

SIMEON I. BOGDANOV

Assistant Professor,
Department of Electrical and Computer Engineering
Nick Holonyak, Jr. Micro and Nanotechnology Laboratory
Illinois Quantum Information Science and Technology Center
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EDUCATION

Ph.D. in Electrical Engineering

Northwestern University, Evanston, IL Sep 2008 – Apr 2014
Research area: Optoelectronics, Solid State Physics, Infrared Detection
Dissertation topic: “Planar Engineering for Dark Current Suppression in Type-II InAs/GaSb Superlattice Photodiodes”
Research advisor: Manijeh Razeghi

M.S. in Microelectronics

Royal Institute of Technology, Stockholm, Sweden Sep 2007 - Aug 2008
Research area: Optoelectronics, Solid State Physics, Infrared Detection
Thesis title: “Fabrication, Characterization and Analysis of Type-II InAs/GaSb Superlattice Photodiodes”
Research advisor: Alex Grishin

B.S. in Physics

Ecole Polytechnique, Palaiseau, France Sep 2004 - July 2007
Research area: Optics, Solid State Lasers, Condensed Matter Physics
Thesis title: “A Decoy-State Protocol for the Implementation of Quantum Key Distribution”
Research advisor: Anders Karlsson

PROFESSIONAL EXPERIENCE

University of Illinois at Urbana-Champaign, Urbana, IL Jan 2020 – present
Assistant Professor of Electrical Engineering

University of Illinois at Urbana-Champaign, Urbana, IL Sep 2019 – Dec 2019
Adjunct Assistant Professor of Electrical Engineering

Purdue University, West Lafayette, IN Apr 2014 – Dec 2019
Postdoctoral Research Associate – Birck Nanotechnology Center
Research topic: Plasmon-assisted single-photon sources and spin-based sensors
Research advisor: Vladimir M. Shalaev

RESEARCH INTERESTS

1. Integrated quantum photonics
2. Nanophotonics, optical metamaterials and plasmonics
3. Semiconductor physics and optoelectronics

PUBLICATIONS

Journal publications (*h*-index = 17, 852 citations as of June 2021)

Articles in preparation

1. A. Solanki, **S.I. Bogdanov**, A. Rustagi, P. Debashis, N. Dilley, T.-T. Shen, Y.-P. Chen, J. Appenzeller, V.M. Shalaev, A. Boltasseva and P. Upadhyaya, “Electric field control of interaction between magnons and quantum spin defects”, preprint available on *arXiv* at <http://arxiv.org/abs/2012.01497>
2. **S.I. Bogdanov**, O.A. Makarova, A.S. Lagutchev, D. Shah, C.-C. Chiang, S. Saha, A.S. Baburin, I.A. Ryzhikov, I.A. Rodionov, A.V. Kildishev, A. Boltasseva and V.M. Shalaev, “Deterministic integration of single nitrogen-vacancy centers into nanopatch antennas”, preprint available on *arXiv* at <http://arxiv.org/abs/1902.05996>

Published articles

3. S. Sahoo, H. Azzouz and **S.I. Bogdanov** “Rapid absolute sizing of deeply subwavelength dielectric nanoparticles by confocal scanning optical microscopy”, *Appl. Phys. Lett.* **118**, 241105 (2021)
4. Z. Kudyshev*, **S.I. Bogdanov***, T. Isacsson, A. Boltasseva and V.M. Shalaev, “Rapid single-photon emitter classification with neural networks”, *Adv. Quant. Techn.*, **3**, 2000067 (2020), * = equal contribution. **Highlighted in *Purdue News, Science Daily, ScienMag, Phys.org and Eurekalert (AAAS)***
5. M.Y. Shalaginov, **S.I. Bogdanov**, A.S. Lagutchev, A. Boltasseva and V.M. Shalaev, “On-chip microwave-spin-plasmon interface”, *ACS Photonics*, **7**, 2018 (2020)
6. C.-C. Chiang, **S.I. Bogdanov**, O. Makarova, X.Xu, S. Saha, D. Shah, Z.O. Martin, D. Wang, A.S. Lagutchev, A.V. Kildishev, A. Boltasseva and V.M. Shalaev, “Chip-compatible quantum plasmonic launcher”, *Adv. Opt. Mater.*, **8**, 2000889 (2020)
7. **S.I. Bogdanov**, O.A. Makarova, X. Xu, Z. Martin, A.S. Lagutchev, M. Olinde, D. Shah, S.N. Chowdhury, A.R. Gabidullin, I.A. Ryzhikov, I.A. Rodionov, A.V. Kildishev, S.I. Bozhevolnyi, A. Boltasseva, V.M. Shalaev and J.B. Khurgin, “Plasmonic nanocavities coupled to strongly radiative antennas enable ultrafast quantum photonics”, *Optica*, **7**, 463 (2020) – **among top 10 downloads in *Optica* in May 2020. Highlighted in *Kommersant***
8. N. Saveskul, N. Titova, E.M. Baeva, A.V. Semenov, A.V. Lubenchenko, S. Saha, H. Reddy, **S.I. Bogdanov**, E.E. Marinero, V.M. Shalaev, A. Boltasseva V.S. Khrapai, A.I. Kardakova, and G.N. Goltsman, “Superconductivity Behavior in Epitaxial TiN Films Points to Surface Magnetic Disorder”, *Phys. Rev. Applied*, **12**, 054001 (2019)
9. **S.I. Bogdanov**, A. Boltasseva and V.M. Shalaev, “Overcoming quantum decoherence with plasmonics”, *Science*, **364**, 532 (2019)

