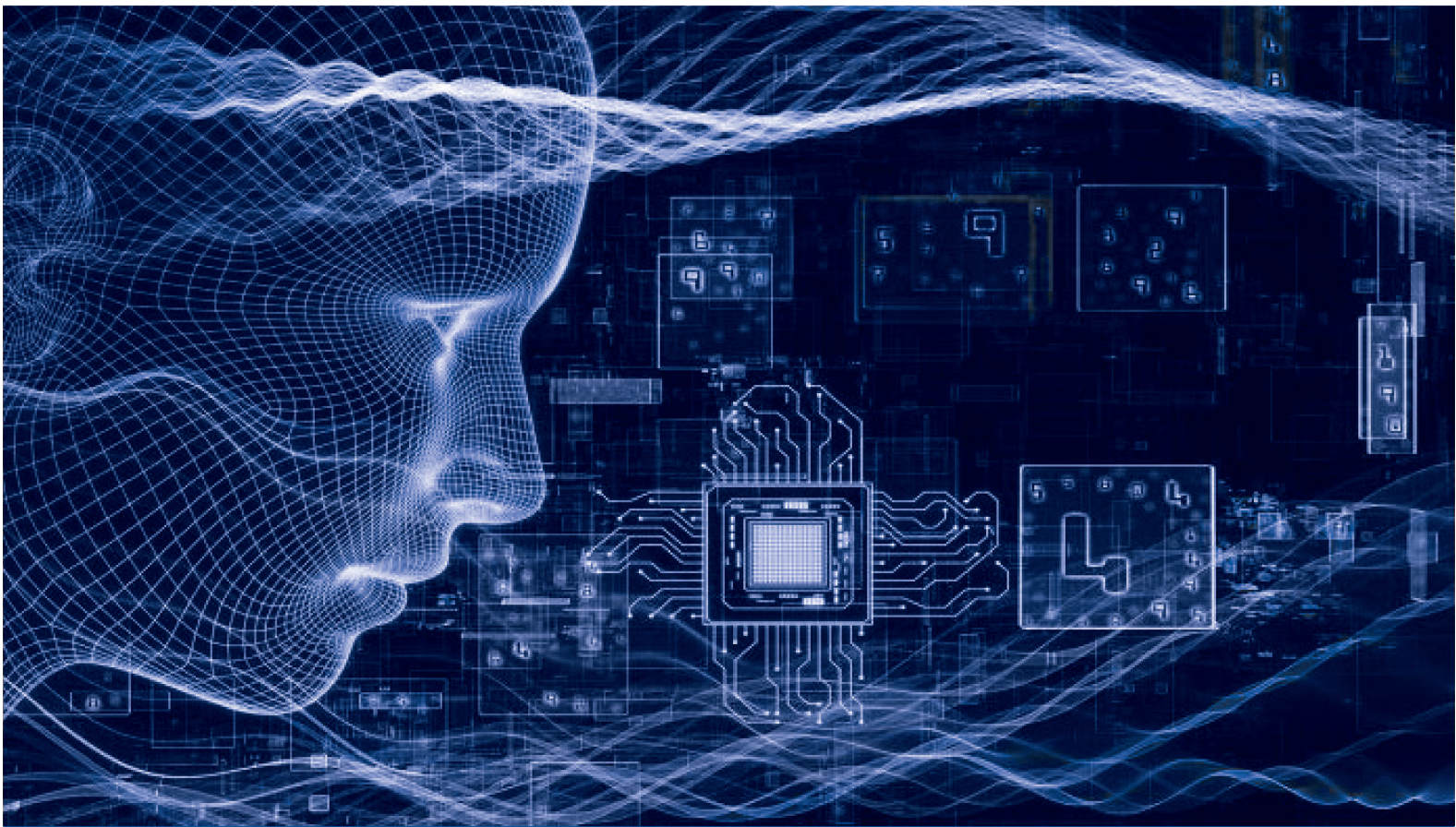


QUANTUM SCIENCE AND ENGINEERING WORKSHOP

»» **NOVEMBER 29-30, 2018**

GRIFFISS INSTITUTE 725 Daedalian Drive • Rome, New York



rfsuny.org/quantumworkshop

#SUNYquantum



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AT A GLANCE

Quantum Science and Engineering Workshop

November 29 - 30

Griffiss Institute
725 Daedalian Drive
Rome, New York

NOVEMBER 29

- 11:30AM **LUNCH AND NETWORKING**
- 12:30PM **WELCOME AND OPENING REMARKS**
- 1:00PM **NATIONAL STRATEGIC OVERVIEW
FOR QUANTUM INFORMATION SCIENCE**
- 2:00PM **INSTITUTIONAL FLASH TALKS**
- 3:15PM **BREAK**
- 3:30PM **QUANTUM INFORMATION SCIENCE AND ENGINEERING
TALENT DEVELOPMENT: VIEW FROM INDUSTRY**
- 5:00PM **CLOSING REMARKS**
- Travel and Hotel Check-In*
- 6 to 8PM **COMMUNITY RECEPTION AND NETWORKING**
Delta Hotels by Marriott Utica • 200 Genesee Street • Utica, NY

NOVEMBER 30

- 8:00AM **AFRL TOUR ONE OR BREAKFAST**
- 9:00AM **OPENING REMARKS**
- 9:15AM **BREAKOUT SESSION ONE:
SCIENTIFIC AND ENGINEERING CHALLENGES**
- 10:45AM **REPORTS OUT**
- 11:00AM **BREAKOUT SESSION TWO:
BRAINSTORMING FOR A NEW YORK
QUANTUM RESEARCH AND INNOVATION CENTER**
- 12:30PM **LUNCH**
- 1:20PM **REPORTS OUT**
- 1:30PM **NEXT STEPS AND CLOSING REMARKS**
- 2:00PM **AFRL TOUR TWO**



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DAY ONE

November 29, 2018

Program Emcee: James Cusack

11:30 a.m. **Lunch and Networking**

12:30 p.m. **Welcome and Opening Remarks**

Jacqueline Izzo, Mayor, City of Rome

Hon. Joseph A. Griffo, NYS Senator, 47th District

William Wolf, Executive Director, Griffiss Institute

Paul Antonik, Chief Scientist, Air Force Research Laboratory Information Directorate

Grace Wang, Senior Vice Chancellor for Research and Economic Development, SUNY

1:00 p.m. **National Strategic Overview for Quantum Information Science**

Carl Williams, Jr., Acting Director, Physical Measurement Laboratory

Fellow, Joint Quantum Institute and QulCS

National Institute of Standards and Technology

U.S. Department of Commerce

2:00 p.m. **Institutional Flash Talks**

Quantum Core Capabilities, Infrastructure, and Partnerships

Your View: Why Quantum, Why Us, and Why Now?

Air Force Research Laboratory Information Directorate

Michael Hayduk

Stony Brook University

Eden Figueroa

University at Albany

Herbert Fotso

Brookhaven National Laboratory

Kerstin Kleese van Dam

University at Buffalo

Quanxi Jia

SUNY Polytechnic Institute

Satyavolu "Pops" Papa Rao

Binghamton University

Steven Czarnecki

DAY ONE

3:15 p.m. **Break**

3:30 p.m. **Quantum Information Science and Engineering Talent Development:
View from Industry**

1. What are and will be the needs of a Quantum Information Science and Engineering (QISE) workforce?
2. How might industry and academia collaborate to stimulate interests from students from high school to graduate school to pursue education and research in QISE?
3. How might we create a diverse QISE talent pool to meet national needs?
4. What approaches have been or might be successful in empowering convergent, trans-disciplinary learning experiences to equip students to address complex, challenging QISE research and application questions?

Moderator

Edward White

Associate Vice President, Test, Assembly and Optical Packaging
AIM Photonics

Air Force Research Laboratory

Kathy-Anne Soderberg

Program Manager
Quantum Information Science

Applied Materials

Siddarth Krishnan

Director
New Markets and Alliances

D-Wave Systems

Joel Gottlieb

Senior Pre-Sales Analyst

IBM Research

Daniel Maynard

Business Development Executive

5:00 p.m. **Closing Remarks**

Grace Wang, Senior Vice Chancellor for Research and Economic Development, SUNY

Travel and Hotel Check-In: Delta Hotels by Marriott Utica, 200 Genesee St., Utica, NY 13502

6 to 8 p.m. **Community Reception and Networking**

Delta Hotels by Marriott Utica, Junior Ballroom

DAY TWO

November 30, 2018

8:00 a.m. **Breakfast at Griffiss Institute**

-or-

AFRL Tour One Meet at Griffiss Institute Lobby for Transportation

9:00 a.m. **Welcome**

Grace Wang, SUNY Senior Vice Chancellor for Research and Economic Development

9:15 a.m. **Breakout Session One: Scientific and Engineering Challenges**

Team One: Quantum Materials and Devices

Leaders:

Satyavolu "Pops" Papa Rao
Krishna Rajan
Kathy-Anne Soderberg

Scribe: Chitra Rajan

Team Two: Electronics, Photonics and Packaging

Leaders:

Michael Fanto
Seungbae Park
Edward White

Scribe: Mary Beth Curtin

Team Three: Quantum Information Theory and Algorithms

Leaders:

Paul Alsing
Philip Goyal
Tzu-Chieh-Wei

Scribe: Satyen Kumar

Team Four: Quantum Technologies

Leaders:

Eden Figueroa
Kirsten Kleese van Dam

Scribe: Nina Maung-Goana

10:45 a.m. **Reports Out**

Leaders and Scribes

DAY TWO

- 11:00 a.m. **Breakout Session Two: Brainstorming for a New York Quantum Research and Innovation Center**
1. *What are our collective strengths?*
 2. *What research challenges in Quantum Information Science and Engineering are we uniquely positioned to address?*
 3. *How might we prepare a diverse talent pool to power quantum workforce needs for New York?*
 4. *What are the necessary next steps? In one month? Three? Six? One year? Five?*
- 12:30 p.m. **Working Lunch**
- Reports Out**
Leaders and Scribes
- 1:30 p.m. **Next Steps and Closing Remarks**
Grace Wang, SUNY Senior Vice Chancellor for Research and Economic Development
- 2:00 p.m. **AFRL Tour Two** Meet at Griffiss Institute Lobby for Transportation
-or-
Departure

**Speaker
and
Participant
Biographies**

JOSEPH GRIFFO

Senator, 47th District

New York State Senate



Joseph A. Griffo, of Rome, represents parts of Oneida, Lewis and St. Lawrence counties in the New York State Senate, a position he's held since 2007. Griffo currently serves as chairman of the Senate Energy & Telecommunications Committee, which oversees the development of legislation and policies related to the energy and communications sectors. The goal of the committee members is to promote competitive markets, support private investment, streamline regulations, create jobs and keep consumer costs down, and its priorities include modernizing the state's energy generation, transmission and distribution; facilitating expansion of renewable and clean energy technologies; and expanding high-speed broadband and other new communication technologies to underserved areas of the state.

Griffo further serves on eight other standing committees, including Rules; Finance; Codes; Transportation; Commerce, Economic Development and Small Business; Crime Victims, Crime and Correction; Higher Education; Racing, Wagering & Gaming. He is also a member of the Senate Select Committee on State-Native American Relations, the Senate Majority Task Force On Counterterrorism And Public Protection and the Joint Senate Task Force on Heroin and Opioid Addiction. He also currently holds the title of Deputy Majority Whip and Co-chair of the New York State Legislative Sportsmen's Caucus.

Prior to his election, Griffo was Oneida County Executive from 2003 to 2006. His advocacy on behalf of Defense Department-related employment resulted in an increase of more than 600 jobs at Griffiss Business and Technology Park, an unprecedented accomplishment during Base Realignment and Closure Commission Hearings. Griffo developed an eight-county coalition to fight the development of a statewide power line and, teaming with fellow county leaders, helped convince the state Legislature to reform the Medicaid program that was burdening county budgets. While County Executive, Griffo was elected to the New York State Association of Counties' board of directors and was a member of the New York State Accreditation Council.

Griffo was elected three times as mayor of Rome, starting in 1991. He protected the local hospital from closure and helped engineer an economic recovery following the closure of the Griffiss Air Force Base. Then Gov. George E. Pataki appointed Griffo to serve on a blue ribbon panel on municipal lobbying as well as the state's Mohawk Valley Heritage Corridor Commission. Former Comptroller H. Carl McCall also picked Griffo for the Comptroller's Advisory Commission.

Griffo was president of the New York Conference of Mayors from 2000-2001 and was a board member of both that organization and the U.S. Conference of Mayors. He also co-chaired the Amtrak Mayor's Council. Before becoming mayor, Griffo was an Oneida County legislator, a director of community relations for Rome and an administrative assistant to the mayor. His public service career started with an internship in Assemblyman James Hurley's office. Griffo is a graduate of both Rome Free Academy and SUNY Brockport, where he earned magna cum laude distinction while receiving a bachelor's degree in political science.

Griffo and his wife, Lorraine, an elementary teacher in Camden, reside in Rome.

JACQUELINE IZZO

Mayor City of Rome



Jacqueline M. Izzo was elected Mayor of the City of Rome in November 2015 making history as the first female mayor of a major city in Oneida County.

A lifelong Roman, Mayor Izzo's administration is promoting growth of the city's tax base through commercial and residential development as well as strengthening the city's aging infrastructure, and promoting a more welcoming community for those wishing to establish a business or call Rome home.

Mayor Izzo has made economic development a priority and her team has worked very hard to identify projects which will make an impact on moving the city forward in the next several years. The City of Rome, under the Mayor's leadership, was the 2017 winner of the New York State \$10 million Downtown Revitalization Initiative (DRI). Just one of 10 cities selected in the 2017 competition statewide, the City of Rome is beginning to implement plans to transform the downtown Rome area with an eye toward the future. New residential housing, new business growth, improved infrastructure and quality of life enhancements are just some of the exciting plans for this area in the next few years.

Mayor Izzo is a proactive partner of the CNY Defense Alliance, supporting activities that promote and advocate for New York's DoD and federal assets including the Air Force Research Laboratory Information Directorate, Unmanned Aerial System Test Site, Eastern Air Defense Sector and Defense Finance and Accounting Service.

Ms. Izzo is also owner and President of Upstate New York Professional Services, d/b/a Central NY Transcription Service, providing medical transcription/dictation services to hospitals, physician offices, and urgent care clinics throughout the United States. While she did not have any medical dictation experience, her entrepreneurial instinct recognized that electronic based document management, e signature, e faxing, and online editing of the complete patient record utilizing the internet were game changing technologies. She created a business which disrupted the world of microcassette dictation by offering a more flexible capability that included capturing voice over the internet and linking the digital voice to the written record. This internet based capability allowed her company to be based in Rome, but to grow throughout the United States.

Prior to establishing her business, Ms. Izzo served as Oneida County Legislator 35th District and General Manager of the Quality Inn of Rome, NY. Ms. Izzo was also an active member of the Rome Area Chamber of Commerce for over 19 years, serving on the Board of Directors, including Chairperson in 1997, and Executive Committee. Jackie was also instrumental in kick starting the Oneida County Convention and Visitors Bureau in the mid 80s and has the distinction of being the longest serving Board President. She has a BS in Public Relations/Journalism from Utica College of Syracuse University.

WILLIAM WOLF

President

Griffiss Institute



Mr. William E Wolf is the President of the Griffiss Institute in Rome NY. The Griffiss Institute was established to build upon technologies under development at the Air Force Research Laboratory Information Directorate to further strengthen security of our nation's cyber infrastructure. In 2009, the Griffiss Institute entered into a Partnership Intermediary Agreement (PIA) with the AFRL Information Directorate to facilitate Technology Transfer (T2).

Mr. Wolf began his career in 1968 as an electrical engineer at the Rome Air Development Center (which later became the Air Force Research Laboratory). He held a variety of positions with progressive responsibility in both management and technical leadership. During his career he served on numerous technical and international committees relating to cyber security. He served as the Air Force lead and Chair for Project Reliance IA Subgroup. From 2004 through 2006, Mr. Wolf served as the US National Lead for The Technology Cooperation Program (TTCP), an international group comprised of scientists from the US, United Kingdom, Canada, Australia and New Zealand addressing technology developments in cyber security. He retired from civil service in March 2006 as Chief of the Cyber Operations Branch and later that year assumed his current position as President of the Griffiss Institute.

PAUL ANTONIK

Chief Scientist, Information Directorate Air Force Research Laboratory



Dr. Paul Antonik, a member of the Scientific and Professional Cadre of Senior Executives, is the Chief Scientist, Information Directorate, Air Force Research Laboratory, Rome, N.Y. The Information Directorate leads the discovery, development and integration of affordable warfighting information technologies for air, space and cyberspace forces. It consists of more than 800 military and civilian scientists, engineers, and administrative and support personnel pursuing a wide variety of research and development projects with an annual budget of more than \$1 billion. Dr. Antonik serves as the directorate's principal scientific and technical adviser and primary authority for the technical content of the science and technology portfolio. He provides principal technical oversight of a broad spectrum of information

technologies.

Dr. Antonik began his career with the Air Force in 1978 when he joined the Rome Air Development Center, where he advanced as an electronics engineer from grade GS-7 to grade GS-12. In 1983, he transitioned to the private sector, where he served as a systems engineer and designed, developed and evaluated a wide variety of sensor systems, waveforms and signal processing techniques. In 1998, he returned to government service, joining the Air Force Research Laboratory, Sensors Directorate, where he developed waveform diversity and knowledge-aided signal processing techniques. In 2009, Dr. Antonik joined the Information Directorate to become Technical Adviser of the Advanced Computing Division. He later became Technical Adviser to the Computing and Communications Division. Dr. Antonik entered the senior executive service in 2012 as the Air Force Senior Scientist for Connectivity and Dissemination. Dr. Antonik holds 4 U.S. patents, and has authored or co-authored more than 55 journal, conference and technical papers and reports. Additionally, Dr. Antonik participates in several national and international panels, committees, and working groups. He is also a licensed Professional Engineer.

GRACE WANG

Senior Vice Chancellor

Research and Economic Development

State University of New York



Appointed by the SUNY Board of Trustees, Dr. Wang has served as Senior Vice Chancellor and previously as Vice Chancellor for Research and Economic Development since January 2017. In this role, Dr. Wang plays a lead role in designing, directing, and expanding the footprint of SUNY's research, graduate education, industry relations, and economic development activities. She supports the SUNY Chancellor in advancing SUNY's overall strategy and mission, and serves as a liaison to the SUNY Board of Trustees in the areas of research and economic development. She is committed to supporting SUNY research faculty and coordinates the SUNY Research Council, and Vice Presidents for Research Council. She works with the Research Foundation for SUNY, providing the research vision and strategic directions the organization will work to operationally support.

In June 2018, the SUNY Board of Trustees and SUNY Chancellor Kristina M. Johnson also appointed Dr. Wang as SUNY Polytechnic Institute Interim President.

