Energetics Research Center (PERC)

Affiliated PI (and member of governance advisory board): DOE Quantum Science Center, Oak Ridge National Lab

Affiliated faculty: the Interdisciplinary Nanoscience Center (iNANO), and integrated Materials Science Center (iMAT) and “Quantum Campus Aarhus”, @Aarhus University

Affiliated PI: WPI (World Premier International Research Center)-AIMR (Advanced Institute for Materials Research) [Foreign PI with resident lab], and Core Research Cluster for Materials Science (CRCMS), and Center for Science and Innovation in Spintronics (CSIS), and Center for Spintronics Research Network (CSRN) @ Tohoku Univ.

Past:

Affiliated Faculty: Purdue Energy Center, Purdue Cooling Technology Research Center (CTRRC), Purdue Center for Topological Materials (PCTM)

Member, Purdue “Spintronics” & “Quantum photonics” preeminence initiative

Affiliated Faculty, Midwest Institute for Nanoelectronics Discovery (MIND), a SRC/NRI center (2008-2012)

**Outreach/Diversity in Science:**

Panelist, Quantum Student Organization (OSO), Purdue University, 04/15/2024

“Stories of Graphene and How it May Change Our Life”, guest lecture (online) for high school students in AOPE (Arts of Physics Education) program (1/2023)

Authored a series of undergraduate-level physics experiments for Journal of Virtual Experiments (2016-2017), <https://app.jove.com/education/3715/physics-ii>

Participants in Purdue Nanodays (2012-)

Physics Guest lecture to Harrison High School honors physics class students on material/nano physics (04/2013)

Speaker and collaborator with NCLT (National Center for Learning and Teaching in Nanoscale Science and Engineering) for high school teachers (selected nation-wide), 2009-

Mentor associated with Mentornet.net (e-mentoring network for diversity in science and engineering): having mentored 1 chemistry undergraduate and 1 physics graduate student from under-represented groups

Participated in the science outreach and mentoring programs at Stratford Academy of Science in Houston (2006)

Volunteer and exhibition leader in the National High Magnetic Field Laboratory Annual Open House (2003)

Participated in the science outreach and mentoring programs at Hunter High School in New York (2001) and Stratford Academy of Science in Houston

**Other leadership activities:**

Interviewer for applicants to MIT undergraduate admission for MIT Alumni Association, 2022-

Interviewer for applicants to Princeton undergraduate admission for Princeton Alumni Association, 2015-2022

Vice President and Board of Directors, MIT Alumni Association of South Texas, 2006-2008

President of Rice University Postdoctoral Association (2006) and Representative in the 4<sup>th</sup> Annual Meeting of National Postdoctoral Association (2006)

Co-chairman, Pan-America Visa Security Check Improvement Committee for Chinese Students and Scholars (2003)

Invited participant, US Foreign Policy Colloquium (Washington DC, 2003)

Invited participant, 8th World Business Dialogue (Cologne, Germany, 2001)

Invited participant, 30th International Management Symposium (St. Gallen, Switzerland, 2000)