10. **S.I. Bogdanov**, M.Y. Shalaginov, A.S. Lagutchev, C.-C. Chiang, D. Shah, A.S. Baburin, I.A. Ryzhikov, I.A. Rodionov, A. Boltasseva and V.M. Shalaev, “Ultrabright and ultrafast room-temperature anti-bunched emission from a nitrogen-vacancy center in a diamond nanocrystal”, *Nano Letters*, 18, 4837 (2018) – **selected for coverage in *Optics and Photonics News* Dec. 2018 issue as “one of the most exciting peer-reviewed articles of the year in Optics”, Highlighted in *Izvestiya***
11. S.K.H. Andersen, **S.I. Bogdanov**, Y. Xuan, O. Makarova, M.Y. Shalaginov, A. Boltasseva, V.M. Shalaev and S. Bozhevolnyi, “Hybrid plasmonic bullseye antennas for efficient photon collection”, *ACS Photonics*, 5, 692 (2018)
12. O.A. Makarova, M.Y. Shalaginov, **S.I. Bogdanov**, U. Guler, A. Boltasseva, A.V. Kildishev and V.M. Shalaev, “Patterned multilayer metamaterial for fast and efficient photon collection from dipolar emitters”, *Opt. Lett.* 42, 3968 (2017)
13. **S.I. Bogdanov**, M.Y. Shalaginov, P. Kapitanova, J. Liu, M. Ferrera, A. Lagutchev, P. Belov, J. Irudayaraj, A. Boltasseva and V. Shalaev, “Spin contrast in Purcell-enhanced nitrogen-vacancy center ensembles in nanodiamonds”, *Phys. Rev. B* 96, 035146 (2017) – **a figure from this article is featured in the review by Hopper et al. *Micromachines*, 9, 437 (2018)**
14. **S.I. Bogdanov**, M.Y. Shalaginov, A. Boltasseva and V.M. Shalaev, “Material platforms for integrated quantum photonics” *Opt. Mat. Exp.* 7, 111 (2017) – **2794 views in 6 months following publication, regularly among top 10 monthly downloads in Optics Materials Express**
15. M. Razeghi, A. Haddadi, A.M. Hoang, G. Chen, **S.I. Bogdanov**, S.R. Darvish, F. Callewaert, P.R. Bijjam and R. McClintock, “Antimonide-based type-II superlattices: a superior candidate for the third generation of infrared imaging systems” *J. of Elec. Mat.* 43(8), 2802 (2014)
16. G. Chen, A.M. Hoang, **S.I. Bogdanov**, A. Haddadi, S.R. Darvish and M. Razeghi, “Effect of sidewall surface recombination on the quantum efficiency in a Y₂O₃ gated type-II InAs/GaSb long-infrared photodetector array” *Appl. Phys. Lett.* 103, 223501 (2013).
17. G. Chen, A.M. Hoang, **S.I. Bogdanov**, P.R. Bijjam, B.-M. Nguyen and M. Razeghi, “Investigation of impurity in type-II InAs/GaSb superlattices via capacitance-voltage measurement” *Appl. Phys. Lett.* 103, 033512 (2013).
18. G. Chen, E.K. Huang, A.M. Hoang, **S.I. Bogdanov**, S.R. Darvish and M. Razeghi, “Surface leakage investigation via gated type-II InAs/GaSb long-wavelength infrared photodetectors” *Appl. Phys. Lett.* 101, 213501 (2012).
19. M. Razeghi, A. Haddadi, A.M. Hoang, E.K. Huang, G. Chen, **S.I. Bogdanov**, S.R. Darvish, F. Callewaert and R. McClintock “Advances in antimonide-based Type-II superlattices for infrared detection and imaging at center for quantum devices” *Infrared Physics and Technology*, 59, 41 (2012).
20. B.M. Nguyen, G. Chen, A.M. Hoang, S. Abdollahi Pour, **S.I. Bogdanov**, and M. Razeghi, “Effect of contact doping on superlattice-based minority-carrier unipolar detectors” *Appl. Phys. Lett.* 99, 033501 (2011).