During Academic Year 2017/2018, Dr. Wang also served as Interim System Provost. In this role, Dr. Wang supported the Chancellor and Board of Trustees to drive academic programs and policies; support the university's deep commitment to diversity, equity, and inclusion; lead strategic enrollment across SUNY campuses; guide the enrichment of the educational experience; enable pathways for student success and completion; and lead the identification and implementation of best practices at scale.

Prior to SUNY, Dr. Wang served as acting Assistant Director for Engineering at the National Science Foundation (NSF). In this role, she led the Engineering Directorate at NSF, managing a funding portfolio of over \$900 million dedicated to investments in frontier engineering research, supporting engineering education, and fostering innovation and technology commercialization. She previously served as NSF's Deputy Assistant Director for Engineering, overseeing the operation of the Directorate for Engineering and helping to identify and implement research, innovation, and education priorities. Previously at NSF, Dr. Wang was the Division Director of Industrial Innovation and Partnerships (IIP) division. She joined NSF in June 2009 as a Program Director for the SBIR/STTR Program, focusing on investing in small businesses in the areas of nanotechnology, advanced materials, and manufacturing.

Dr. Wang began her career at IBM/Hitachi Global Storage Technologies, focusing on research and development of magnetic thin film and carbon overcoat for data storage. She holds seven U.S. patents. Dr. Wang received her Ph.D. in Materials Science and Engineering from Northwestern University.

CARL WILLIAMS, Jr.

Acting Director, Physical Measurement Laboratory Fellow, Joint Quantum Institute and QulCS National Institute of Standards and Technology



Carl J. Williams is the Acting Director of the Physical Measurement Laboratory (PML), National Institute of Standards and Technology (NIST). He is a Fellow of the Joint Quantum Institute and the Joint Center for Quantum Information in Computer Science and Adjunct Professor of Physics at the University of Maryland (UMD). He directs the Quantum Information Program and helps lead the National Strategic Computing Initiative at NIST. He is a member and chairs interagency efforts in support of these activities under the Committee of Science of the National Science and Technology Council. He is a member of the Executive Leadership Team within the PML and represents the PML to other federal agencies.

Dr. Williams received his B.A. in Physics from Rice University in 1981, his Ph.D. from the University of Chicago in 1987, joined NIST in 1998 becoming coordinator of the NIST Quantum Information Program in 2000 and Chief of the Atomic Physics Division of the NIST Physics Laboratory in 2004 before being appointed Chief of the Quantum Measurement Division of the NIST Physical Measurement Laboratory in 2011. In 2006, Dr. Williams helped establish the Joint Quantum Institute (JQI), became a founding Fellow of the JQI, and the first NIST co-Director of the JQI – a position he held until spring 2011. Dr. Williams worked as a senior policy analyst within the Office of Science and Technology Policy (OSTP), Executive Office of the President from April 2008 until July 2010. He is a Fellow of the American Physical Society, the American Association for the Advancement of Science, and the Washington Academy of Science. He received the Department of Commerce Silver Medal in 2003 for his leadership of the NIST Quantum Information Program, the Department of Commerce Gold Medal for science in 2008 for scientific contributions and was awarded the 2005 Arthur S. Flemming Award for Scientific Excellence in Government Service for his contributions to quantum physics. He is an Associate Editor of the Journal of Quantum Information and Computation, has authored over 110 scientific publications, and has been a speaker at numerous national and international conferences.

MICHAEL HAYDUK

Chief of the Computing and Communications Division

Air Force Research Laboratory



Dr. Michael J. Hayduk is the Chief of the Computing and Communications Division, Air Force Research Laboratory, Information Directorate, Rome, New York. The division's mission is to lead the discovery, development and integration of affordable computing, networking and communications technologies for our air, space and cyberspace forces. Dr. Hayduk is responsible for defining, planning, budgeting, advocating, managing and directing the execution of the research program and leads all aspects of personnel management within the division

Dr. Hayduk joined the Air Force through the Palace Knight educational program in 1991 and was assigned to Rome Laboratory. Upon completion of his graduate studies, he served as a research engineer where he developed ultrafast solid state pulsed lasers for optical communication systems. As a team leader Dr. Hayduk led the development of microwave photonic components and subsystems for use in radio frequency sensors. Dr. Hayduk became the acting Chief for the Electro-Optic Components Branch in 2007 in the AFRL Sensors Directorate which developed components and subsystems for advanced radio frequency and electro-optic AF sensor systems. In 2007 he became the Chief of the Emerging Computing Technology Branch in the AFRL Information Directorate which performs fundamental and exploratory research and development in nanocomputing, quantum computing, computational intelligence and optical computing for advanced computing architectures. Dr. Hayduk has published more than 50 journal and conference papers and holds one US patent.

EDUCATION

1991 Bachelor of Science in Electrical Engineering, Clarkson University, Potsdam, NY
1993 Master of Science in Electrical Engineering, University of Virginia, Charlottesville, VA
1997 Doctor of Philosophy in Electrical Engineering, Cornell University, Ithaca, NY
2008 Air War College (correspondence), Air University, Maxwell AFB, AL

EDEN FIGUEROA

Associate Professor

Stony Brook University



In 2013 Edén Figueroa became group leader for the Quantum Information Technology group at Stony Brook University. From September 2008 to December 2012 he was postdoc in the Quantum Dynamics Group of Prof. G. Rempe at the Max Planck-Institute für Quantenoptik in Garching, Germany.

Prof. Edén Figueroa's Quantum Information Technology group has been active for over five years and has pioneered quantum information and technology activities in Stony Brook. He has published numerous scientific papers, focusing on engineering novel quantum storage devices and information processing units that will enable future quantum information communication networks and computing. More specifically, Prof. Figueroa's laboratory has focused on developing scalable room temperature quantum light matter

interfaces capable of storing quantum information. His laboratory has also developed sources of single photons tuned for atomic interaction. Currently, the laboratory is developing a prototype of a network of quantum devices in which the photons are used to communicate quantum information among atomic ensemble nodes, where it can be stored and processed. Furthermore, the laboratory is also designing quantum transistors and logic-gates using cold atoms inside optical cavities. The short-term goal of Prof. Figueroa's research is to combine all produced devices to create an elementary quantum computer. Prof. Figueroa is also the CSO of a quantum start up QUNNECT LLC, which is a company dedicated to commercializing quantum communication devices using quantum memories to achieve long distance quantum protected operation.

Most cited quantum publications:

- 1) *An elementary quantum network of single atoms in optical cavities*, S Ritter, C Nölleke, C Hahn, A Reiserer, A Neuzner, M Uphoff, M Mücke, E. Figueroa, Nature 484, 195 (2012). **602 citations.**
- 2) *Quantum memory for squeezed light*, J Appel, E Figueroa, D Korystov, M Lobino, Al Lvovsky, Physical Review Letters 100 (9), 093602 (2008). **362 citations.**
- 3) *A single-atom quantum memory*, HP Specht, C Nölleke, A Reiserer, M Uphoff, E Figueroa, S Ritter, ...Nature 473, 190 (2011). **310 citations.**
- 4) *Electromagnetically induced transparency with single atoms in a cavity*, M Mücke, E Figueroa, J Bochmann, C Hahn, K Murr, S Ritter, ... Nature 465, 755 (2010). **262 citations.**
- 5) *Complete characterization of quantum-optical processes*, M Lobino, D Korystov, C Kupchak, E Figueroa, BC Sanders, Al Lvovsky. Science 322, 563-566 (2008). **113 citations.**
- 6) *Decoherence of electromagnetically induced transparency in atomic vapor*, E Figueroa, F Vewinger, J Appel, Al Lvovsky. Optics letters 31, 2625-2627 (2006). **113 citations.**

Quantum related patents: Provisional Patent: "System and method for room-temperature quantum secure network" - docket: 180-083 (2018).

HERBERT FOTSO

Assistant Professor

University at Albany



Herbert Fotso is a faculty member in the Department of Physics at the University at Albany SUNY. His research falls under the large umbrella of Theoretical/Computational Condensed Matter Physics. Research interests include correlated systems in and out of equilibrium as well as the control of quantum emitters and spin systems for quantum information processing. I have particularly been interested in high temperature superconductivity, ultracold atoms in optical lattices, the dynamics of field-driven quantum systems as well as the dynamics of quantum emitters in the solid state that are prime candidate for qubits in Quantum Information Processing.

Quantum related research and interests:

- Nonequilibrium quantum systems, quantum information processing, quantum optics, quantum control, strongly correlated systems, ultracold atomic gases, quantum metrology.
- Theoretical and computational studies of the interaction of light and matter as it relates to fundamental Quantum Information Processing operations.
- Theoretical and computational studies of correlated quantum systems in and out of equilibrium

Most cited quantum publications:

- *Suppressing Spectral Diffusion of the Emitted Photons with Optical Pulses*, Herbert F. Fotso, A. E. Feiguin, D. D. Awschalom, and V. V. Dobrovitski, Phys. Rev. Lett. 116, 033603 (2016).
- *Proximity of the Superconducting Dome and the Quantum Critical Point in the Two-Dimensional Hubbard Model*, S.-X. Yang, Herbert Fotso, S.-Q. Su, D. Galanakis, E. Khatami, J.-H. She, J. Moreno, J. Zaanen, and M. Jarrell, Phys. Rev. Lett. 106, 047004 (2011).
- *Parquet approximation for the 4x4 Hubbard cluster*, S. X. Yang, Herbert Fotso, J. Liu, T. A. Maier, K. Tomko, E. F. D'Azevedo, R. T. Scalettar, T. Pruschke, and M. Jarrell, Phys. Rev. E 80, 046706 (2009).
- *Thermalization of field driven quantum systems*, Herbert F. Fotso, K. Mikelsons and J. K. Freericks, Nature's Scientific Reports 4, 4699 (2014).

Education:

PhD. Physics, Louisiana State University

KERSTIN KLEESE VAN DAM

Director, Computational Science Initiative

Brookhaven National Laboratory



Kerstin Kleese van Dam is the director of the Computational Science Initiative (CSI) at the Department of Energy's Brookhaven National Laboratory (BNL), in Long Island, NY. With over 150 petabytes, BNL hosts the second largest scientific data archive in the US and the fourth largest in the world, it processes annually in access of 690 petabytes of scientific results. CSI conducts leading edge computer science and applied mathematics research to address the associated analysis challenges, specific focus areas are machine learning, programming models, and systems and architectures. Before she joined BNL Kerstin was associated division director at Pacific Northwest National Laboratory, Director of Computing at University College London Medical School and Data Management Group Lead at the Science and Technology Facilities Council in the UK.

Quantum related research and interests: Kerstin's directorate is involved in collaborative efforts in quantum networking, quantum programming models and quantum algorithm development within the Northeast Quantum Systems Center founded by BNL, which includes partners such as Harvard, Yale, Columbia, Princeton, MIT, Stony Brook, Toronto and Tufts. In addition CSI is in the process of establishing a quantum computing testbed, with its collaborators NIST and Raytheon.

Education:

Computer Science

QUANXI JIA

Empire Innovation Professor and National Grid Professor of Materials Research University at Buffalo



Quanxi Jia is an Empire Innovation Professor and National Grid Professor of Materials Research at the University at Buffalo. He is also the Scientific Director of New York State Center for Excellence in Materials Informatics. Prior to joining the University at Buffalo in 2016, he was the Director of the Center for Integrated Nanotechnologies, a DOE Nanoscale Science Research Center operated jointly by Los Alamos and Sandia National Laboratories. Jia's research areas include synthesis and study of the structure-property relationships of nanostructured materials, multifunctional materials, and thin films; development of novel deposition techniques for the growth of electronic materials; as well as development and fabrication of novel solid-state microelectronic/electro-optic devices. He has authored/co-authored

over 480 peer-reviewed journal articles and holds 49 U.S. patents. He is an elected Fellow of the Los Alamos National Laboratory, MRS, APS, ACerS, AAAS, and IEEE

Quantum related research and interests: Professor Jia's research on quantum materials are mostly on controlled synthesis of epitaxial heterostructures and/or nanocomposites, and fundamental understanding of the processing-structure-property relationship of the materials using advanced probing techniques. The materials include superconductors (NbN, NbC, MoN, and YBCO), magnetic materials, and multiferroics. He has also worked on high temperature superconducting Josephson junctions, SQUIDs, filters, and resonators.

Most cited quantum publications:

- "Strongly enhanced current densities in superconducting coated conductors of $\text{YBa}_2\text{Cu}_3\text{O}_{7-x} + \text{BaZrO}_3$," *Nature Materials* **3** (7), 439 (2004). [Citation > 1000](#)
- "Transport magnetism correlations in the ferromagnetic oxide $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$," *Applied Physics Letters* **67** (6), 860 (1995). [Citation > 400](#)
- "Strain control and spontaneous phase ordering in vertical nanocomposite heteroepitaxial thin films," *Nature Materials* **7** (4), 314 (2008). [Citation > 240](#)

Quantum related patents: None.

Education:

PhD in Electrical & Computer Engineering, University at Buffalo

SATYAVOLU “POPS” PAPA RAO

Associate Vice President for Research

SUNY Polytechnic Institute



Papa Rao joined Texas Instruments in 1996 right after graduating from MIT, and worked on technologies ranging from 64Mb DRAM to 32nm node logic devices till 2007. He then joined IBM's T.J. Watson Research Center, working on advanced node fabrication processes, and nanostructures DNA nucleotide sensing among other projects. In 2014, he became the Director of Process Technology at SEMATECH, and was appointed Chief Technology Officer in 2015. In June 2017, he became the Associate VP for Research at SUNY Polytechnic Institute. He leads the SUNY Poly efforts on quantum computing device research, and other exploratory research. He holds over 50 US patents, and has co-authored over 40 publications (journal articles and conference proceedings).

Quantum related research and interests: Have demonstrated transmon qubits with tight frequency control, fabricated using 193nm lithography. Current projects include the fabrication of fully fab-compatible Josephson junctions (both self-shunted and not) leveraging advanced processes and materials available in the 300mm SUNY Poly line, fabrication of UV-transparent waveguides at 300mm scale, fabrication of superconducting nanowire single-photon detector structures using 193nm lithography for use in photonic quantum computing architectures as well as in superconducting optoelectronic neuromorphic computing architectures. We are fortunate to have partnerships with Syracuse University, U. Maryland, Yale and Auburn University, as well as Hypres Inc.

Quantum publications:

“Materials And Processes For Superconducting Qubits And Superconducting Electronic Circuits On 300mm Wafers”, S.S. Papa Rao et al, ECS Transactions vol. 85, no. 6, pp 151-161 (2018).

Quantum related patents: none

Education:

Ph.D., Materials Science & Engineering, MIT, Cambridge, MA (1996)
B. Tech, Metallurgical Engineering, IIT-Madras, India (1988)

STEVEN CZARNECKI

Associate Director, S3IP Center of Excellence

Binghamton University



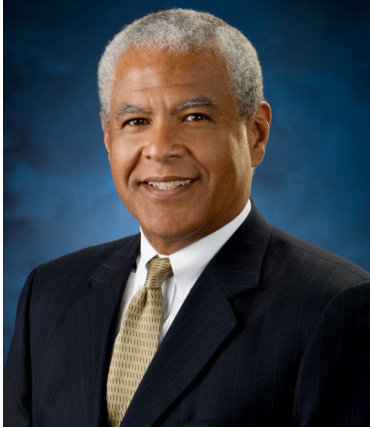
Associate Director for the Small Scale Systems Integration and Packaging (S3IP), a New York state Center of Excellence, an umbrella organization integrating the efforts of five research centers and an advanced instrumentation laboratory. Provides managerial oversight of day to day operations and develops strategic expansions of the client base and research program portfolio. The S3IP partners with industry, providing expertise in microelectronics packaging, reliability, flexible electronics, energy efficiency, and alternative energy technologies, generating documented economic benefit (business revenue and cost savings, and job creation/retention) for New York state companies.

EDWARD WHITE

Associate Vice President

Test, Assembly and Optical Packaging

AIM Photonics



Ed White began his career at the Eastman Kodak Company after earning a Bachelor of Science degree in Mechanical Engineering. He later earned an MBA, also from the University of Rochester.

At Kodak, Ed held several executive positions with global responsibility including Vice President, Kodak Optical Products, Vice President World Wide Equipment Manufacturing and Vice President Global Ink Jet Manufacturing.

After leaving Kodak in 2009, Ed founded Edward White Consulting, LLC an independent consulting firm specializing in Optics & Photonics and global Operations and Manufacturing.

In 2011, Ed was selected by the National Academy of Sciences to be a co-author of the NAS study: “Optics and Photonics: Essential Technologies for Our Nation” which was published in 2012. Recommendations that have been adopted from the NAS study include the creation of the *National Photonic Initiative* and the creation of an advanced manufacturing institute focused on Optics and Photonics (now the *American Institute for Manufacturing Integrated Photonics* – “AIM Photonics”).

Ed’s current position at AIM Photonics is Associate Vice President; Test, Assembly and Optical Packaging (TAP). In this role Ed has responsibility for the Test, Assembly and Optical Packaging business. Ed also serves as the current Chair of the National Photonics Initiative, a collaborative alliance of industry, academia and government focused on raising awareness of optics, photonics and quantum science and technology.

KATHY-ANNE SODERBERG

Senior Research Scientist

Air Force Research Laboratory



Dr. Kathy-Anne Brickman Soderberg is a Senior Research Scientist at the Air Force Research Laboratory (AFRL) Information Directorate in Rome, NY. Dr. Soderberg is the primary investigator and team leader for AFRL's Trapped-Ion Quantum Networking group. Dr. Soderberg received a B.S. in physics from the College of William and Mary, a M.S. and Ph.D. in physics from the University of Michigan, and was a postdoctoral researcher at the University of Chicago. Dr. Soderberg has over fifteen years of technical experience in atomic physics and quantum information processing. Her graduate work focused on trapped-ion quantum computing research and included key demonstrations of phonon-mediated entangling gates and proof-of-principle quantum algorithms (the Grover search algorithm). Her postdoctoral work focused on novel neutral-atom quantum computing and

the difficulties associated with targeted atomic interactions and optical lattice translation and control. Before joining AFRL, Dr. Soderberg was a Booz Allen Hamilton technical consultant for quantum information science.

SIDDARTH KRISHNAN

Director, New Markets and Alliances

Applied Materials



Siddarth Krishnan is an experienced Director with a demonstrated history of working in the semiconductors industry. Mr. Siddarth is skilled in Management, Research and Development (R&D), Matlab, Semiconductors, and Integrated Circuits (IC). He is a strong professional with a Ph.D focused in Electrical and Computer Engineering from The University of Texas at Austin.

JOEL GOTTLIEB

Senior Pre-Sales Analyst

D-Wave Systems



Dr. Joel M. Gottlieb joined D-Wave in January 2016 as Senior Pre-Sales Analyst, after 20 years in and out of AT&T and AT&T Research. He earned a Ph. D from University of Wisconsin--Madison in condensed matter physics, after graduating from the University of Michigan. At D-Wave, he focuses mainly on getting new people on to the quantum computer, and also does research in finding basic problems which show the power of the computer. He loves learning new subjects and new technology, and also enjoys talking music.

DANIEL MAYNARD

Business Development Executive

IBM Research



Mr. Maynard is responsible for building alliances and partnerships for IBM Research, which currently includes Science and Technology, Quantum Computing, IoT, and Security research topics. He launched the IBM Research Frontiers Institute at the beginning of 2016, which is a consortium providing access to a number of research growth areas in information technologies initially shaped by physical sciences and since has expanded to other areas of research, such as artificial intelligence.



Name: Paul M. Alsing, Ph.D

Title: Principal Research Physicist, Group Lead, Quantum Information Processing Group

Institution: Air Force Research Laboratory

Department: Information Directorate

Career Overview: Dr. Paul M. Alsing is a Principal Research Physicist and the Group Lead for Quantum Information Science at the Air Force Research Laboratory, Information Directorate, Rome, NY. He began his civilian government career with AFRL in 2005 at the Space Vehicles Directorate, Kirtland AFB. In 2009, he transferred to the Information Directorate, Rome Research Site to develop and lead a theory and experimental Quantum Information Science group focused on photon-based quantum computing and information processing. In 2016 he became Program Manager and Technical Lead for AFRL's participation in

the OSD funded tri-service DoD Laboratory Quantum Science and Engineering program which established a trapped ion group focused on quantum memories for quantum communication and networking and a focus on quantum information processing in integrated waveguide devices. His ground breaking research in Relativistic Quantum Information theory extends the boundary of our understanding of quantum entanglement, the principle that underlies the heart of the computational power of quantum computation. He is recipient of the 2016 68th Arthur S. Flemming Award for Basic Science in federal government, and became an Air Force Fellow in 2018.

Quantum related research and interests: Relativistic quantum information, quantum entanglement and distribution, quantum information processing and computing, quantum networking, integrated waveguide quantum photonic theory and devices.

Most cited quantum publications:

"Teleportation with a uniformly accelerated partner," P.M. Alsing, G.J. Milburn, Physical Review Letters **91** (18), 180404 (2003).

"Entanglement of Dirac fields in noninertial frames," P.M. Alsing, I. Fuentes-Schuller, R.B. Mann, T.E. Tessier, Physical Review A **74** (3), 032326, (2006).

"Observer dependent entanglement," P.M. Alsing and I. Fuentes, Class. Quantum Grav. **29**, 224001, Special Issue on Relativistic Entanglement (2012).

Recent Publications:

P.M. Alsing, E.E. Hach III, C.C. Tison and A.M. Smith, "A quantum optical description of losses in ring resonators based on field operator transformations," Phys. Rev. A. **95**, 053828 (2017).

P.M. Alsing and E.E. Hach III, "Photon-pair generation in a lossy microring resonator. I. Theory," Phys. Rev. A **96**, 033847 (2017).

P.M. Alsing and E.E. Hach III, "Photon-pair generation in a lossy microring resonator. II. Entanglement in the output mixed Gaussian squeezed state," Phys. Rev. A **96**, 033848 (2017)

Quantum related patents:

Method and apparatus for quantum holographic information processing, US9047571B2

Periodic probabilistic two-dimensional cluster state generator with arbitrary interconnections, US8995797B2

Education:

Ph.D, Quantum Optics



Name: Michael L. Fanto

Title: Research Physicist, Experimental Lead, Quantum Information Processing Group

Institution: Air Force Research Laboratory

Department:

Career Overview: Michael L. Fanto is a research physicist with the Air Force Research Laboratory (AFRL) Information Directorate in Rome, NY. He is the Experimental lead for the Photon-based Quantum Information Processing Group. At the same time, he is a graduate student member of the Future Photon Institute (FPI) at Rochester Institute of Technology (RIT) conducting research in integrated quantum photonics. He completed his BS degree in Physics from

Utica College in 2002 with his research project focused on ultra-fast ultra-stable mode-locked erbium-doped fiber lasers. After completing his BS degree, he accepted a position at AFRL. While at AFRL he has conducted research in a number of areas including fiber laser systems, optical modulators, laser radar, and quantum information science, including quantum computation. In 2015 he accepted the admission to RIT to start his Ph.D. in microsystems engineering in the integrated photonics group of Dr. Stefan Preble. He has been conducting research on photon pair sources utilizing the third order nonlinearity in silicon and the enhanced efficiency gained from a microring resonator. This research has broadened to include photon generation in the ultraviolet regime, beyond the typically generated infrared photons from silicon to align with trapped ion quantum memory technologies. Michael has over 50 publications in various areas and holds 6 US patents on implementations of photonic circuitry for quantum photon sources.

Quantum related research and interests: Quantum information processing, quantum networking, entanglement distribution, entanglement quantification, single and entangled photon generation, and integrated photonics.

Most cited quantum publications:

On-Chip Quantum Interference from a Single Silicon Ring-Resonator Source, Stefan F. Preble, Michael L. Fanto, Jeffrey A. Steidle, Christopher C. Tison, Gregory A. Howland, Zihao Wang, and Paul M. Alsing, Phys. Rev. Applied 4, 021001 – Published 20 August 2015

Z. Vernon, M. Menotti, C. C. Tison, J. A. Steidle, M. L. Fanto, P. M. Thomas, S. F. Preble, A. M. Smith, P. M. Alsing, M. Liscidini, and J. E. Sipe, "Truly unentangled photon pairs without spectral filtering," Opt. Lett. 42, 3638-3641 (2017)

Quantum related patents:

Apparatus and method for a symmetric sequential entangler of periodic photons in a single input and output mode, US9146441B2

Two dimensional photonic cluster state generator from sequential photons with multiple entanglement gates, US9264148B2

Two dimensional photonic cluster state generator from sequential photons with fixed delay loopback, US9083473B1

Two dimensional photonic cluster state generator from sequential photons with variable delay loopback, US9077457B1

Sequential entangler of periodic photons in a single input and output mode, US9075282B2

Periodic probabilistic two-dimensional cluster state generator with arbitrary interconnections, US8995797B2

Education:



Name: David Hucul

Title: Physicist

Institution: Air Force Research Laboratory

Department:

Career Overview: I received my PhD from the University of Maryland in 2015 (adviser: Chris Monroe) where I worked on building quantum networks with trapped Yb ions. My work involved the juxtaposition of entanglement gates using phonon modes between adjacent trapped ions with the heralded remote entanglement between ions in separate vacuum chambers. I worked as a post doc at UCLA (2015-2018) pioneering the use of a new qubit: $^{133}\text{Ba}^+$ ions. This work culminated in the lowest single qubit error rate qubit ever achieved on any platform. I am currently at AFRL where I work on quantum networking and quantum sensing.

Quantum related research and interests: I am an experimentalist in quantum communication and information processing in the field of atomic, molecular and optical physics. My research interests center around quantum networking and information processing and my experience has primarily involved laser cooled, isolated atomic systems to serve as hosts for quantum bits. I am interested in scaling up small quantum systems as a means to simulate and to interface with condensed matter systems and to serve as arrays of quantum sensors.

Most cited quantum publications:

"Modular entanglement of atomic qubits using photons and phonons," D. Hucul et al., *Nature Physics* **11**, 37-42 (2015).

"Entanglement of distinguishable quantum memories," G. Vittorini et al., *Phys. Rev. A* **90**, 040302(R) (2014).

"Entanglement of atomic qubits using an optical frequency comb," D. Hayes et al., *Phys. Rev. Lett.* **104**, 140501 (2010).

Quantum related patents: N/A

Education:

PhD: University of Maryland (2015)



Name: Steven T Johns

Title: Branch Chief

Institution: Air Force Research Laboratory

Department: Information Directorate, Rome NY

Career Overview: Photonics, material characterization, laser and fiber optics. Supervise Quantum Photonics groups, which include quantum photonic devices and algorithm development on quantum computers.

Quantum related research and interests:

Developing partnerships in the development of algorithm and simulation models on quantum computers.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

MS Applied Physics University of Arizona, BS EE Syracuse University



Name: Kaitlin Poole

Title: Military Officer - Quantum Networking Lab Manager

Institution: Air Force Research Laboratory

Department: Information Directorate

Career Overview: I received my bachelors degree in physics from Montana State University in 2016, at which time I commissioned into the US Air Force as a Second Lieutenant, after completing the ROTC program. My first duty assignment has been working at the Air Force Research Labs Information Directorate in Rome, NY (AFRL/RI). At AFRL/RI, I have worked predominately with the Quantum research groups specifically the Quantum Networking with trapped ions group. My undergraduate research areas include: high power ultra-short pulse lasers, rare earth doped crystal growth, material properties for use in laser spectroscopy, and external cavity diode lasers.

Quantum related research and interests: The only Quantum related research that I have done full time has been with AFRL on the Quantum Networking project. For collaborations and partnerships, please refer to Kathy-Anne Soderberg's Quantum Profile.

Most cited quantum publications:

The only quantum publication that I have been an author on is:

B. Tabakov, J. Bell, D. F. Bogorin, B. Bonenfant, P. Cook, L. Disney, T. Dolezal, J. P. O'Reilly, J. Phillips, K. Poole, L. Wessing, K.-A. Brickman- Soderberg, "Towards using trapped ions as memory nodes in a photonmediated quantum network," Proc. SPIE 10660, Quantum Information Science, Sensing, and Computation X, 106600L (16 May 2018); doi: 10.1117/12.2305058

Quantum related patents: N/A

Education:

Bachelor of Science in Physics from Montana State University Bozeman

Will begin a Master's program at the Air Force Institute of Technology (AFIT) in summer 2019



Name: Boyan Tabakov

Title: Physicist

Institution: Air Force Research Laboratory

Department: Information Directorate

Career Overview: Since 2015, developing new capabilities at AFRL with focus on building Quantum Networks with trapped ions as memory nodes and photons as information carriers.

Quantum related research and interests: Working towards demonstrating entanglement between multiple delocalized qubits implemented with trapped ions; trapped ion - photon interfaces; trapped ion – photon hybrid devices; distributed Quantum Computing; Quantum sensors.

Most cited quantum publications: n/a

Quantum related patents: n/a

Education:

Ph.D. in Physics



Name: Christopher C. Tison

Title: Research Physicist, Quantum Information Processing Group

Institution: Air Force Research Laboratory

Department:

Career Overview: Christopher C. Tison is a recent hire (June 2018) at the Air Force Research Laboratory (AFRL) Information Directorate in Rome, NY within the Photon-based Quantum Information Processing Group. He received his Ph.D. in physics from Florida Atlantic University through co-advisors Dr. Warner A. Miller and Dr. Paul M. Alsing in May 2018 in the field of quantum optics.

Quantum related research and interests: Christopher C. Tison's research interests pertain to scaling quantum photonics to a level which is capable of performing non-trivial processing. He has worked closely with Dr. Stefan Preble's group at Rochester Institute of Technology (RIT) to develop integrated single-photon sources and with Dr. Gregory A. Howland at RIT and Dr. James Schneeloch at AFRL to characterize high dimensional entanglement.

Most cited quantum publications:

On-Chip Quantum Interference from a Single Silicon Ring-Resonator Source, Stefan F. Preble, Michael L. Fanto, Jeffrey A. Steidle, Christopher C. Tison, Gregory A. Howland, Zihao Wang, and Paul M. Alsing, Phys. Rev. Applied 4, 021001 – Published 20 August 2015

Z. Vernon, M. Menotti, C. C. Tison, J. A. Steidle, M. L. Fanto, P. M. Thomas, S. F. Preble, A. M. Smith, P. M. Alsing, M. Liscidini, and J. E. Sipe, "Truly unentangled photon pairs without spectral filtering," Opt. Lett. 42, 3638-3641 (2017)

Quantum related patents:

Education:

Ph.D. in Physics from Florida Atlantic University 2018



Name: Laura Wessing
Title: Research Computer Scientist
Institution: Air Force Research Laboratory
Department: AFRL/RITA

Career Overview: I have been working with the Air Force Research Laboratory Information Directorate since 2015 upon graduating from the State University of New York College at Potsdam.

Quantum related research and interests: Interests include research to exploit quantum computation applications for computationally hard Air Force problems.

Education:

- 2015 Bachelor of Arts, Computer Science, State University of New York College at Potsdam, Potsdam, NY
- 2015 Bachelor of Arts, Mathematics, State University of New York College at Potsdam, Potsdam, NY
- 2015 Master of Arts, Mathematics, State University of New York College at Potsdam, Potsdam, NY



Name: Mingwei Zhu

Title: Sr. Manager for Advanced Technologies

Institution: Applied Materials

Department: Office of the CTO

Career Overview: Dr. Mingwei Zhu received his Ph.D in Physics from Rensselaer Polytechnic Institute and has been with Applied Materials since 2010. He has 15 years experience in GaN and CMOS semiconductor material and devices. The projects he led include optoelectronics, power, CIS, RF MEMS, advanced display, optical films and quantum computing. Dr. Zhu has authored 36 original publications in peer-reviewed journals and conference proceeding and holds 15 patents / patent applications. Zhu is an IEEE senior

member.

Quantum related research and interests: Photonics quantum computing, superconducting films, SNSPDs

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

Ph.D. in Physics, Rensselaer Polytechnic Institute



Name: Tara P. Dhakal
Title: Assistant Professor
Institution: Binghamton University
Department: Electric and Computer Engineering

Career Overview: Tara P. Dhakal received his B.S. and M.S. degrees in Physics and Material Science from Tribhuvan University, Kathmandu, Nepal and Shimane University, Matsue, Japan in 1998 and 2001, respectively. He received his Ph.D. degree in Physics from the University of Florida, Gainesville in 2008 where he studied complex magnetic oxide thin films. He joined University of South Florida as a postdoctoral researcher and was involved in the areas of spintronics, solar and thermoelectric materials. He has been working at the Center for

Autonomous Solar Power (CASP) at Binghamton University since April 2010 as a research scientist. He is currently Director of the CASP center and holds an assistant professor position at the electrical and computer engineering department at Binghamton University. Recently, Dr. Dhakal received NSF CAREER award to investigate lead free and stable perovskite solar cells. Dr. Dhakal has published more than 50 peer-reviewed articles in journals such as Nature Physics, Phys. Review Letter, ACS Applied Materials and Interfaces, and IEEE Transactions on Device and Materials Reliability. He is a member of IEEE, American Physical Society (APS), Material Research Society (MRS), American Vacuum Society (AVS), and Japanese Physical Society.

Quantum related research and interests: Dr. Dhakal's interests are in synthesis and assembly of novel 2D-based thin-film topological quantum materials for spin lifetime improvement. The Dhakal group has extensive experience with ALD growth techniques, which allows coating in atomic layer precision. The ALD system utilizes sequential self-limiting surface reactions between the precursors to achieve atomic layer controlled conformal thin film growth. Dr. Dhakal has worked on spintronic devices using complex magnetic oxides such as manganites. Dr. Dhakal has found evidence of carrier-mediated room temperature ferromagnetism in dilute magnetic semiconductor such as Mn-doped ZnO. He recently submitted a proposal to establish a Quantum Foundry (NSF- Q-AMASE-i) in collaboration with Caltech, Cornell, University of South Florida, and the industrial partner Zyvex Labs.

Most cited quantum publications:

- **Tara P. Dhakal**, Daniel Vanhart, Rachel Christian, Abhishek Nandur, Anju Sharma and Charles R. Westgate, "Growth Morphology and Electrical/Optical Properties of Al-doped ZnO thin films grown by ALD", Journal of Vacuum Science and Technology A 30, 021202 - 021212 (2012)
- Devajyoti Mukherjee, **Tara P. Dhakal**, Hariharan Srikanth, Pritish Mukherjee and Sarath Witanachchi "Evidence for carrier-mediated magnetism in Mn doped ZnO thin films", PRB, 81, 205202 (2010)
- **Tara P. Dhakal**, D. Mukherjee, P. Mukherjee, S. Hariharan, and S. Witanachchi, "Magnetic anisotropy in epitaxial cobalt ferrite grown by pulsed laser deposition", Journal of Applied Physics, 107, 053914 (2010)
- G.Singh Bhalla, S. Selcuk, **Tara P. Dhakal**, A. Biswas, A.F. Hebard, "Intrinsic Tunneling in Phase Separated Manganites", Phys. Rev. Lett. 102, 077205 (2009)
- **Tara P. Dhakal**, Jacob Tosado, and Amlan Biswas, "Effect of strain and electric field on the electronic soft matter in manganite thin films", Phys. Rev. B 75, 092404 (2007)

Quantum related patents: N/A

Education:

PhD in Physics, University of Florida, 2008



Name: Jiye (James) Fang

Title: Associate Professor

Institution: Binghamton University

Department: Chemistry/ Materials Science and Engineering

Career Overview: Fang focuses on the synthesis and manipulation of functional nanocrystals (NCs) with size-, crystallographic facet- and surface control using wet-chemical approach. He is also interested in the exploit of the correlation between the NC structure and its property such as electronic and magnetic behaviors. He was also involved in spintronic research projects. He has research expertise of diluted magnetic semiconductor quantum dot synthesis and spintronic exploration. He is currently participating in a DOE EFRC as a Co-PI and an NSF research project (PI). He also serves as a Co-PI in an NSF S-STEM project.

Quantum related research and interests: Spintronics related study, DARPA and ONR, Industry - Zyvex (recent).

Most cited quantum publications:

- The First Synthesis of $Pb_{1-x}Mn_xSe$ Nanocrystals, Tianhao Ji, Wen-Bin Jian and Jiye Fang*, *J. Am. Chem. Soc.*, 125(28), 8448-8449 (2003).
- Quantum-size-effect-enhanced Dynamic Magnetic Interactions among Doped Spins in $Cd_{1-x}Mn_xSe$ Nanocrystals, W.-B. Jian, Jiye Fang*, Tianhao Ji and Jibao He, *Appl. Phys. Lett.*, 83(16), 3377-3379 (2003).
- p-Type Field-Effect Transistors of Single-Crystal ZnTe Nanobelts, Jun Zhang, Po-Chiang Chen, Guozhen Shen, Jibao He, Amar Kumbhar, Chongwu Zhou and Jiye Fang*, *Angew. Chem. Int. Ed.* 47(49) 9469-9471, (2008).
- Spontaneous Magnetization and Ferromagnetism in PbSe Quantum Dots, W. B. Jian, Weigang Lu, Jiye Fang, M. D. Lan and J. J. Lin, *J. Appl. Phys.*, 99, 08N708 (2006).

Quantum related patents: N/A

Education:

Ph.D. of Materials Science, National University of Singapore.