21. **S.I. Bogdanov**, B.M. Nguyen, A.M. Hoang and M. Razeghi, “Surface leakage current reduction in long wavelength infrared type-II InAs/GaSb superlattice photodiodes” *Appl. Phys. Lett.* 98, 183501 (2011).
22. B.M. Nguyen, **S.I. Bogdanov**, S. Abdollahi Pour, and M. Razeghi, “Minority electron unipolar photodetectors based on type II InAs/GaSb/AlSb superlattices for very long wavelength infrared detection,” *Appl. Phys. Lett.* 95, 183502 (2009) – **109 citations as of November 2019**
23. S. Abdollahi Pour, B.M. Nguyen, **S.I. Bogdanov**, E.K. Huang, and M. Razeghi, “Demonstration of high performance long wavelength infrared type II InAs/GaSb superlattice photodiode grown on GaAs substrate,” *Appl. Phys. Lett.* 95, 173505 (2009).
24. B.M. Nguyen, D. Hoffman, E.K. Huang, **S.I. Bogdanov**, P.Y. Delaunay, M. Razeghi and M.Z. Tidrow, “Demonstration of midinfrared type-II InAs/GaSb superlattice photodiodes grown on GaAs substrate,” *Appl. Phys. Lett.* 94, 223506 (2009).

Conference proceedings

1. **S.I. Bogdanov**, O.A. Makarova, X. Xu, A.S. Lagutchev, D. Shah, A.R. Gabidullin, I.A. Ryzhikov, I.A. Rodionov, A.V. Kildishev, S.I. Bozhevolnyi, A. Boltasseva, V.M. Shalaev and J.B. Khurgin, “Enhancing the performance of coupled cavity-antenna plasmonic nanostructures for ultrafast quantum photonics” CLEO, San Jose, CA (2020), *OSA Technical Digest*, FM4C.3
2. C.-C. Chiang, **S.I. Bogdanov**, O.A. Makarova, X. Xu, S. Saha, D. Shah, D. Wang, A.S. Lagutchev, A.V. Kildishev, A. Boltasseva and V.M. Shalaev, “A quantum plasmonic launcher for integrated ultrafast single-photon sources”, CLEO, San Jose, CA (2020), *OSA Technical Digest*, FTh4D.4
3. **S.I. Bogdanov**, O.A. Makarova, A.S. Lagutchev, D. Shah, C.-C. Chiang, A. Baburin, I.A. Ryzhikov, S. Saha, I.A. Rodionov, A. Boltasseva and V.M. Shalaev, “Spin Coherence in Single NV Centers Coupled to Controllably Assembled Nanopatch Antennas”, CLEO, San Jose, CA (2019), *OSA Technical Digest*, FM1M.6
4. O.A. Makarova, **S.I. Bogdanov**, X.Xu, D. Shah, A.S. Baburin, I.A. Ryzhikov, S. Saha, I.A. Rodionov, A.V. Kildishev, A. Boltasseva and V.M. Shalaev, “Controlled Assembly of an Ultrafast Single-Photon Source”, CLEO, San Jose, CA (2019), *OSA Technical Digest*, FM1M.5
5. **S.I. Bogdanov**, S. Saha, M.Y. Shalaginov, N. Kinsey, A.S. Lagutchev, A. Boltasseva and V.M. Shalaev, “Hybrid plasmon-dielectric platform for high-speed on-chip quantum nanophotonics”, Nanometa 7th International Topical Meeting on Nanophotonics and Metamaterials, Seefeld, Austria (2019)
6. **S.I. Bogdanov**, M. Shalaginov, A. Lagutchev, C. Chiang, D. Shah, A. Baburin, I. Ryzhikov, I. Rodionov, A. Boltasseva, and V. Shalaev, “Ultrabright Room-Temperature Emission from Single Plasmon-Enhanced Nitrogen-Vacancy Centers in Diamond”, CLEO, San Jose, CA (2018), *OSA Technical Digest*, FTu4E.6