Name: Michael J. Lawler
Title: Associate Professor
Institution: Binghamton University
Department: Physics, Applied Physics and Astronomy

Career Overview: My research focuses on the theory of strongly correlated electron materials, including high temperature superconductors and frustrated quantum magnets. For my Ph.D. at the university of Illinois Urbana-Champaign under my advisor Eduardo Fradkin, I solved correlated metal problems sensitive to strain using quantum field theory techniques. For my postdoc at the University of Toronto with my supervisors Yong Baek Kim, Hae-Young Kee and Arun Paramekanti, I studied quantum spin liquid materials, materials whose spins remain entangled even between two distant atoms. During my assistant and associate professorship

positions at Binghamton University in 2008, I have focused on these two directions with a particular emphasis on understanding the organization of complex information encoded in frustrated magnetism and in Scanning Tunneling Spectroscopic data on quantum materials.

Quantum related research and interests: A quantum computer could answer many of the important questions in my field (strongly interacting electrons in quantum materials). These include quantum magnets with “long range entanglement” and high temperature superconductivity in the “Hubbard model”. Answers to these questions could drive the discovery of novel quantum materials with useful properties such as room temperature superconductors and control over the properties of materials by frustrating their desire to be in a particular phase of matter. I am interested in pursuing the question of what could early quantum computers reveal about these questions but I don’t have any active projects currently addressing this, though I hope to soon.

I am also interested in quantum computers from an educational standpoint. I believe physicists are uniquely well suited to teaching introductory quantum computation and information classes, at least as far as introducing what quantum mechanics is and what are its limitations and peculiarities. So I am interested in developing a course which would attract a broad group of science, computer science and engineering students interested in building a foundation in this subject.

Most cited/select quantum publications:

- Fradkin et. al., “Nematic Fermi fluids in condensed matter physics”, Annu. Rev. Condens. Matter Phys., 1, 153 (2010) [434 citations on Google Scholar]
- Lawler, et. al. “Intra-unit cell nematicity in the high T_c Copper pseudogap states”, Nature 466, 347 (2010). [402 citations on Google Scholar]
- Lawler et. al., “Gapless spin liquids on the three dimensional kagome lattice of Na₄Ir₃O₈”, Phys. Rev. Lett. 101, 197202 (2008) [125 citations on Google Scholar]

Quantum related patents: N/A

Education:

Ph. D. in Physics, University of Illinois at Urbana-Champaign, 2006.



Name: Wei-Cheng Lee

Title: Assistant Professor

Institution: Binghamton University

Department: Physics, Applied Physics and Astronomy

Career Overview: 2008 PhD in Physics from the University of Texas at Austin, specialized in theoretical condensed matter physics. 2008 – 2010 Postdoc at University of California, San Diego, working on quantum phases in cold atom systems, transition metal oxides, and iron-based superconductors. 2010 – 2014 Postdoc at University of Illinois, Urbana-Champaign (UIUC), working on high-temperature superconductor. I am the winner of 2013 Michelson Postdoctoral Prize Lectures awarded by Case Western Reserve University for my

work on theoretical understanding of unconventional superconductors.

Quantum related research and interests: Primary interests: Strongly Correlated system, topological phase, quantum phase transitions. I have been working with a number of experimentalists on a variety of subjects. Important projects include: Theoretical interpretation of the point contact spectroscopy with Prof. Laura Greene (UIUC, now at Florida State University): This project was funded through ‘Center for Emergent Superconductivity’, an EFRC sponsored by DOE while I was a postdoc at UIUC.

Metal to Insulator Transition in transition metal oxides with Prof. Louis Pier (Binghamton University) and Prof. W. Alan Doolittle (GaTech): This project is currently funded through a MURI program by DOD.

Most cited quantum publications:

- [Wei-Cheng Lee](#), Shou-Cheng Zhang, and Congjun Wu, Pairing State with a Time-Reversal Symmetry Breaking in FeAs Based Superconductors, Phys. Rev. Lett. 102, 217002 (2009). (cited 127 times as of 11/9/2018 according to Google Scholar)

Quantum related patents: N/A

Education:

1999, 2002
2008

BS and MS in Physics, National Taiwan University, Taiwan
PhD in Physics, the University of Texas at Austin



Name: Vladimir Nikulin

Title: Associate Professor

Institution: State University of New York at Binghamton

Department: Electrical and Computer Engineering

Career Overview:

Dr. Nikulin joined the Department of Electrical and Computer Engineering at SUNY-Binghamton in 2002 where he is currently an Associate Professor. In 2006, he was a visiting scholar in the Department of Cybernetics at the Czech Technical University in Prague and also worked as a visiting research faculty at the U.S. Air Force Research Laboratory since 2006. His research interests include quantum/optical communications, quantum cryptography, experimental optics and photonics, electro-optics, advanced controls, system optimization, mathematical modeling

and computer simulations.

Quantum related research and interests:

Research interests include quantum-based optical signal encryption, keyed communication in quantum noise, quantum key distribution, quantum optical circuits, design of electro-optical sub-systems, analysis of atmospheric propagation. Relevant projects funded by the government agencies include: "Exploitability of Free-Space Optical Communication Links and Verification of Hyper-Entanglement After Propagation Through the Receiver Components" (AFRL), "Quantum Communication: Pointing-Acquisition-Tracking Station on a Mobile Platform" (AFOSR), "High-Speed Secure Optical Link Using Quantum Noise Aided Encryption Between Two Mobile Platforms" (AFOSR)

Most cited quantum publications:

- D. Hughes, R. Erdmann, and V. Nikulin, "Quantum Operations on Entangled Photons Using Lyot Filters," Proc. SPIE, 9996-16, 2016
- V. Nikulin, R. Fang, D. Hughes and S. Huerster, "Off-axis performance of Lyot filters in multi-access quantum communication receivers," Proc. SPIE 10547, 105470F, 2018

Quantum related patents: N/A

Education:

Ph.D. in Electrical Engineering, State University of New York at Binghamton, 2002.



Name: SB (Seungbae) Park
Title: Professor and Director of IEEC
Institution: Binghamton University
Department: Integrated Electronics Engineering Center

Career Overview: Dr. Seungbae (SB) Park is a Professor of Mechanical engineering of the State University of New York at Binghamton. He is also the director of Integrated Electronics Engineering Center (IEEC) that is a New York State Center of Advanced Technology (CAT). He received his B.S. and M.S. from Seoul National University and Ph.D. at Purdue University in 1994. Dr. Park began his professional career at IBM Microelectronics Division. He was engaged in the reliability engineering responsible for the reliability of leaded and lead-free solders and

high performance packaging. After 7 years at IBM, Dr. SB Park started his academic career as a professor at the State University of New York at Binghamton in 2002.

Quantum related research and interests: Professor Park is an expert in Modeling and Simulation for electronics components and systems. He has been involved in advanced package development for CMOS and MEMS packaging, and flexible electronics manufacturing and their reliability assessment.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

Ph.D. (1994 Purdue University)



Name: Louis Piper

Title: Director of Materials Science & Engineering, Associate Professor

Institution: Binghamton University

Department: Physics, Applied Physics & Astronomy

Career Overview: Louis Piper is an Associate Professor of Physics at the State University of New York at Binghamton. In 2018 he was appointed as Director of Materials Science & Engineering. He has published over 120 journal articles, and his research is supported by NSF, DOE and DOD. He received his PhD in Physics in 2006 at University of Warwick (UK). He joined Binghamton in 2010, after his post-doctoral studies with Boston University at Brookhaven National Laboratory. Dr Piper employs a range of synchrotron-based spectroscopy techniques to explain optical, electronic and electrochemical phenomena of functional metal oxides, including memristors for neuromorphic computing, strain-engineered oxides, and Li-ion battery electrodes. He has published over 120 journal articles,

and his research is supported by NSF, DOE and DOD (AFOSR).

Quantum related research and interests: My research employs x-ray spectroscopic methods that are sensitive to correlated phenomena, such as charge-transfer and collective excitations (RIXS) and incoherent features (lower Hubbard band) and loss of Fermi liquid behavior (Photoemission). I have been working on a range of range of metal insulator transition oxides to understand the effects of doping, temperature and strain. These activities have been supported by NSF for work on strain-engineering phases of VO₂, and lately a DOD MURI (AFOSR) - FA9550-18-1-0024 on Nb oxides. I have worked with various MBE groups at Cornell, Georgia Tech and PNNL and theorists at Binghamton (Wei-Cheng Lee), Penn State and UCL. In addition, my work on high-voltage lithium ion battery cathodes explicitly considers the effects of electron correlation at high states of delithiation. The DOE MURI project is working to employ Li⁺ diffusion in memristor devices to induce new phases.

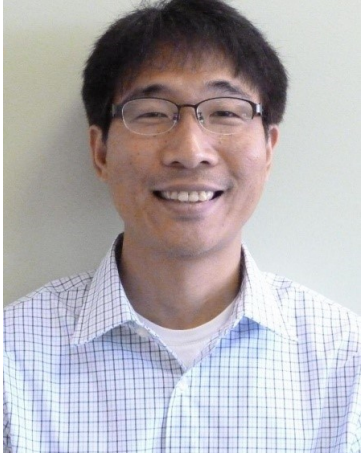
Most cited quantum publications:

- Joshua C Shank, M Brooks Tellekamp, Matthew J Wahila, Sebastian Howard, Alex S Weidenbach, Bill Zivasatienraj, Louis FJ Piper, W Alan Doolittle *Scalable Memdiodes Exhibiting Rectification and Hysteresis for Neuromorphic Computing*. **Scientific reports** 8 (2018), 12935
- NF Quackenbush, H Paik, MJ Wahila, S Sallis, ME Holtz, X Huang, A Ganose, BJ Morgan, David O Scanlon, Y Gu, F Xue, L-Q Chen, GE Sterbinsky, C Schlueter, T-L Lee, JC Woicik, J-H Guo, JD Brock, DA Muller, DA Arena, DG Schlom, **LFJ Piper*** *Stability of the M2 phase of vanadium dioxide induced by coherent epitaxial strain* **Physical Review B** 94, 085105 (2016) Shantanu Mukherjee, N. F. Quackenbush, H. Paik, C. Schlueter, T.-L. Lee, D. G. Schlom, **LFJ Piper***, and Wei-Cheng Lee *Tuning a strain-induced orbital selective Mott transition in epitaxial VO₂* **Physical Review B** 93, 241110(R) (2016)
- KHL Zhang, Y Du, PV Sushko, ME Bowden, V Shutthanandan, S Sallis, **LFJ Piper**, SA Chambers *Hole-induced insulator-to-metal transition in L_{1-x}Sr_xCrO₃ epitaxial films* **Physical Review B** 91 155129 (2015)
- F Quackenbush, Joshua W Tashman, Julia A Mundy, S Sallis, Hanjong Paik, R Misra, Jarrett A Moyer, J-H Guo, Daniel A Fischer, Joseph C Woicik, David A Muller, DG Schlom, L. F. J. Piper and LFJ Piper*, *Nature of the metal insulator transition in ultrathin epitaxial vanadium dioxide* **Nano Letters** 13 4857-4861 (2013)
- L. Colakerol, T. D. Veal, H.-K. Jeong, L. Plucinski, A. DeMasi, T. Learmonth, P. Glans, S. Wang, Y. Zhang, **L. F. J. Piper**, P. H. Jefferson, A. Fedorov, T.-C. Chen, T. D. Moustakas, C. F. McConville, and K. E. Smith *Quantized Electron Accumulation States in Indium Nitride Studied by Angle-Resolved Photoemission Spectroscopy* **Phys. Rev. Lett.** 97, 237601 (2006).

Quantum related patents: N/A

Education:

Warwick University	UK	Physics	BSc(Hons) Class I, 2003
Warwick University	UK	Physics	PhD, 2006
Boston University	USA	Condensed Matter	2006



Name: Bonggu Shim
Title: Associate Professor
Institution: Binghamton University
Department: Physics

Career Overview: Bonggu Shim received his Ph.D. in Physics from the University of Texas at Austin in 2006 and B.S. in physics from Seoul National University, South Korea in 1997. After postdoctoral work at Cornell University, he joined Binghamton University in August 2012 as an assistant professor. Shim's research is focused on experimental and theoretical studies of high intensity laser-matter interactions on femtosecond time scales such as high-order harmonic generation, laser filamentation, and laser material processing and characterization.

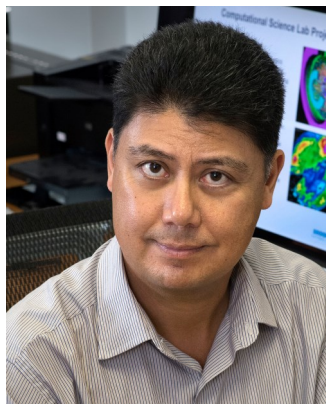
Quantum related research and interests: Bonggu Shim, as Co-PI, wrote 2 proposals (DoE and NSF) in which several universities (Binghamton, Caltech, Cornell, Univ. of South Florida) and an industry member (Zyvex) participated. His role is time-resolved study of spin-dynamics in novel materials using femtosecond lasers.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

2006 - Ph.D. in Physics at University of Texas at Austin
1997- B.S. in Physics at Seoul National University, South Korea



Name: Nicholas D'Imperio

Title: Chair

Institution: Brookhaven National Laboratory

Department: Computational Science Lab, CSI

Career Overview: Nicholas D'Imperio joined the computational staff at Brookhaven National Laboratory (BNL) in 2000 as a physics associate tasked with developing highly parallel, scalable, data intensive computer simulations of particle accelerators. During his time at BNL, his roles have included Group Lead for New York Blue, #5 in the Top 500 list of the World's Fastest Computers, June 2007 and Group Lead of the HPC Code Center where he led development efforts on a wide range of scientific codes. He is currently the Chair of the

Computational Science Laboratory at BNL which is tasked with the development, optimization and porting of scientific codes to both conventional and Department of Energy Leadership Class High Performance Computing resources.

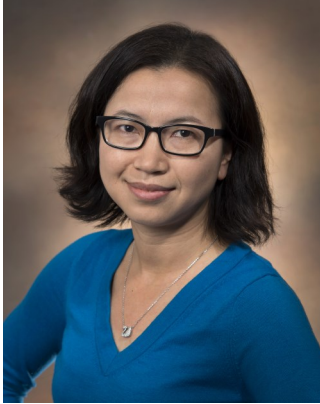
Quantum related research and interests: The newly formed CSI Quantum Computing Group is located in the Computational Science Lab and will conduct research on Quantum Algorithms, Quantum Communication and Quantum Machine Learning as well as operate a Superconducting Qubit Quantum Computer. Current collaborators include NIST and Raytheon to build Quantum Computers.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

MS Computer Science NYIT, BS Physics Stony Brook University



Name: Meifeng Lin
Title: Computational Scientist
Institution: Brookhaven National Laboratory
Department: Computational Science Initiative

Career Overview: Dr. Lin holds a BS degree in Physics from Peking University in China and a PhD in Theoretical Particle Physics from Columbia University. She was a postdoctoral researcher at the Center for Theoretical Physics at MIT from 2007 to 2009, and at Department of Physics at Yale University from 2009 to 2012. After a six-month visiting position at Boston University, she joined Argonne National Lab as an Assistant Computational Scientist at the Argonne Leadership Computing Facility in 2013. She later joined Brookhaven National Laboratory and has been there since. Her research projects include lattice field theory,

theoretical nuclear and particle physics, high performance computing and, most recently, quantum computing.

Quantum related research and interests: Dr. Lin's interests in quantum computing mostly lie in the potential applications of quantum computers in nuclear and high energy physics, and the end-to-end quantum tool chains from quantum compiling to quantum algorithms. Her most recent projects involve the application of existing quantum computers such as IBM Q Experience and Rigetti Forest to effective models in nuclear physics.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

PhD. In Theoretical Particle Physics, Columbia University, 2007
B.S. in Physics, Peking University, China, 2001



Name: Michael McGuigan
Title: Computational Scientist
Institution: Brookhaven National Laboratory
Department: Computational Science Initiative

Career Overview: Michael McGuigan is a Computational Scientist in the Computational Science Initiative of Brookhaven National Laboratory. He specializes in the field of scientific visualization, parallel computing and data analysis. His computational research interests include visualization, parallel simulation and quantum simulation. He works in the field of nanoscience on the implementation of parallel Monte Carlo codes on supercomputers such as IBM BlueGene to study nanomaterials and quantum algorithms to IBM Q quantum computer. He

also develops parallel and quantum computing algorithms that can be applied to nanoscience in particular nanorings, nanotubes and nanoparticles of gold and carbon.

Quantum related research and interests: Applications of quantum computing and quantum algorithms to high energy, nuclear and condensed matter physics. Applications of the variational quantum eigensolver to Carbon nanosystems, tight binding models of condensed matter and quantum field theory used in nuclear and high energy physics. DOE funded collaboration in QIS applications to High Energy physics with U. Iowa, MIT, UCSB, Boston U., Syracuse U., Michigan State, Microsoft and BNL.

Most cited quantum publications:

- H. Soul Lee, M. McGuigan, Visualization of the Higgs interaction in the Standard Model and Beyond the Standard Model Physics, Proceedings of IEEE 2016 New York Scientific data Summit (2016)
- Y. Low, M. McGuigan, Visualization and Simulation of the Material Properties of Carbon Nanotori, , Proceedings of IEEE 2016 New York Scientific data Summit (2016)
- K.S. Kang, J.W. Davenport, J. Glimm, D.E. Keyes, M. McGuigan, Linear Augmented Slater-type Orbital Method for Free Standing Clusters, Journal of Computational Chemistry 30, 1185 (2009).
- M. McGuigan, J.W. Davenport, J. Glimm, Computational Approach to finite size and shape effects in iron nanomagnets, J. Magnetism and Magnetic Materials 320, 190 (2008).
- M. McGuigan, Quantum cellular automata from lattice field theories, Simons workshop on quantum computation, Stony Brook (2003) arXiv:quant-ph/0307176

Quantum related patents:

Education:

Ph.D., Theoretical Physics, Rockefeller University, New York, NY
M.S., Physics, Yale University, New Haven, CT
B.S., Physics and Math, Carnegie-Mellon University



Name: Shigeki Misawa

Title: Manager/Architect

Institution: Brookhaven National Laboratory

Department: Nuclear and Particle Physics Directorate/Scientific Data and Computing Center

Career Overview: Architect at the Scientific Data and Computing Center (SDCC), home of the primary computing and data storage resources for experiments at the Relativistic Heavy Ion Collider (RHIC) at BNL, the primary U.S. computing center for the ATLAS experiment at the Large Hadron Collider and the home of the HPC clusters supporting science at BNL. Key contributor to the transformation of the SDCC precursor from a department level computing facility to a leader in high throughput computing and petascale data storage and distribution and the center for high performance

computing resources at BNL.

Quantum related research and interests: The SDCC is involved in the deployment and support of quantum information systems at BNL. As the center of scientific computing at BNL, with extensive experience supporting experimental scientific instruments, the SDCC's mission is to provide scientists with access to the leading edge computing technology to further their research.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

Ph.D Experimental High Energy Physics, University of California at Berkeley,

S.M. Electrical Engineering, Massachusetts Institute of Technology

S.B. Electrical Engineering, Massachusetts Institute of Technology

S.B. Physics, Massachusetts Institute of Technology



Name: James W. Cusack
Title: Principal Engineer
Institution: Griffiss Institute
Department:

Career Overview: Mr. Cusack joined the staff of what is now known as the Air Force Research Laboratory in Rome NY in June 1968 where he held many assignments involving research in radar and antenna technology, laser development and propagation, large optics for strategic defense systems, space surveillance and others. As a manager he led several of the Laboratory's technical divisions in Optical and Radar surveillance, Photonics, Communications and finally its Information Systems Division, retiring in 2009.

Mr. Cusack is currently a Principal Engineer on the staff of the Griffiss Institute, an organization established to advocate and facilitate the co-operation of private industry, academia and government in developing technology transfer opportunities with the Air Force Research Laboratory. In addition, Mr. Cusack formerly chaired the Rome City Planning Commission and now sits on a number of local civic boards supporting the regions libraries and the development of the Griffiss Business and Technology Park.



Name: Jerry L. Dussault
Title: Principal Engineer
Institution: Griffiss Institute
Department:

Career Overview: Recently completed a 36 year career with AFRL as an R&D program manager, directing research projects across a spectrum of information technologies in support of Command and Control (C2) System innovation and modernization. Joined the Griffiss Institute at the beginning of 2018 to bolster the activities of the Cyber Research Institute (CRI), and support technology transfer.

Quantum related research and interests: Promoting and facilitating technology collaboration and technology transfer.

Quantum related patents: N/A

Education:
BSEE 1981 Rensselaer Polytechnic Institute



Name: Supriya Karmakar

Title: Assistant Professor

Institution: Farmingdale State College – State University of New York

Department: Electrical Engineering Technology

Career Overview: Dr. Supriya Karmakar received his Ph.D. from University of Connecticut, Storrs, CT, in 2011. His doctoral research was on the fabrication and circuit modeling of quantum dot gate FETs (QDGFETs). After completing his Ph.D., Supriya worked as an Engineer for Intel Corporation, for four years. Then, he joined at Mellanox Technology, as a Senior Product Engineer in their Silicon Photonics group. Currently, Dr. Karmakar is working as an Assistant Professor, Department of Electrical Engineering Technology, Farmingdale State College-SUNY, Farmingdale, NY.

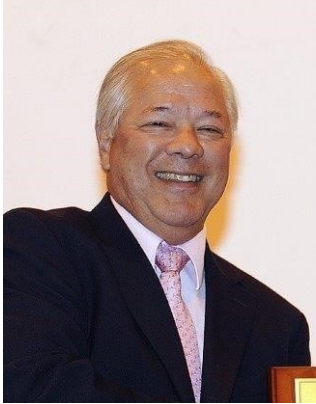
Quantum related research and interests: His current research interest includes the fabrication and modeling of different semiconductor devices and their application in various fields of technologies. Application of Quantum dots in future semiconductor devices.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

Ph. D. in Electrical Engineering



Name: Frank Hoke
Title: Technical Director
Institution: Griffiss Institute

Career Overview:

2016 - present, Technical Director of the Griffiss Institute
2000 - 2016 – ORTA, Information Directorate (AFRL/RI) and Deputy Director of the Information Institute with more than 70 academic institution members nationwide
2012 - 2014 - Director of the National Law Enforcement and Corrections Technology Center Northeast Region, within the National Institute of Justice.

1972 - 2000 – US Air Force

Federal Laboratory Consortium Technology Transfer Awards: 2015 Technology Transfer Professional of the Year; 2015 DOD George Linsteadt Award for Technology Transfer; the FLC Northeast Region Representative of the Year for 2009, 2013, 2014 and 2015. He was instrumental in AFRL/RI's winning the national FLC STEM award for 2013 and the 2015 Northeast Region Laboratory of the Year, as well as FLC Laboratory Director of the Year in 2015.

Quantum related patents: N/A

Education:

BS Engineering, United States Military Academy
MSSM, University of Southern California
MSSM, Air Force Institute of Technology



Name: Michael Wessing
Title: Principal Engineer
Institution: Griffiss Institute

Career Overview:

2017 - present - Principal Engineer Griffiss Institute
2007 -2017 - Deputy Division Chief Information and Intelligence Systems Analysis Division
2006 (6-month detail) - Branch Chief of Intelligence Data Handling Branch
2001 – 2006 - Information and Intelligence Division Technical Advisor
1997 – 2001 - Branch Chief Global Information Base Branch
1991 – 1997 - Branch Chief Command Development Branch
1982 -1991 - Laboratory Program Manager for the Air Force

Quantum related patents: N/A

Education:

BS in Computer Sciences, SUNY at Potsdam
MS in Information Systems Management, SUNY at Binghamton



Name: Nathaniel Cady, Ph.D.

Title: Professor of Nanobioscience

Institution: SUNY Polytechnic Institute, College of Nanoscale Sciences

Department: Nanobioscience

Career Overview: I am a biologist turned nanoscale engineer, who has spent much of my career working at the interface of nanotechnology and biology. My PhD and post doctoral work at Cornell Univ. heavily focused on nanoscale fabrication. My research group at SUNY Poly focuses on the unique interface between nanotechnology and biology. A major theme in my group is drawing knowledge from biological systems to enable unique nanotechnologies, and to improve our abilities in engineering, processing and manufacturing.

Quantum related research and interests: During my time at SUNY Poly, I have established an ongoing research program on resistive memory devices (aka: memristors). These metal-insulator-metal (MIM) devices behave similarly to neural synapses, as their “memory state” depends on the current and voltage history of the device. We have previously developed memristors as both non-volatile memory (NVM) elements, as well as devices to control the reconfigurability of CMOS circuits (for encryption applications). Our current work (supported by the Air Force Research Laboratory / AFRL) is focused on integrating memristors with CMOS circuits for neuromorphic computing applications. We collaborate with researchers from the Univ. of Tenn. (Knoxville), Univ. of Idaho, and recently submitted an NSF “Quantum Foundry” proposal with U. Buffalo.

Most cited quantum publications:

- None – I do not specifically focus on quantum research...but here are a few representative pubs on nanofabrication & CMOS integration:
- K. Beckmann, J. Holt, W. Olin-Ammentorp, Z. Alamgir, J. Van Nostrand, **N.C. Cady**. The effect of reactive ion etch (RIE) process conditions on ReRAM device performance. (2017) *Semiconductor Science and Technology*. 32: 095013
- Z. Alamgir*, J. Holt*, K. Beckmann*, **N.C. Cady**. The effect of different oxygen exchange layers in TaOx based RRAM devices. (2017) *Semiconductor Science & Technology*. 33: 015014
- Z. Alamgir*, K. Beckmann*, J. Holt*, **N.C. Cady**. Pulse width and height modulation for multi-level resistance in bi-layer TaOx based RRAM. *Applied Physics Letters*. (2017) 111: 063111 DOI: <http://dx.doi.org/10.1063/1.4993058>

Quantum related patents: N/A

Education:

Post Doctoral Associate, Nanobiotechnology, Cornell Univ., Ithaca, NY, 2006

Ph.D., Microbiology, Cornell University, Ithaca, NY, 2005

B.A., Biology, Cornell University, Ithaca, NY, 1999



Name: Wenfeng Chen

Title: Lecturer in Applied Mathematics

Institution: SUNY Polytechnic Institute, Utica

Department: Mathematics & Physics Department

Career Overview: I am a biologist turned nanoscale engineer, who has spent much of my career working at the interface of nanotechnology and biology. My PhD and post doctoral work at Cornell Univ. heavily focused on nanoscale fabrication. My research group at SUNY Poly focuses on the unique interface between nanotechnology and biology. A major theme in my group is drawing knowledge from biological systems to enable unique nanotechnologies, and to improve our abilities in engineering, processing and manufacturing.

Quantum related research and interests: Topological quantum field theory, quantum field theory, supersymmetric quantum theory and supergravity, differential geometry and geometric analysis, quantum theory, and application of quantum field theory to condensed matter physics including nanostructure and nanoscience.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

Postdoctoral Research Fellow, University of Guelph (09/2000 – 08/2002)

Postdoctoral Research Associate, University of Winnipeg (09/1998 – 08/2000)

Postdoctoral Research Fellow and Research Scientist, University of Helsinki and Helsinki Institute of Physics (02/1996 – 08/1998)

Ph. D. in Theoretical High Energy Physics and Mathematical Physics, Institute of Theoretical Physics, Chinese Academy of Science, Beijing (1996)

M. Sc. in Mathematical Physics, Lanzhou University (1991)

B. Sc. in Theoretical Physics, Lanzhou University (1988)



Name: Chen-Fu Chiang, Ph.D.

Title: Assistant Professor

Institution: SUNY Polytechnic Institute, College of Nanoscale Sciences

Department: Computer and Information Science

Career Overview: I came to SUNY Poly in Fall 2015 as assistant professor in computer science after 2 years of postdoctoral training in Canada and 1.5 year of teaching in a teaching oriented university in Missouri. My study focus has always been around design and analysis of quantum algorithms and their efficient implementations. These algorithms are techniques that can be applied in any fields (problems). Quantum walk (QW) has been the major part of my research. In the near future, I intend to explore more application of QW, in addition to search, such as in cryptography and efficient pseudo random generator, that can be realized by the

near-term quantum technology.

Quantum related research and interests: Design, analysis and implementation of quantum algorithms in the circuit level || Approximate optimization || Optimization with limited quantum resources

Related work: Simulation of Quantum Walks via Hamiltonian Reduction || Dimensionality Reduction of the Complete Bipartite Graph with k Edges Removed for Quantum Walks || Optimal Dimensionality Reduced Quantum Walk and Noise Characterization|| Scaffold: Quantum Programming Language|| Quantum Algorithm for Preparing Thermal Gibbs States - Detailed Analysis || Quantum Algorithm for Approximating Partition Functions

Computation models (Adiabatic Quantum Computation (AQC) || Quantum Walkers (QW) || Resonant Transition (RT) based) and complexity

Related work: Resonant Transition Based Quantum Computation || Efficient Circuits for Quantum Walks Resonant transition based quantum computation

Collaborators: Chang-Yu Hsieh @ Tencent Quantum lab || Tzu-Chieh Wei @ Stonybrook || Pawel Wocjn @ UCF || Daivd Poulin @ USherbrooke ||

Most cited quantum publications: (based on statistics on Google scholar)

- Quantum algorithm for approximating partition function
- Scaffold: Quantum programming language
- Quantum phase estimation with arbitrary constant-precision phase shift operators
- Quantum algorithm for preparing thermal Gibbs state-detailed analysis

Quantum related patents: N/A

Education:

Masters degree in Computer and Information Science from the University of Pennsylvania. Studied quantum algorithms with Dr. Pawel Wocjan and obtained Ph.D. in Computer Science from the University of Central Florida [Aug. 2006 - Dec. 2011].



Name: Alain Diebold, Ph.D.

Title: Interim Dean College of Nanoscale Sciences, Empire Innovation
Professor of Nanoscale Science

Institution: SUNY Polytechnic Institute, College of Nanoscale Sciences

Department: Nanoscience

Career Overview: Extensive experience in laboratory based materials characterization and cleanroom based metrology including electron microscopy (TEM/STEM), X-Ray, optical, and other methods. Research interests include 2D and semiconductor materials. Long time user of synchrotron based X-Ray measurements for ultra-thin films and nanoscale structures. Established and lead the Characterization and Metrology Road for the International Technology

Roadmap for Semiconductors. Achievements include being SPIE and AVS Fellow and associate editor for IEEE Transactions on Semiconductor Manufacturing. Previous employment includes SEMATECH Senior Fellow and Senior Chemist at Allied Signal.

Quantum related research and interests: Quantum related interests include being PI for an NSF proposal for a Quantum Center. Research expertise directly applicable to all areas of materials characterization and metrology using for fabricating new materials and structures used for Quantum. Industrial partnerships include extensive collaborations with semiconductor equipment suppliers such as TEL, Nanometrics, and KLA-Tencor and with IC manufacturers.

Most cited quantum publications:

All publications my group' s publications are applicable to characterization and metrology for materials and structures used in Quantum devices such as Josephson Junctions.

Quantum related patents: N/A

Education:

Ph.D., Statistical Mechanics of Gas-Solid Surface Scattering, Purdue University, 1979

B.S., Chemistry, Indiana University-Purdue University, 1975



Name: Spyros Gallis (Spyridon Galis)
Title: Assistant Professor of Nanoengineering
Institution: SUNY Polytechnic Institute, College of Nanoscale Sciences
Department: Nanoscience

Career Overview: Dr. Galis is an Assistant Professor of Nanoengineering at the SUNY Poly's Colleges of Nanoscale Science and Engineering (CNSE). Prior to joining the CNSE faculty, Dr. Galis worked for 8 years as a Senior Scientist at IBM's Semiconductor Research and Development Center. He is a recipient of several prestigious awards (Excellence in Teaching Award, SUNY Poly (2016 and 2017); Outstanding Contributor Award, IBM (2013); Advanced Physical Failure Analysis Innovation Award, IBM (2012); Invention Achievement Award, IBM (2009) etc.). His primary academic research focuses are the synthesis, fabrication,

and characterization of nanostructured materials, and novel layered semiconductor materials for quantum, photonic, and optoelectronic applications.

Quantum related research and interests: *On-Demand Silicon Carbide Photonic Nanostructures for Quantum Photonics at Telecom Wavelength:* The proposed research can pave pathways towards disruptive advances in telecom C-band (1540 nm) single-photon emission that can be benefited by the deterministic placement of rare-earth erbium ions in silicon carbide nanostructures.

Development of Large-Scale Chemically-Stable Layered Gallium Telluride for Quantum Applications: Our proposed approach can help identify and demonstrate the physical and quantum properties of layered GaTe for the practical realization of scalable nanophotonics with structural, and luminescence stability. Collaborations/ Partnerships: Dr. Edward Crawford, GLOBALFOUNDRIES Corp., New York, USA; Dr. Stefania Castelletto, School of Engineering RMIT University, Melbourne, Australia

Most cited quantum publications:

- Tabassum N., Nikas V., Kaushik V., Huang M., Crawford E., and Gallis S., "Enhanced telecom C-band emission and deterministic positioning of Er³⁺ by self-aligned ultrathin SiC photonic nanostructures", *Submitted to ACS Nano* (2018). <http://arxiv.org/abs/1707.05738>
- Tabassum N., Kotha M., Kaushik V., Ford B., Dey S., Crawford E., Nikas V., and Gallis S., "On-demand CMOS-Compatible Fabrication of Ultrathin Self-Aligned SiC Nanowire Arrays", *Nanomaterials*, 8, 906, (2018). <https://www.mdpi.com/2079-4991/8/11/906/htm>
- Gallis S., Huang M. and Kaloyeros A. E., "Efficient energy transfer from silicon oxycarbide matrix to Er ions via indirect excitation mechanisms", *App. Phys. Lett.*, 90, 161914 (2007). <http://scitation.aip.org/content/aip/journal/apl/90/16/10.1063/1.2730583>
- M. Kotha and S. Gallis: Effect of Oxidation on the Raman and Photoluminescence Properties of Unpassivated and Novel-Passivated Layered GaTe. To be submitted to *Appl. Phys. Lett.* (2018).

Quantum related patents: N/A

Education:

University of Crete, Heraklion, Greece	Physics	B.Sc. (2000)
University of Crete, Heraklion, Greece	Microelectronics	M.Sc. (2001)
SUNY University at Albany, Albany, NY, USA	Physics	M.Sc. (2002)
SUNY University at Albany, Albany, NY, USA	Nanoscale Science	Ph.D. (2006)



Name: Vincent LaBella

Title: Professor

Institution: SUNY Polytechnic Institute, College of Nanoscale Sciences

Department: Nanoscale Science

Career Overview: Vincent LaBella is a Professor of Nanoscale Science at SUNY Polytechnic Institute. After earning his Ph.D. in Physics from RPI in 1998, he did a post-doc for 4 years at the University of Arkansas in the fields of III-V MBE growth, surface science, and spintronics. In 2002 he joined SUNY Albany and was awarded the New York State Foundation for Science, Technology and Innovation (NYSTAR) Distinguished Professor Award in 2002 and The Faculty Early Career Development (CAREER) Program award from the National Science

Foundation in 2004. In 2014 he was elected as a fellow of the American Physical Society for his pioneering work involving classroom response systems (clickers). In 2015 he received the SUNY Chancellor's Award for Excellence in Scholarship and Creative Activities. He has published over 50 peer reviewed journal articles and given numerous talks and invited presentations.

Quantum related research and interests: My research is focused on visualizing the electrostatic barrier at the interface between materials to nanoscale dimensions in materials that have high technological impact. This is accomplished utilizing a scanning tunneling microscope (STM) to perform ballistic electron emission microscopy (BEEM) measurements and computational modelling. In addition, I teach a course entitled *Introduction to Quantum Theory for Nanoscale Systems* in the fall.

Most cited quantum publications:

- Above room temperature ferromagnetism in Mn-ion implanted Si, M. Bolduc, C. Awo-Affouda, A. Stollenwerk, M. B. Huang, F. G. Ramos, G. Agnello, V. P. LaBella, *Physical Review B*, **71** 033302 (2005).
- Atomic structure of the GaAs(001)-(2×4) surface resolved using scanning tunneling microscopy and first-principles theory, V. P. LaBella, H. Yang, D. W. Bullock, P. M. Thibado, P. Kratzer, M. Scheffler, *Physical Review Letters*, **83** 2989 (1999).
- Spatially resolved spin-injection probability for gallium arsenide, V. P. LaBella, D. W. Bullock, Z. Ding, C. Emery, A. Venkatesan, W. F. Oliver, G. J. Salamo, P. M. Thibado, M. Mortazavi, *Science*, **292** 1518 (2001).
- Nanoscale Schottky Barrier Visualization Utilizing Computational Modeling and Ballistic Electron Emission Microscopy, Westly Nolting, Chris Durcan, Steven Gassner, Joshua Goldberg, Robert Balsano, Vincent P. LaBella, *Journal of Applied Physics*, **123** 245302 (2018).

Quantum related patents: N/A

Education:

B.S. in Mechanical Engineering and a B.A. in Physics from Rutgers University in 1993. Ph.D. in Physics from Rensselaer Polytechnic Institute in 1998.