7. **S.I. Bogdanov**, M. Shalaginov, A. Akimov, A. Lagutchev, J. Liu, D. Woods, M. Ferrera, P. Kapitanova, P. Belov, J. Irudayaraj, A. Boltasseva, and V. Shalaev, "Spin Contrast of Purcell-Enhanced Nitrogen-Vacancy Centers in Diamond", CLEO, San Jose, CA (2017), *OSA Technical Digest*, FW4H.3
8. O. A. Makarova, M. Y. Shalaginov, **S.I. Bogdanov**, U. Guler, A. Boltasseva, A. V. Kildishev, V. M. Shalaev, Patterning metamaterials for fast and efficient single-photon sources, *SPIE Proceedings*, vol. 10112, p.1011208 (2017)
9. J. Ndukaife, B. Isaacoff, M. Shalaginov, **S.I. Bogdanov**, A. Nnanna, J. Biteen, M. Segev, V. Shalaev, and A. Boltasseva, Massive Parallel Positioning of Nanodiamonds on Nanophotonic Structures, CLEO, San Jose, CA (2017), *OSA Technical Digest*, FTu3H.1
10. M.Y. Shalaginov, **S.I. Bogdanov**, J. Liu, A. Lagutchev, A.V. Kildishev, D. Peroulis, J.M. Irudayaraj, A. Boltasseva and V.M. Shalaev, "Effect of photonic density of states on spin-flip induced fluorescence contrast in diamond nitrogen-vacancy center ensembles" (Presentation Recording)", *SPIE Proceedings*, San Diego, CA Vol. 9544, p.95440O (2015)
11. M. Y. Shalaginov, **S.I. Bogdanov**, P. V. Kapitanova, A. S. Lagutchev, A. V. Kildishev, P.A. Belov, A. Boltasseva, V. M. Shalaev, "Merging metamaterials with quantum photonics", 9th International Congress on Advanced Electromagnetic Materials in Microwaves and Optics, p. 283, (2015)
12. D. Hoffman, B.M. Nguyen, E.K. Huang, P.Y. Delaunay, **S.I. Bogdanov**, P. Manurkar, M. Razeghi, and V. Nathan, "The importance of band alignment in VLWIR type-II InAs/GaSb heterodiodes containing the M-structure barrier," *SPIE Proceedings*, San Jose, CA Vol. 7222 p. 722215 (2009).
13. P.Y. Delaunay, B.M. Nguyen, D. Hoffman, E.K. Huang, P. Manurkar, **S.I. Bogdanov** and M. Razeghi, "Background limited performance of long wavelength infrared focal plane arrays fabricated from M-structure InAs/GaSb superlattices," *SPIE Proceedings*, San Jose, CA Vol. 7222 p.72220W (2009).
14. B.M. Nguyen, S. Abdollahi Pour, **S.I. Bogdanov** and M. Razeghi "Minority electron unipolar photodetectors based on Type II InAs/GaSb/AlSb superlattices for very long wavelength infrared detection," *SPIE Proceedings*, San Francisco, CA Vol. 7608 p. 760825-1 (2010).
15. M. Razeghi, B.M. Nguyen, P.Y. Delaunay, E.K. Huang, S. Abdollahi Pour, P. Manurkar and **S.I. Bogdanov**, "State-of-the-art type-II antimonide-based superlattice photodiodes for infrared detection and imaging," *SPIE Proceedings*, San Diego, CA Vol. 7467, p. 74670T-1 (2009)
16. M. Razeghi, B.M. Nguyen, P.Y. Delaunay, S. Abdollahi Pour, E.K.W. Huang, P. Manurkar, **S.I. Bogdanov**, and G. Chen "High operating temperature MWIR photon detectors based on Type II InAs/GaSb superlattice," *SPIE Proceedings*, San Francisco, CA Vol. 7608, p. 76081Q-1 (2010)