Name: Michael Liehr

Title: Executive Vice President of Innovation and Technology

Institution: SUNY Polytechnic Institute, College of Nanoscale Sciences

Career Overview: Michael Liehr is the Chief Executive Officer of the American Institute for Manufacturing (AIM) Photonics. Michael focuses on the creation of new AIM business opportunities, and is responsible for the effective and efficient operation of AIM's programs including SUNY Polytechnic Institute's strategic 300mm integrated photonic semiconductor and 3D packaging. He is also SUNY Polytechnic Institute's Executive Vice President of Innovation and Technology. Prior to this assignment, he led the Global 450mm Consortium through the

start-up phase as the General Manager and was an IBM Distinguished Engineer.

Quantum related research and interests: N/A

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

RWTH Aachen, Germany, Ph.D., Physics



Name: Serge Oktyabrsky, Ph.D.

Title: Professor of Nanoscience

Institution: SUNY Polytechnic Institute, College of Nanoscale Sciences

Department: Nanoscience

Quantum related research and interests: Professor Oktyabrsky's research group focuses on the physics and technology of quantum confined structures and microcavity photonic devices. More specifically, this includes:

- Novel photonic and optoelectronic semiconductor structures with quantum confinement. Numerous types of semiconductor devices utilize effect of quantum confinement, when the energy of localized electrons increases in a small (down to a few nanometers) quantum wells. Oktyabrsky's group is fabricating various quantum confined structures, such as superlattices,

quantum dots (QDs), coupled quantum well - dots, using molecular beam epitaxy and explore their electronic and optical properties, with the ultimate purpose of building better devices.

- Design, fabrication, and characterization of semiconductor electronic and photonic devices. Oktyabrsky's group is engaged in these activities in the lab to build laser diodes, vertical cavity surface-emitting lasers (VCSELs), LEDs, photodetectors with superior performance parameters. For example, Oktyabrsky's group recently developed a technology for shape-engineering of quantum dots resulted in high electron-hole coupling. A laser build using these QDs had unsurpassed thermal stability with maximum lasing temperature of 219 0C and an extremely high characteristic temperature of 380 K. In addition, they have found that the QD structures can withstand two orders of magnitude higher defect density than quantum wells typically used in lasers. This results directly in enhanced laser lifetime.

Most cited quantum publications:

- S. Oktyabrsky, M. Yakimov, V. Tokranov, and P. Murat, "Integrated Semiconductor Quantum Dot Scintillation Detector: Ultimate Limit for Speed and Light Yield," IEEE Trans. Nucl. Sci., 63, 656-663 (2016); "
- A. Varghese, M. Yakimov, V. Tokranov, V. Mitin, K. Sablon, A. Sergeev, and S. Oktyabrsky, "Complete voltage recovery in quantum dot solar cells due to suppression of electron capture," Nanoscale, 8, 7248-7256 (2016).
- S. Oktyabrsky, V. Tokranov, G. Agnello, J. van Eijsden, and M. Yakimov. "Nanoengineering approaches to self-assembled InAs quantum dot laser medium." J. Electron Materials, 35(5) 822-833 (2006).
- D. Goldberg, L.I. Deych, A.A. Lesyansky, Z. Shi, V.M. Menon, V. Tokranov, M. Yakimov, and S. Oktyabrsky, "Exciton-Lattice-Polaritons in Multiple-Quantum-Well based Photonic Crystals," Nature Photonics, v.3, pp. 662 - 666 (2009).
- A. M. Mintairov, Y. Chu, Y. He, S. Blokhin, A. Nadtochy, M. Maximov, V. Tokranov, S. Oktyabrsky, and J. L. Merz. " High-spatial-resolution near-field photoluminescence and imaging of whispering-gallery modes in semiconductor microdisks with embedded quantum dots." Phys. Rev. B 77, 195322 (2008).
- X. Huang, J. L. Zhang, V. Tokranov, S. Oktyabrsky, C. F. Gmachl, "Same-wavelength cascaded-transition quantum cascade laser." Appl. Phys. Lett., 103, pp. 051113-1-4 (2013).

Quantum related patents: N/A

Education:

Ph.D. (Solid State Physics) from P.N.Lebedev Physics Institute, Moscow, 1988,
M.S. (Physics and Engineering) from Moscow Physical-Technical Institute, 1980.



Name: F. Shadi Shahedipour Sandvik, Ph.D.

Title: Professor of NanoEngineering

Institution: SUNY Polytechnic Institute, College of Nanoscale Sciences

Department: Nanoscale Engineering

Career Overview: From 1998 to 2001, Professor Shahedipour-Sandvik held postdoctoral and Research Associate positions in the Departments of Materials Science and Engineering, and Electrical Engineering at Northwestern University, respectively. There, she was the first to report a fully packaged GaN-based photocathode detector for solar-blind applications. In 2001, she joined the College of Nanoscale Science and Engineering at SUNY Polytechnic Institute, where she is currently a Professor of Engineering. Her research focus is on development of understanding of materials characteristics-device performance relationship, enabling improved performance and/or functionality of opto/electronic/sensing

devices based on III-nitride material systems. Her current research interests include the theoretical study/simulation, design, fabrication and measurement of Cs-free photocathodes, high power HEMT, photon detectors, and beta(photo)voltatics-based on III-Nitrides.

Quantum related research and interests: Professor Shahedipour-Sandvik's research involves study of the physics, materials science and technology of quantum confined structures and devices. On this topic and specifically her team has been focused on:

- Photonics and optoelectronic semiconductor structures that operate due to the presence of quantum confinement and using epitaxial growth (MOCVD). With their great potential for applications in photonics/optoelectronics and the next generation quantum material III-Nitride family of alloys possess direct and tunable bandgap. This allows for realization of devices with emission and detection spanning the near IR to deep UV,
 - Physics-led theory and design of high-performance devices
 - These include single and multi quantum well-based light emitting devices.
 - Single photon detectors based on hot electron detection; avalanche photodetection, layered (<5nm) hyperspectral detection,
 - Design, fabrication, characterization and analysis of devices

Most cited quantum publications:

- Efficient GaN photocathodes for low-level ultraviolet signal detection, *Shahedipour, FS; Ulmer, MP; Wessels, BW; Joseph, CL; Nihashi, T, IEEE Journal of Quantum Electronics* **38, 333-335 (2002)**
- Selective area heteroepitaxy of nano-AlGaIn ultraviolet excitation sources for biofluorescence application, *Jindal, Vibhu; Grandusky, James R.; Tripathi, Neeraj; Shahedipour-Sandvik, Fatemeh; LeBoeuf, Steven; Balch, Joleyn; Tolliver, Todd, Journal of Materials Research* **22, 838-844 (2007)**
- III-nitride heterostructure layered tunnel barriers for a tunable hyperspectral detector, *Bell, L. Douglas; Tripathi, Neeraj; Grandusky, J. R.; Jindal, Vibhu; Shahedipour-Sandvik, F. Shadi, IEEE Sensors Journal* **8, 724-729 (2008)**
- Theoretical prediction of GaN nanostructure equilibrium and nonequilibrium shapes, *Jindal, Vibhu; Shahedipour-Sandvik, Fatemeh, Journal of Applied Physics* **106, 083115 (2009)**
- Turn-on voltage engineering and enhancement mode operation of AlGaIn/GaN high electron mobility transistor using multiple heterointerfaces, *Tripathi, N.; Jindal, V.; Shahedipour-Sandvik, F.; Rajan, S.; Vert, A., Solid-State Electronics* **54, 1291-1294 (2010)**
- Visible-Blind Avalanche Photodetector heterostructure Device Design with Superior Field Confinement and Low Operating Voltage, *J. Bulmer; P. Suvarna; J.M. Leathersich; J. Marini; I. Mahaboob; N. Newman; F. Shahedipour-Sandvik, IEEE Photonics Technology Letters* **28, 39-42 (2015)**
- Single Photon Counting UV Solar-Blind Detectors using Silicon and III-Nitride Materials, *S. Nikzad; M. Hoenk; A. Jewell; J. Hennessy; A. Carver; T. Jones; T. Goodsall; E. Hamden; P. Suvarna; J. Bulmer; F. Shahedipour-Sandvik; E. Charbon; P. Padmanabhan; B. Hancock; L.D. Bell, Sensors* **16, 927 (2016)**

Education:

Post-doc (Electrical Engineering/Materials Sci&Eng) Northwestern University, 2001

Ph.D. (Solid State Physics) from University of Missouri-Columbia, 1998

B.S. (Physics) from Teheran University, Iran 1993



Name: Xu Du
Title: Associate Professor
Institution: Stony Brook University
Department: Physics and Astronomy

Career Overview: Dr. Xu Du received Bachelor of Engineering degree from Beijing University of Aero. & Astr. in 1996, Master of Science degree from Beijing University in 1999, and ph.D degree from University of Florida in 2004. After doing postdoctoral study at Rutgers University, he joined the faculty of department of Physics and Astronomy at Stony Brook University in 2009. He was promoted to Associated Professor with tenure in 2015.

Quantum related research and interests: Dr. Xu Du's research interest mainly focuses on quantum charge transport phenomena in 2D materials. Funded by AFOSR between 2010 – 2018, he worked on 2D material-based superconducting devices; funded by NSF since 2018, he works on 2D charge transport in quantizing magnetic fields and quantum braiding of the topological states; funded by NSF between 2011-2014, he studied graphene/ferroelectric hybrid devices; funded by NSF since 2018, he studied the impact strain on the electronic properties of 2D atomic crystals.

Most cited quantum publications:

- *Approaching ballistic transport in suspended graphene*, X Du, I Skachko, A Barker, EY Andrei, Nature nanotechnology 3 (8), 491-495
- *Fractional quantum Hall effect and insulating phase of Dirac electrons in graphene*, X Du, I Skachko, F Duerr, A Luican, EY Andrei, Nature 462 (7270), 192-195
- *Josephson current and multiple Andreev reflections in graphene SNS junctions*, X Du, I Skachko, EY Andrei, Physical Review B 77 (18), 184507
- *Ballistic-like supercurrent in suspended graphene Josephson weak links*, N Mizuno, B Nielsen, X Du, Nature communications 4
- *Bolometric response in graphene based superconducting tunnel junctions*, H Vora, P Kumaravadeivel, B Nielsen, X Du, Applied Physics Letters 100 (15), 153507

Quantum related patents: N/A

Education:

Beijing Univ. of Aero. & Astr.	Mechanical Engineering	B.E. 1996
Beijing University	Physics	M.S. 1999
University of Florida	Physics	Ph.D. 2004



Name: Vladimir Korepin

Title: Professor

Institution: Stony Brook University

Department: C.N. Yang Institute for Theoretical Physics and
SUNY center for Quantum Information Science at Long Island

Career Overview: Dr. Vladimir Korepin is a professor at Stony Brook University in the C.N. Yang Institute for Theoretical Physics and the SUNY Center for Quantum Information Science at Long Island. He received his bachelor's degree in Quantum Field Theory, Quantum Gravity, and Mathematical Physics at the Leningrad State University in 1974. He then went on to receive his PhD in Conformal Field Theory, Matrix Product States, Quantum Solitons, and Topological Excitations at the

Steklov Mathematical Institute in 1977. He continued his postdoctoral career at the Steklov Mathematical Institute from 1978 to 1984, under his science advisor Ludwig Faddeev, working in his fields of study from his undergraduate and graduate education. He was appointed to Professor in the Steklov Mathematical Institute in Saint Petersburg from 1985 to 1989. Dr. Korepin then became a professor with tenure in 1989 in the C.N. Yang Institute for Theoretical Physics at Stony Brook University where he currently conducts research.

Quantum related research and interests:

Research and interests: Entanglement in quantum spin chains. Quantum optics. Strongly correlated electrons. Grover partial search algorithm. Adiabatic quantum computation. Measurement based quantum computation. Quantum information. Quantum communication.

Collaboration: a) Mohammad Amin from D-wave: quantum machine learning., b) Ramis Movassagh from IBM: highly entangled spin chains.

Most cited quantum publications:

- Simple Algorithm for Partial Quantum Search, Vladimir Korepin and Lov K. Grover, Quantum Information Processing, vol. 5, number 1, page 5-10, 2006
- Optimization of Partial Search, Vladimir Korepin, Journal of Physics A: Math. Gen. vol 38, pages L731-L738, 2005
- Quantum partial search for uneven distribution of multiple target items, Kun Zhang, Vladimir Korepin, Quantum Inf. Process. (2018) 17: 143
- A Review on Quantum Search Algorithms, Pulak Ranjan Giri, Vladimir E. Korepin, Quantum Inf. Process. Vol. 16 No. 12 (2017) 1-36
- Quantum network teleportation for quantum information distribution and concentration, Yong-Liang Zhang, Yi-Nan Wang, Xiang-Ru Xiao, Li Jing, Liang-Zhu Mu, V. E. Korepin, Heng Fan, Phys. Rev. A 87, 022302 (2013)

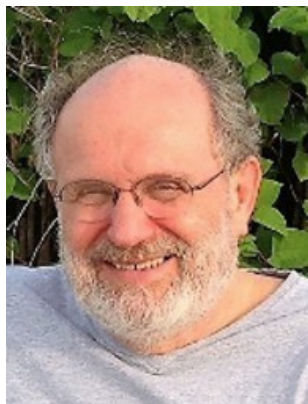
Five other publications

- Fredkin Spin Chain, Vladimir Korepin, Olof Salberger, Ludwig Faddeev memorial volume: a life in mathematical physics. World Scientific, 2018
- Entanglement spectra of q-deformed higher spin VBS states, Raul Santos, Francis Paraan, Vladimir Korepin, Andreas Klümper, Journal Phys. A: Math. Theor. 45 (2012) 175303
- Entanglement in XY Spin Chain A. R. Its, B.-Q. Jin, V. E. Korepin, Journal Phys. A: Math. Gen. vol 38, pages 2975-2990, 2005
- The Algebraic Bethe Ansatz and Tensor Networks, Valentin Murg, Vladimir E. Korepin, Frank Verstraete, Phys. Rev. B 86, 045125 (2012)
- Universality of Entropy Scaling in 1D Gap-less Models V.E. Korepin, Physical Review Letters, vol 92, issue 9, electronic identifier 096402, 2004

Education:

Undergraduate: Leningrad State University. Trained in Quantum Field Theory, Quantum Gravity, Mathematical Physics; Bachelor degree 1974.

Graduate Institution: Steklov Mathematical Institute. Trained in Conformal Field Theory, Matrix Product States, Quantum Solitons, Topological Excitations, PhD 1977.



Name: Predrag Krstic

Title: Research Professor

Institution: Stony Brook University

Department: Institute for Advanced Computational Science

Career Overview: Dr. Predrag Krstic is a Research Professor at the Institute for Advanced Computational Science at Stony Brook University and is the founder and owner of the Theoretik consulting. He received his B.S. in Technical Physics in 1975 at Belgrade University in Yugoslavia with a thesis on *Sphero-Symmetric Gravitational Collapse*. He then received a M.Sc. in Experimental Plasma Physics in 1979 at Belgrade University with a thesis on *Electric Arc in Magnetic Field as Standard of High Temperatures*. He received his Ph.D. in Theoretical Physics

in February of 1982 at the City College of CUNY with a dissertation on *Hydrogen Atom in Ultra-Strong Laser Field*. Dr. Krstic was a member of the senior research staff in the Physics Division at Oak Ridge National Laboratory from 1995 to 2011. His research covers a wide range of fields in theoretical atomic physics, quantum computing, laser physics, plasma physics and nuclear fusion, plasma and particle-material interfaces interactions, computational physics and chemistry, molecular electronics and bio-nanotechnology.

Dr. Predrag Krstic is the editor of a number of conference proceedings, a member of editorial boards and advisory committees, a consultant of International Atomic Energy Agency, and an elected Fellow of the American Physical Society. His work has been disseminated in more than 220 papers in peer-reviewed journals, several patents, book chapters, and more than a hundred of invited talks.

Quantum related research and interests: He has several research projects including Quantum-Classical Science for the Plasma Material Interface in NSTX-U, Theoretical Studies of Nucleation and Growth of B-C-N Nanomaterial in Plasma, Instrument to optimize DNA sequencing by recognition tunneling, Development of Suite Atomistic Codes for Fusion Advanced Materials, and others that are funded by the US Department of Energy and NIH. His most recent publications include: *Simulations of the synthesis of boron-nitride nanostructures in a hot, high pressure gas volume* (PS Krstic et al, Chemical science 9, 3803, 2018), *Physical model for recognition tunneling* (PS Krstic et al, Nanotechnology 28, 084001, 2015), *Deuterium uptake in magnetic-fusion devices with lithium-conditioned carbon walls* (PS Krstic et al, Physical review letters 110, 105001, 2013), and *Translocation of single-stranded DNA through single-walled carbon nanotubes* (Liu, Haitao et al, Science 327, 5961, 64-67, 2010).

Quantum related patents:

- PS Krstic, V Meunier, [Nanoscopic electrode molecular probes](#), US PATENT [8,183,648](#) (2012). ORNL owns license
- Mark A Reed, Predrag S Krstic, Weihua Guan, Xiongce Zhao, System and Method for Trapping and Measuring a Charged Particle In a Liquid, US PATENT [8,294,092](#) (2013). Yale U. and ORNL own license
- Stuart Lindsay, Brett Gyarfás, Predrag Krstic, Padmini Krishnakumar, Systems, Devices And Methods For Translocation Control, US Patent Appl. 20,160,025,702, 2016; Pub. No.:US [20160025702 A1](#) (2016). Arizona State U. owns license

Education:

Ph.D. in Theoretical Physics, Physics Department, City College of CUNY, New York 02/1982

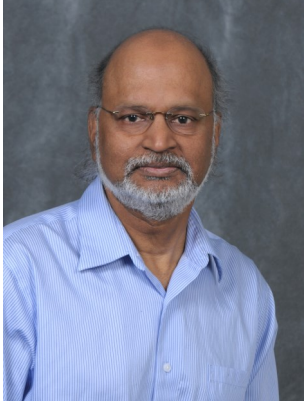
Dissertation: Hydrogen Atom in Ultra-Strong Laser Field

M.Sc. in Exp. Plasma Physics, Faculty of Electrical Engineering, Belgrade University (Yugoslavia) 1979

Thesis: Electric Arc in Magnetic Field as Standard of High Temperatures

B.S. Technical Physics, Faculty of Electrical Engineering, Belgrade University (Yugoslavia) 1975

Thesis: Sphero-Symmetric Gravitational Collapse



Name: IV Ramakrishnan

Title: Associate Dean for Research

Institution: Stony Brook University

Department: College of Engineering and Applied Sciences

Career Overview: IV Ramakrishnan is a Professor in the Department of Computer Science, whose research in artificial intelligence spans three decades, specifically in computing with logic combined with machine learning, accessible computing, and health IT. A recipient of the SUNY Chancellor's award for Excellence in Scholarship and Creative Activities, he has published nearly 200 research papers. Supported by over 40 federal research grants, he has also co-founded two companies and garnered over a dozen Phase I

and Phase II SBIR grants from NSF, NIH, Department of Education, NIDILRR and DARPA. IV is listed as a co-inventor in two patents, and the technology emerging from his health IT work has been commercially licensed. He and his collaborators in Charmtech Labs LLC, a startup in Stony Brook, received the 2014 FCC (Federal Communications Commission) Award for Advancing Accessibility in Mobile Web Browsing.

In September 2018 he was appointed as the Associate Dean for Research, after being named interim Associate Dean in August, 2017. In his short tenure as the Associate Dean, he put in place several initiatives such as the serendipity seminar series on cross-disciplinary research, a seed funding program to catalyze large-center like proposal activities, initiated cross-disciplinary research at the nexus of engineering and medicine, and began framing new research centers and institutes such as AI-Driven Discovery and Innovation and the Center for Regenerative Medicine and 3D-Bioprinting, both of which have received funding from the Empire Innovation Program of New York State

Quantum related research and interests: Interested in building capacity in Quantum Computing in the College of Engineering and Applied Sciences.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

PhD in Computer Science



Name: Dominik Schneble
Title: Associate Professor
Institution: Stony Brook University
Department: Physics & Astronomy

Career Overview:

Associate Professor, Stony Brook University since 2011
Assistant Professor, Stony Brook University - 2005-11
Research Associate, MIT - 2001-04
Research Assistant, Univ. Konstanz (Germany) - 1997-2001

Quantum related research and interests: Quantum simulations with ultracold atoms; quantum gases, optical lattices

Most cited quantum publications:

- **Spontaneous emission of matter waves from a tunable open quantum system**, L. Krinner, M. Stewart, A. Pazmino, J. Kwon, D. Schneble, *Nature* **559**, 589 (2018)
- **Probing an Ultracold-Atom Crystal with Matter Waves**, B. Gadway, D. Pertot, J. Reeves, D. Schneble, *Nature Physics* **8**, 544 (2012)
- **Superfluidity of Interacting Bosonic Mixtures in Optical Lattices**, B. Gadway, D. Pertot, R. Reimann, D. Schneble, *Phys. Rev. Lett.* **105**, 045303 (2010)

Quantum related patents: N/A

Education:

Postdoctoral research associate <i>Advisors: Prof. Wolfgang Ketterle, Prof. David E. Pritchard</i>	MIT (2001-04)
Dr. rer. nat. (summa cum laude) <i>Advisors: Prof. Jürgen Mlynek, Prof. Tilman Pfau</i>	Univ. Konstanz, Germany (2002)
Diplom-Physiker	Univ. Konstanz, Germany (1997)
Master of Science in Physics	U. of Massachusetts Dartmouth (1994)
Vordiplom	Univ. Konstanz, Germany (1992)



Name: Sergey Suchalkin

Title: Assistant Professor

Institution: Stony Brook University

Department: Electrical and Computer Engineering

Career Overview: Sergey Suchalkin graduated from St. Petersburg Electrical Engineering University, St. Petersburg, Russia, in 1989 and received the Ph.D. degree in physics and mathematics from the Ioffe Physical Technical Institute, St. Petersburg, Russia, in 1998. After graduation, he worked at the Ioffe Physical Technical Institute (G. Alferov's lab) and the Max Planck Institute, Stuttgart, Germany (K. von Klitzing's lab). Currently he is an assistant professor in the department of Electrical and Computer Engineering, State University

of New York at Stony Brook. S. Suchalkin is a recipient of the IEE (UK) Optoelectronics Premium (2005). He is a coauthor of more than 80 scientific papers in refereed journals, 5 US patents and numerous invited talks at international scientific conferences.

Quantum related research and interests: Research interests include physics of semiconductor nanostructures as well as design and characterization of semiconductor optoelectronic devices. Collaborations with National High Magnetic Field Laboratory, Georgia Institute of Technology, Brookhaven National Laboratory, U.S. Army Research Laboratory. NSF funded joint research project with Georgia Institute of Technology: "Carrier Dispersion and Nontrivial Topological Phases in InAsSb Ordered Alloys"

Most cited quantum publications:

- S. Suchalkin, G. Belenky, M. Ermolaev, S. Moon, Y.X. Jiang, D. Graf, D. Smimov, B. Laikhtman, L. Shterengas, G. Kipshidze, S.P. Svensson, W.L. Sarney, "Engineering Dirac Materials: Metamorphic InAs_{1-x}Sb_x/InAs_{1-y}Sb_y Superlattices with Ultralow Bandgap", Nano Letters, v.18, p.p. 412-417 (2018).
- S.Suchalkin J.Ludwig, G.Belenky, B.Laykhtman, G.Kipshidze, Y. Lin, L.Shterengas, D.Smirnov, S.Lyui, W.Sarney, S.Svensson, "Electronic properties of unstrained unrelaxed InAs_xSb_{1-x} alloys", Journal of Physics D, v. 49, art. 105101 (2016).
- S. Suchalkin, G. Belenky, M. Belkin, "Rapidly tunable quantum cascade lasers", Journal of Selected Topics in Quantum Electronics, v. 21, No 6, pp. 1-9 (2015)
- S. Suchalkin, G. Belenky, S. Jung, T. Hosoda, M. Belkin, "Distributed feedback quantum cascade laser with optically tunable emission frequency", Appl. Phys. Lett., v. 103, No 4, art. 041120 (2013).
- Yu. Vasilyev, S. Suchalkin, K. von Klitzing, S. Ivanov, P. Kop'ev, B. Meltser, "Evidence for electron-hole hybridization in cyclotron-resonance spectra of InAs/GaSb heterostructures" Phys. Rev. B, v. 60, No 15, pp. 10636-10640 (1999).

Quantum related patents:

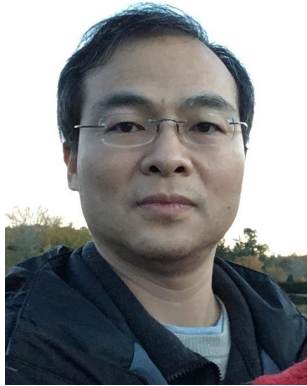
"Quantum cascade lasers with electrically tunable emission wavelength", Gregory Belenky, John D. Bruno, Mikhail V. Kisin, Serge Luryi, Leon Shterengas, Sergey Suchalkin, Richard L. Tober, Mikhail Belkin US Patent No 8571082.

Education:

Ph.D. in Physics and Mathematics from the Ioffe Physical Technical Institute, St. Petersburg, Russia (1998)
dissertation on "Far-infrared spectroscopy of 2D semiconductor systems in a strong magnetic field".

M.S. Degree with High Honors in Semiconductor Physics and Optoelectronics from St. Petersburg Electrical Engineering University, St. Petersburg, Russia (1989)

thesis on "Effect of magnetic field on temperature regime of electron-hole plasma in InSb".



Name: Tzu-Chieh Wei

Title: Associate Professor

Institution: Stony Brook University

Department: C.N. Yang Institute for Theoretical Physics

Career Overview: I received my PhD in Physics from the University of Illinois, working on entanglement theory in quantum information science and on entangled photons in information processing. In addition, I extended my research on condensed matter theory and materials, working on superconductivity, Bose-Einstein condensation, cold atoms in optical lattices. After UIUC, I worked as a postdoc at the Institute for Quantum Computing, at University of Waterloo, and focused on quantum information processing and quantum computational complexity. Later I

moved to University of British Columbia as a postdoctoral researcher and then research associate, where I studied various models of quantum computation and in particular, extended the one-way quantum computer to condensed matter systems. In 2011 I moved to Stony Brook as an assistant professor and was promoted to an associate professor in 2017.

Quantum related research and interests: I'm interested in both fundamental physics questions of quantum computation (QC) and its possible applications. Various computation models, including the standard circuit approach, topological, adiabatic and the measurement-based quantum computation (MBQC) can offer respective advantages regarding implementation and possibly error resistance/protection. My project on MBQC aims to provide substantial characterization of universal resources and how they emergent from states of matter. In understanding the latter, I also employ tensor-network methods for simulating quantum systems. I collaborate with experimental groups for demonstrating various information processing tasks and quantum simulations. Recently, I am taking advantage of a few freely accessible small quantum computers (e.g. IBM and Rigetti) for proof-of-principle demonstrations

Most cited quantum publications:

- "Geometric measure of entanglement for bipartite and multipartite quantum states," **T.-C. Wei** and P.M. Goldbart, Phys. Rev. A **68**, 042307 (2003) [569 citations—Google Scholar]
- "Beating the channel capacity limit for linear photonic superdense coding", Julio T. Barreiro, **Tzu-Chieh Wei**, and Paul G. Kwiat, Nature Phys. **4**, 282-286 (2008) [501 citations—Google Scholar]
- "Maximal entanglement versus entropy for mixed quantum states," **T.-C. Wei**, K. Nemoto, P.M. Goldbart, P.G. Kwiat, W.J. Munro, and F. Verstraete, Phys. Rev A **67**, 022110 (2003) [308 citations—Google Scholar]
- "Ancilla-assisted quantum process tomography," J.B. Altepeter, D. Branning, E. Jeffrey, **T.-C. Wei**, P.G. Kwiat, R.T. Thew, J.L. O'Brien, M.A. Nielsen, and A.G. White, Phys. Rev. Lett. **90**, 193601 (2003) [273 citations—Google Scholar]
- "Remote preparation of single-photon "hybrid" entangled and vector-polarization states", Julio T. Barreiro, **Tzu-Chieh Wei**, and Paul G. Kwiat, Phys. Rev. Lett. **105**, 030407 (2010) [174 citations—Google Scholar]
- "Affleck-Kennedy-Lieb-Tasaki State on a Honeycomb Lattice is a Universal Quantum Computational Resource", **Tzu-Chieh Wei**, Ian Affleck, and Robert Raussendorf, Phys. Rev. Lett. **106**, 070501 (2011) [112 citations—Google Scholar]

Quantum related patents: N/A

Education:

PhD in Physics, University of Illinois at Urbana-Champaign (UIUC), October 2004

Dissertation title: "Quantum entanglement: geometric quantification and applications to multi-partite states and quantum phase transitions" under supervision of Prof. Paul M. Goldbart

Other thesis committee members: Prof. Paul G. Kwiat, Prof. Anthony J. Leggett, and Prof. Michael B. Weissman



Name: Philip Goyal
Title: Associate Professor
Institution: University at Albany, SUNY
Department: Physics

Career Overview:

1999–2004 **Department of Physics, University of Cambridge.**
 PhD in Theoretical Physics, Thesis: “*An information-theoretic approach to Quantum Theory*”.
 2004–2007 **Department of Physics, University of Cambridge.**
Departmental Research Fellow, Information-theoretic reconstruction of quantum theory & Foundations of quantum theory

2007–2010 **Perimeter Institute for Theoretical Physics, Waterloo, Canada.**
Postdoctoral Research Fellow, Quantum information theory & information-theoretic foundations of quantum theory.

2010–present **Department of Physics, University at Albany (SUNY), NY.**
Assistant Prof. (2010–2016) & Assoc. Prof. (2017–)

Quantum related research and interests:

- Derivation of mathematical formalism of quantum theory in terms of novel informational and operational principles. (1999–)
- Systematic derivation and interpretation of the symmetrization postulate for describing identical particles in the quantum formalism. (2001–)
- Application of Bayesian inference and information theory to rigorously characterize informationally-optimal generalized quantum measurements (POVMs). (2014–)
- Investigation of the relationship of information geometry to the geometry of quantum state space. (2001–2006)
- Development of question-based calculus for describing a core component of the quantum formalism (2017–)

Most cited quantum publications:

- “Informational Approach to the Quantum Symmetrization Postulate”, **Goyal P.**, *New Journal of Physics* 17 (2015) 013043 (19 pages). DOI:10.1088/1367-2630/17/1/013043. Corrigendum: *N. J. Phys.* 17 (2015) 109501
- “Derivation of Quantum Theory from Feynman’s Rules”, **Goyal P.**, *Physical Review A* 89(3), 032120 (2014) (12 pages). DOI: 10.1103/PhysRevA.89.032120
- “Information Physics—Towards a New Conception of Reality”, **Goyal P.**, *Information* 3(4), 567–594 (2012). (*Information and Energy/Matter* Special Issue) (28 pages). DOI: 10.3390/info3040567
- “Quantum Theory and Probability Theory: their Relationship, and Origin in Symmetry”, **Goyal P.**, Knuth K., *Symmetry* 3, 171–206 (2011) (*Quantum Symmetry* Special Issue) (36 pages). DOI:10.3390/sym3020171
- “Origin of Complex Quantum Amplitudes and Feynman’s Rules”, **Goyal P.**, Knuth K., Skilling J., *Phys. Rev. A* 81, 022109 (2010) (12 pages). DOI: 10.1103/PhysRevA. 81.022109

Quantum related patents: N/A

Education:

Oct 1991 – Jun 1994	Oxford University	Bachelor of Arts (BA) Honors in Physics, First Class.
Oct 1999 – Sept 2004	Department of Physics University of Cambridge.	PhD in Theoretical Physics



Name: Dola Saha

Title: Assistant Professor

Institution: University at Albany, SUNY

Department: Electrical and Computer Engineering

Career Overview: Dola Saha is an Assistant Professor in Department of Electrical & Computer Engineering at University at Albany, SUNY since 2016. Prior to that, she was a Research Assistant Professor at Wireless Information Network Laboratory (WINLAB) and Department of Electrical & Computer Engineering at Rutgers University. Before that, she was a Researcher in the Mobile Communications and Networking group at NEC Laboratories America. She received her Masters and Doctorate degrees from the Department of Computer Science in

the University of Colorado Boulder. Her research interests lie in the crossroads of Digital Communication, Wireless Networks, Cognitive Radios and Mobile Computing with focus on systems design and practical evaluation. She is a recipient of the Google Anita Borg scholarship for her outreach services and academic credentials. She has been awarded outstanding researcher by the department of Computer Science at CU and received the Dean's outstanding merit scholarship to support her graduate studies.

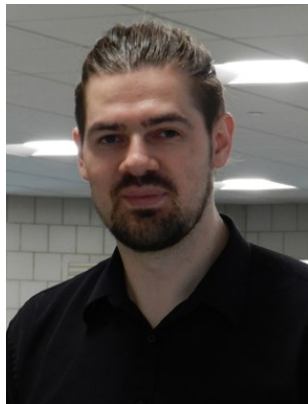
Quantum related research and interests: My research interests are in the broader areas of communications and networking. As we are making a leap towards Quantum Computing, I'm interested in employing signal processing techniques to the union between techniques for improving high performance computation and the same signal processing techniques. Realization of wireless base station processing and Cloud RAN multi-antenna signal processing with quantum computing methods, will significantly change the approach that the research community takes to tackling very high wireless computational demand. To cope with high demand of signal processing requirement from a large set of antennas, my current NSF project (CHRONOS) employs multi-FPGA system, which is not scalable for real-time applications beyond a certain point. Use of Quantum Computing for complex large-scale signal processing algorithms, as in Cloud RAN, will be the future of Radio Frequency research.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

PhD, Computer Science, University of Colorado Boulder



Name: Alexey V. Akimov
Title: Assistant Professor
Institution: University at Buffalo
Department: Chemistry

Career Overview: Alexey V. Akimov obtained his PhD in chemistry from Rice University in 2011. He worked as a postdoctoral scholar jointly at the University of Rochester and the Brookhaven National Laboratory (2012-2014) and later at the University of Southern California (2014-2015). In 2015, he joined the Chemistry Department at the University at Buffalo as an Assistant Professor.

Quantum related research and interests: Akimov's research interests include the development of novel quantum-classical methodologies for accurate and efficient simulation of nonadiabatic and quantum dynamics in models and atomistic systems. His group actively contributes to the development of the corresponding modular open-source software [<https://quantum-dynamics-hub.github.io/>]. The applied scientific interests include studies of photoinduced charge and energy transfer in solar energy materials and functional nanomaterials, and utilizing the computations to guide the development of novel materials with desired quantum dynamics properties.

Most cited quantum publications:

- Nijamudheen; **Akimov, A. V.*** "Excited-State Dynamics in Two-Dimensional Heterostructures: SiR/TiO₂ and GeR/TiO₂ (R = H, Me) and Promising Photocatalysts" *J. Phys. Chem. C* **2017**, 121, 6520-6532
- **Akimov, A. V.*** "Libra: An Open-Source "Methodology Discovery" Library for Quantum and Classical Dynamics Simulations" *J. Comput. Chem.* **2016**, 37, 1626-1649
- **Akimov, A. V.*** "Nonadiabatic Molecular Dynamics with Tight-Binding Fragment Molecular Orbitals" *J. Chem. Theory Comput.* **2016**, 12, 5719-5736
- **Akimov, A. V.**; Prezhdo, O. V.* "Advanced capabilities of the PYXAID program: Decoherence effects, multi-excitonic states, direct photoexcitation, and TD-SE integration schemes" *J. Chem. Theory Comput.* **2014**, 10, 789
- **Akimov, A. V.**; Prezhdo, O. V.* "The PYXAID program for non-adiabatic molecular dynamics in condensed matter systems" *J. Chem. Theory Comput.* **2013**, 9, 4959

Quantum related patents: N/A

Education:

MSc in Chemistry, M. V. Lomonosov Moscow State University (2007), Thesis: "Molecular Dynamics of Nanocars"
MA in Chemistry, Rice University, automatic (December 2009)
PhD in Chemistry, Rice University (December 2011), Thesis: "Theoretical studies of molecular machines"



Name: Cemal Basaran
Title: Professor and Director
Institution: University at Buffalo
Department: Electronic Packaging Laboratory

Career Overview: Cemal Basaran specializes in computational and experimental damage mechanics of electronics packaging materials. He has authored 140 + peer reviewed archival journal publications and several book chapters. His most important scientific contribution to date has been modifying Newton's Laws that Newton published in 1687 in *The Principia*. His research includes development of the Unified Mechanics Theory, which is the unification of Newtonian Mechanics and Thermodynamics where Newton's Laws are modified to incorporate a universal degradation law of all physical systems and nano mechanics of 2-D electronic materials for very high current density and high temperature applications. He is a recipient of a 1997 US Navy, ONR Young Investigator Award, and a 2011 ASME EPPD Excellence in Mechanics Award. His research has been funded by NSF, US Navy ONR, Department of Defense, State of New York, and many industrial sponsors including but not limited to Northrop Grumman, Raytheon, Delphi, Intel, DuPont, Texas Instruments, Micron, Tyco Electronics, Analog Devices and many others.

Quantum related research and interests: Professor Basaran is currently working on a US Navy sponsored project to develop an all Graphene Nano Ribbon (GNR) power switch for high current density and high temperature applications.