Other scientific publications

1. M.Y. Shalaginov, R. Chandrasekar, **S.I. Bogdanov**, Z. Wang, X. Meng, O.A. Makarova, A. Lagutchev, A.V. Kildishev, A. Boltasseva and V.M. Shalaev “Hyperbolic metamaterials for single-photon sources and nanolasers”, *Quantum Plasmonics*, p. 97 Springer Int. Publ. (2016)
2. **S.I. Bogdanov** and M. Razeghi, “Des atomes aux dispositifs quantiques”, *La Jaune et la Rouge, Journal de l’Ecole Polytechnique*, 702, (2015)
3. M. Shalaginov, **S.I. Bogdanov**, V. Vorobyov, A. Lagutchev, A. Kildishev, A. Akimov, A. Boltasseva and V. Shalaev “Enhancement of Single-Photon Sources with Metamaterials”, *From Atomic to Mesoscale*, World Scientific Review, p. 123 (2015)

HONORS AND AWARDS

- 2018 - Best Presentation Award, OSA IONS Midwest Conference, (Purdue University, USA)
- 2018 - Preparing Future Faculty Scholarship (Stony Brook University, USA) - \$700
- 2018 - Postdoc Travel Grant Award for Professional Conference (Purdue University, USA) - \$500
- 2017 - The Graduate School Postdoc Travel Grant (Purdue University, USA) - \$440
- 2016 - The Graduate School Postdoc Travel Grant (Purdue University, USA) - \$440
- 2015 - Best Poster Award and Travel Fellowship, Metamaterials Science and Technology Workshop, (San Diego, USA) - \$1 000
- 2015 - Best Poster Award, Enrico Fermi Summer School in Complex Photonics, (Varenna, Italy) - €300
- 2013 - Cabell Terminal Year Fellowship (Northwestern University) – full final year tuition and stipend funding
- 2011 - Dow Sustainability Innovation Student Challenge Award (Chicago, USA) - \$10 000, received by the team consisting of C. Wilmer, T. Phan, **S.I. Bogdanov** and E. Hoxha
- 2011 - 3rd place, Scientists Without Borders Global Malnutrition Challenge Prize (InnoCentive, USA) - \$1 000, received by the team consisting of C. Wilmer, T. Phan, **S.I. Bogdanov** and E. Hoxha
- 2009 - Shared 1st place Nature.com Clean Water Distribution Challenge Prize (InnoCentive, USA) - \$4 000, received by the team consisting of C. Wilmer, T. Phan and **S.I. Bogdanov**
- 2008 - Finalist, Diversity Challenge (Academic Search, Sweden)
- 2004 - Scholarship for Outstanding International Students (Ecole Polytechnique Foundation, France)
- 2001 - Honorable Mention, National Mathematics Competition (France)
- 2000 - 3rd place, Olympiades Academiques de Mathematiques (France)

FUNDRAISING ACTIVITIES AND UNIVERSITY SERVICE

1. Strategic Research Initiative Grant, Grainger College of Engineering (UIUC, 2021), with co-PIs P.K. Jain and B.K. Clark, \$70K.

2. Extensive experience in drafting winning research and equipment grant proposals: instrumentation proposals resulting in total awarded funds of **\$0.6M**; research proposals with total awards in excess of **\$2.2M** (Purdue University)
3. Leading member of the local organizing committee of the Purdue Quantum Center 2015 Kickoff Conference hosting 36 world leading faculty members in the area of Quantum Physics, scientific journal editors and Department of Defense program managers, as well as over 200 attendees

SELECTED MEDIA COVERAGE

1. *Eurekalert* (AAAS), “New machine learning-assisted method rapidly classifies quantum sources” (09/10/2020)
2. *Kommersant Nauka*, Разгон до сотен терагерц. Улучшены параметры самого яркого источника одиночных фотонов. (“Speedup into the terahertz range – improving the performance of the brightest single-photon sources”, in Russian, 08/25/2020)
3. *Izvestia*, Science News, “На всех квантит: усовершенствована технология связи по оптоволокну” (“Enough for all: improvement in optical fiber communication technology”, in Russian, 12/01/2020)
4. *Optics and Photonics News*, “Single NV centers produce 30 million photons per second at room temperature” (12/01/2018)
5. *Purdue News*, “Toward unhackable communication: single particles of light could bring about the quantum internet”, (10/16/2018), reposted by phys.org and nanowerk.com
6. *The New York Academy of Sciences*, “Innovating on a shoestring” (04/15/2011)
7. *Scientists Without Borders*, “The power of teamwork” (05/18/2011)
8. *Northwestern News*, “Students excel in maternal health care challenge” (09/06/2011)