Most cited quantum publications:

- *Thermomigration in Pb–Sn solder joints under joule heating during electric current stressing*, H Ye, **C Basaran**, D Hopkins, Applied Physics Letters 82 (7), 1045-1047
- *A thermodynamic framework for damage mechanics of solder joints*, **C Basaran**, CY Yan, Journal of Electronic Packaging 120 (4), 379-384
- *Failure modes and FEM analysis of power electronic packaging*, H Ye, M Lin, **C Basaran**, Finite Elements in Analysis and Design 38 (7), 601-612

Quantum related patents: N/A

Education:

MSc M.I.T; PhD University of Arizona



Name: Michel Dupuis

Title: Professor

Institution: University at Buffalo

Department: Chemical and Biological Engineering

Career Overview:

- Senior Scientist, IBM Corporation (1984-1995); Laboratory Fellow, Pacific Northwest National Laboratory (1996-2014); Professor, University at Buffalo (2015-present)
- Elected Member of the International Academy of Quantum Molecular Science (2005); Fellow of American Physical Society (2007); Fellow, American Association for Advancement of Sciences (2008)
- ~ 215 publications, ~ 28000 citations, ~ 165 invited talks

Quantum related research and interests:

- Interests and expertise are in quantum chemical theory and computation for chemistry and materials, using multi-scale, multi-physics models, and large-scale computations.
- Current research mostly on energy conversion materials (catalysis, photocatalysis, photovoltaics) and energy storage materials (fuel cells, batteries). Major focus is on carrier transport in semi-conductor materials and redox reactivity at interfaces.
- Expertise includes: electronic structure of molecules and materials; spin coupling interactions; electron transfer processes; spectroscopy of molecules and solids; chemical reaction mechanisms and rates; charge carrier transport in complex chemical and material environments. Other interests and expertise include also the development of quantum chemical methods and algorithms for molecules and solids

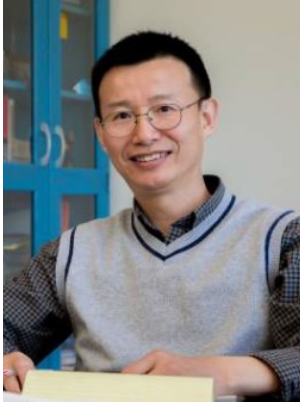
Most cited quantum publications:

- Deskins, N.A. and **M. Dupuis**, *Electron transport via polaron hopping in bulk TiO₂: A density functional theory characterization*. Physical Review B, 2007. **75**: p. 195212-195221.
- Deskins, N.A. and **M. Dupuis**, *Intrinsic Hole Migration Rates in TiO₂ from Density Functional Theory*. Journal of Physical Chemistry C, 2009. **113**: p. 346-358.
- Deskins, N.A., R. Rousseau, and **M. Dupuis**, *Defining the Role of Excess Electrons in the Surface Chemistry of TiO₂*. Journal of Physical Chemistry C, 2010. **114**(13): p. 5891-5897.
- Deskins, N.A., R. Rousseau, and **M. Dupuis**, *Distribution of Ti³⁺ Surface Sites in Reduced TiO₂*. The Journal of Physical Chemistry C, 2011. **115**(15): p. 7562-7572.
- Deskins, N.A., R. Rousseau, and **M. Dupuis**, *Localized Electronic States from Surface Hydroxyls and Polarons in TiO₂(110)*. Journal of Physical Chemistry C, 2009. **113**(33): p. 14583-14586.
- Farazdel, A., et al., *Electric-Field Induced Intramolecular Electron Transfer in Spiro pi-Electron Systems and Their Suitability as Molecular Electronic Devices - A Theoretical Study*. Journal of the American Chemical Society, 1990. **112**(11): p. 4206-4214.
- Gajdos, F., et al., *On the Inapplicability of Electron-Hopping Models for the Organic Semiconductor Phenyl-C61-butiric Acid Methyl Ester (PCBM)*. Journal of Physical Chemistry Letters, 2013. **4**(6): p. 1012-1017.
- Gajdos, F., et al., *Ultrafast Estimation of Electronic Couplings for Electron Transfer between pi-Conjugated Organic Molecules*. Journal of Chemical Theory and Computation, 2014. **10**(10): p. 4653-4660.
- Liu, T., et al., *Bimodal hole transport in bulk BiVO₄ from computation*. Journal of Materials Chemistry, 2018. **6**: p. 3714-3723.
- Schmidt, M.W., et al., *General Atomic and Molecular Electronic Structure System*. Journal of Computational Chemistry, 1993. **14**(11): p. 1347-1363.

Quantum related patents: N/A

Education:

Diplome d'Ingenieur, Ecole Polytechnique, France (1972); PhD, University at Buffalo (1976)



Name: Xuedong Hu
Title: Professor
Institution: University at Buffalo
Department: Physics

Career Overview: Xuedong Hu obtained his PhD in 1996 from the University of Michigan. His PhD work was on the theoretical investigation of quantum statistical properties of lattice vibrations. During his first postdoc, Hu worked on coherent control of electron dynamics with light. In 1998, he joined the University of Maryland as one of the earliest federally funded postdocs to work on solid state quantum computing. Professor Hu joined the University at Buffalo in 2002, and has been supported to work on solid state quantum computing ever since.

Quantum related research and interests: Since 1998, Professor Hu has performed theoretical investigations of spin qubits in semiconductor nanostructures, especially quantum dots in GaAs and Si. His work has ranged from spin decoherence, control, to communication. Presently, his research focuses on making robust and controllable spin qubits in Silicon.

Most cited quantum publications:

- *Hilbert space structure of a solid state quantum computer: two-electron states of a double quantum dot artificial molecule*, **X. Hu** and S. Das Sarma, Phys. Rev. A **61**, 062301 (2000).
- *Exchange in Si based quantum computer architecture*, B. Koiller, **X. Hu**, and S. Das Sarma, Phys. Rev. Lett. **88**, 027903 (2002).
- *Charge fluctuation induced dephasing of exchange coupled spin qubits*, **X. Hu** and S. Das Sarma, Phys. Rev. Lett. **96**, 100501 (2006).
- *Analytical solution of electron spin decoherence through hyperfine interaction in a quantum dot*, C. Deng and **X. Hu**, Phys. Rev. B **73**, 241303 (RC) (2006).
- *Strong coupling of a spin qubit to a superconducting stripline cavity*, **X. Hu**, Y. Liu, and F. Nori, Phys. Rev. B **86**, 035314 (2012).
- *Toward high-fidelity coherent electron spin transport in a GaAs double quantum dot*, X. Zhao and **X. Hu**, Sci. Rep. **8**, 13968 (2018).

Quantum related patents: N/A

Education:

PhD, University of Michigan



Name: Vasili Perebeinos
Title: Professor
Institution: University at Buffalo
Department: Electrical Engineering

Career Overview: Vasili Perebeinos is a Professor of Electrical Engineering at the University at Buffalo. He joined the University at Buffalo in 2018 from the faculty at Skoltech, Moscow, Russia where he has been since June 2014. Prior to that, he spent 11 years at IBM T. J. Watson Research Center, Yorktown Heights, NY and two years at the condensed matter theory group at Brookhaven National Lab as a Research Associate. He received a Physics Diploma with excellence from the Moscow State University in 1997 and a PhD degree in Physics with Council Commendation from Stony Brook University in 2001. During his research

career, he became a Fellow of the American Physical Society in 2013, he has received the highly competitive IBM "Research Technical Accomplishment" award in 2005, 2006, and 2008, and best paper award by the IBM Materials Research Council in 2012.

Quantum related research and interests: Professor Perebeinos' interests are in the area of advanced materials and nanostructures for electronics and optoelectronics, specifically 1D-carbon nanotubes and novel 2D materials, which offer new opportunities in electronic and opto-electronic applications. His research aims to provide theoretical guidance for the experimental efforts to expedite development of such devices with new functionalities including, but not limited to, bio molecular sensors, photo detectors, nanoscale light emitters, and quantum technologies. He is the author or co-author on over 80 journal articles, one book chapter, two review articles, and one US patent. He currently advises six graduate students. His work has been cited over 12,000 times, h-index 48 (google scholar). He is interested in exploring potential of novel low dimensional materials electronics, opto-electronics and quantum information devices.

Most cited quantum publications: (citation numbers from google scholar):

- F. Xia¹, **V. Perebeinos**¹, Y. Lin, Y. Wu, and Ph. Avouris, "The origins and limits of metal-graphene junction resistance", *Nature Nano* 6, 179-184 (2011), 1equal contributions, 655 citations
- Y. Wu¹, **V. Perebeinos**¹, Y. M. Lin, T. Low₂, F. Xia, and Ph. Avouris, "Quantum behavior of graphene transistors near the scaling limit", *Nano Lett.* 12, 1417-1423 (2012) 1equal contributions, 71 citations
- **V. Perebeinos**, "Metal dichalcogenides: Two dimensions and one photon", *Nature Nano.* 10, 485-486 (2015), 21 citations
- L. Dobusch, S. Schuler, **V. Perebeinos**, and T. Mueller, "Nanoscale thermal light emission from a monolayer transition metal dichalcogenide", *Adv. Materials* 29, 1701304 (2017), 14 citations
- V. Semenenko, S. Schuler, T. Mueller, and **V. Perebeinos**, "Plasmon-Plasmon Interactions and Radiative Damping of Graphene Plasmons", *ACS Photonics* 5, 3459-3465 (2018)

Quantum related patents:

P. Avouris, **V. Perebeinos**, M. Steiner, and A. Valdes Garcia, "Graphene plasmonic communication link", Issued on Sept. 11, 2014, US Patent Number 9,250,389

Education:

Diploma in Physics with excellence, Moscow State University, September 1991 - January 1997
PhD in Physics with Council Commendation, Stony Brook University, September 1999 - May 2001
Thesis title: "Polaronic Effects in Manganese Oxides: Self-Trapped Electronic States in LaMnO₃ and NaCl"



Name: Krishna Rajan

Title: Erich Bloch Chair

Institution: University at Buffalo

Department: Materials Design and Innovation

Career Overview: Krishna Rajan is the inaugural Erich Bloch Chair of the Department of Materials Design and Innovation at the University at Buffalo - a position he assumed in the summer of 2015 to nucleate a totally new department. Professor Rajan is the leading proponent of the field of Materials Informatics. His research is on the application of information science and data intensive methodologies for the discovery, characterization and modeling of materials. He has received numerous awards and recognitions, including the Alexander von Humboldt

Research Award from Germany for his pioneering work in establishing the field of materials informatics and is a member of the Science & Technology Experts Group of the US National Academies of Science, Technology & Medicine. He received his undergraduate education at the University of Toronto and a doctorate from MIT followed by a postdoctoral appointment at Cambridge University.

Quantum related research and interests:

- Nanoscale imaging and spectroscopy: atom probe tomography, high resolution TEM
- Materials informatics for materials discovery and design

Most cited quantum publications:

- *Complex Inorganic Solids: Structural Stability and Magnetic Properties of Alloys*: eds: P.E.A.Turchi, A. Gonis, **K. Rajan** and A. Meike; Springer-Verlag NY (2005).
- *Informatics for Materials Science and Engineering: data-driven discovery for accelerated experimentation and application*-editor **Krishna Rajan**; Elsevier, Oxford ISBN: 9780123943996 (2013)
- *A Fast Hybrid Methodology based on Heuristics and Quantum Methods for Evaluating Materials Properties*: C.S. Kong, M. Haverty, H. Simka, S. Shankar and **K. Rajan**; Modeling and Simulation in Materials Science and Engineering – 25 065014 (2017)

Quantum related patents: N/A

Education:

BASc University of Toronto, Metallurgy and Materials Science; ScD MIT, Materials Science



Name: Kenneth W. Regan

Title: Associate Professor

Institution: University at Buffalo

Department: Computer Science and Engineering

Career Overview: Marshall Scholar to Oxford University, Kenneth Regan obtained a DPhil in 1986 and had postdocs at Oxford and Cornell before coming to the University at Buffalo in August 1989. His main field is Computational Complexity, which was one of several springboards for quantum computing in the 1990s. Professor Regan has co-authored the textbook *Quantum Algorithms Via Linear Algebra* (MIT Press, 2014-) with Richard Lipton, whose prominent blog “Gödel’s Lost Letter and P=NP” (GLL) he partners on. Separate research on human decision making at chess has been covered in the New York Times and

NPR Weekend Edition.

Quantum related research and interests: Besides the textbook, Professor Regan’s research centers on algebraic and logical characterizations of quantum circuits. This includes a new proof of the Gottesmann-Knill theorem and strategies for classical simulation of general quantum circuits. In the past year, he and his PhD student, Chaowen Guan, have written an emulator in C++ using these strategies, which can be “demo’ed.” The research also seeks algebraic-geometric invariants that may pose non-linearities in scaling up quantum computing.

Most cited quantum publications:

- **K. Regan**, A. Chakrabarti, and C. Guan, “Algebraic and Logical Emulations of Quantum Circuits,” *Transactions on Computational Science* 31 (2018), 41—76.
- R. Lipton and *Quantum Algorithms Via Linear Algebra* (MIT Press, 2014-)
- Series of articles on the GLL blog in 2012 while moderating and editing a debate between MIT physicist Aram Harrow and Israeli mathematician Gil Kalai about the technological feasibility of quantum computing. (<https://rjlipton.wordpress.com/2012/10/03/quantum-supremacy-or-classical-control/> and previous)

Quantum related patents: N/A

Education:

BA in Mathematics, Princeton University, 1981. DPhil in Mathematics, Oxford University, 1986.



Name: Ramalingam Sridhar
Title: Associate Professor
Institution: University at Buffalo
Department: Computer Science and Engineering

Career Overview: Ramalingam Sridhar started his academic career in the Department of Electrical and Computer Engineering in 1987 and, is currently an Associate Professor of Computer Science and Engineering and is the Director of High Performance VLSI Systems and Architecture Laboratory, continuing efforts in electronic circuits and computing solutions with emphasis on power aware circuits and systems, computer architecture and emerging technologies.

Sridhar was awarded the IEEE Technical Technological Innovation (Academic) Award “For research accomplishments and leadership in system on chip, power-performance tradeoffs in mobile & embedded solutions,” 2018. He is also a Key Organizer, Steering Committee member, Finance and Publications Chair for IEEE System on Chip Conference.

Quantum related research and interests: Sridhar’s research spans Electronic circuits, novel technologies, Computer architecture, power aware solutions (circuits, systems and application driven), embedded security, Machine Learning using in-memory computing and tensor train, Use of tensor train and QTT in modeling Quantum circuits and simulation of Quantum computing; Improving the classical-quantum interface through hardware architecture models; Impact of Quantum computing in ultra -low power systems, and in security, Quantum machine learning, Differentiating classical and quantum computing, analyzing tradeoffs and design choices.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

Ph.D. Electrical and Computer Engineering, Washington State University, 1987



Name: Hao Zeng

Title: Professor

Institution: University at Buffalo

Department: Department of Physics

Career Overview: Hao Zeng received his BS from Nanjing University and PhD from the University of Nebraska, both in physics. He was a postdoc fellow at IBM T. J. Watson Research Center between 2001 and 2004. He joined the Physics Department at the University at Buffalo in 2004 and was promoted to full professor in 2014. He is the recipient of an IBM Research Division Award, NSF CAREER award and UB Exceptional Scholar-Yong Investigator Award. He has published ~110 papers in Journals including Nature, Nature Nano., Nano Lett., Nano Energy, JACS and Adv. Mater. These papers have been cited for more than 15,000 times. Dr.

Zeng's main research area is in condensed matter and materials physics. His present research interests focus on nanoscale magnetism and spintronics, materials for energy applications and biomagnetics. He is an editor of J. Magn. Magn. Mater. and an editorial board member of Chin. Phys. B and Acta Phys. Sin.

Quantum related research and interests: Professor Zeng's related research focuses on the nascent field of "valleytronics" in 2D materials. In monolayer transition metal dichalcogenides, there are two inequivalent valleys that can serve as Q-bits. Breaking the energy degeneracy of the two valleys (valley splitting) allows convenient control of valley degree of freedom. His group was the first to demonstrate greatly enhanced valley splitting using magnetic exchange fields (<http://www.buffalo.edu/news/releases/2017/04/051.html>). The valley excitons can be used as qubits since their coherent states can be initialized, controlled, and read out using optical pulses. However, their relatively short lifetime makes quantum information processing challenging. Built on their previous work, they are working on using exchange fields to brighten the dark excitonic states, taking advantage of their long lifetime, yet allow them to be accessed optically.

Most cited quantum publications:

- C. Zhao, T. Norden, P. Zhang, P. Zhao, Y. Cheng, F. Sun, J. P. Parry, P. Taheri, J. Wang, Y. Yang, T. Scrace, K. Kang, S. Yang, G.-X Miao, R. Sabirianov, G. Kioseoglou, W. Huang, A. Petrou, and **H. Zeng**, "Enhanced valley splitting in monolayer WSe₂ due to magnetic exchange field", Nature Nano., 12, 757 (2017) (cited 45 times).

Quantum related patents: N/A.

Education:

Nanjing University, P.R. China	Physics	BS/1993
University of Nebraska-Lincoln	Physics	MS/1998
University of Nebraska-Lincoln	Physics	PhD/2001
Postdoctoral Research Associate, Nanoscale Materials and Devices, IBM T.J. Watson Research Center (2001-2004)		



Name: Chunyu Liu

Title: Professor

Institution: SUNY Upstate Medical University

Department: Psychiatry

Career Overview: I received my Ph.D. of Medical Genetics in Hunan Medical University, China. I had my postdoc training in Department of Psychiatry, the University of Chicago. Since then (1998), I focused on genetics of psychiatric disorders. I was an Assistant Professor at the University of Chicago, Associate Professor at University of Illinois at Chicago, now Professor at SUNY Upstate. Funded by NIH, my lab studies gene expression regulation in human brains, and relate that to psychiatric disorders. We hope to find biomarkers of disorders that can facilitate

objective diagnosis, also discovery of novel drug targets.

Quantum related research and interests: My lab uses bioinformatics tools to analyze massive omics data. I don't have any current projects, or collaboration using quantum methods, but I hope to learn and explore the opportunities.

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

N/A



Name: Chunling Zhang
Title: Research Assistant Professor
Institution: SUNY Upstate Medical University
Department: Neuroscience & Physiology

Career Overview: I am specialized in Bioinformatics analyses using cutting-edge statistical and computational tools in biomedical field for more than a decade. I am new to Quantum research and would like to explore the opportunities of Quantum technology for my research.

Quantum related research and interests: N/A

Most cited quantum publications: N/A

Quantum related patents: N/A

Education:

M.S. of Computer Science, the University of Chicago
M.S. of Cell Biology, Xiamen University, PR China

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Thank
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