INVITED TALKS

1. **SPIE Optics and Photonics**, Active Photonic Platforms XII, 11461-56, San Diego, CA (2020)
2. **SPIE Optics and Photonics**, Spintronics XIII, 11470-70, San Diego, CA (2020)
3. **SPIE FOCUS, Northwestern University**: Light and Matter Conference, Evanston, IL, (2019)
4. **City University of New York**, Advanced Science Research Center, Photonics Initiative, colloquium, New York City, NY (2019)
5. **University of Iowa**, Department of Physics and Astronomy, colloquium, Iowa City, IA, (2019)
6. **Virginia Commonwealth University**, Department of Electrical and Computer Engineering, colloquium, Richmond, VA, (2019)
7. **University of Illinois at Urbana-Champaign**, Department of Electrical and Computer Engineering, colloquium, Urbana, IL (2019)
8. **University of Nebraska**, Department of Electrical and Computer Engineering, colloquium, Lincoln, NE, (2019)
9. **Old Dominion University**, Department of Physics and Astronomy, colloquium, Norfolk, VA (2019)

10. **SPIE Photonics West**, Quantum Sensing and Nano Electronics and Photonics XVI, 10926-54, San Francisco, CA (2019)
11. **IEEE Summer Topical Meeting Series**, Quantum Networks, WD3.1, Waikoloa, HI (2018)
12. **City College of New York**, Department of Physics, seminar, New York City, NY (2018)
13. **Argonne National Laboratory**, Center for Nanoscale Materials, seminar, Lemont, IL (2018)
14. **8th International Conference on Lasers, Optics and Photonics**, Las Vegas, NV (2017)
15. **Russian Quantum Center**, seminar, Skolkovo, Russia (2017)
16. **SPIE Photonics West**, Quantum Sensing and Nano Electronics and Photonics XIII, 9755-49, San Francisco, CA (2016)

CONTRIBUTED CONFERENCE TALKS

1. **OSA Quantum 2.0 Conference**, virtual event, QM4B.5 (2020)
2. **SPIE Optics and Photonics**, Plasmonics: Design, Materials, Fabrication, Characterization, and Applications, 11462-16, virtual event, (2020)
3. **Conference on Lasers and Electro-Optics**, FM4C.3, virtual event, (2020)
4. **Conference on Lasers and Electro-Optics**, FTh4D.4, virtual event, (2020)
5. **Conference on Lasers and Electro-Optics**, FM1M.6, San Jose, CA (2019)
6. **Conference on Lasers and Electro-Optics**, FTu4E.6, San Jose, CA (2018)
7. **SPIE Optics and Photonics**, Quantum Nanophotonics, 10359-20, San Diego, CA (2017)
8. **Conference on Lasers and Electro-Optics**, FW4H.3, San Jose, CA (2017)
9. **SPIE Optics and Photonics**, Metamaterials, Metadevices, and Metasystems, 9918-81, San Diego, CA (2016)
10. **SPIE Optics and Photonics**, Metamaterials, Metadevices, and Metasystems, 9544-16, San Diego, CA (2015)

CAMPUS AND DEPARTMENTAL TALKS

1. “Plasmon-enhanced quantum emitters for ultrafast quantum photonics”, IQUIST seminar, University of Illinois, (2020)
2. “Ultrabright sub-nanosecond emission from single nitrogen-vacancy centers in nanodiamonds” OSA IONS Conference, Purdue University, West Lafayette, IN (2018)
3. “Material platforms for integrated quantum photonics”, NSAC conference, Purdue University, West Lafayette, IN (2016)
4. “Practical nanophotonics: new approaches and material platforms”, 10th anniversary celebration of Birck Nanotechnology Center, Purdue University, West Lafayette, IN (2016)

RESEARCH EXPERTISE AND TECHNICAL SKILLS

Optical characterization techniques: time-resolved single-photon counting, optical and Fourier spectroscopy, optically detected magnetic resonance. Cryogenic electrical characterization techniques: sensitive current-voltage and capacitance-voltage measurements, spectral noise characterization and photodetector quantum efficiency measurements. Structural device characterization: scanning electron microscopy, optical profilometry and atomic force microscopy. Semiconductor device processing techniques: lithography, wet and dry etching, e-beam and thermal evaporation, plasma-enhanced chemical vapor deposition (PECVD). Packaging techniques: flip-chip bonding, underfilling, substrate removal and chemical-

mechanical polishing. Electromagnetic simulation with analytical and numerical methods: COMSOL Multiphysics, Matlab. Large-scale experimental setup automation and data acquisition via Labview, Matlab and microcontroller programming.

RESEARCH EXPERIENCE AND ACCOMPLISHMENTS

Purdue University, West Lafayette, IN

Apr 2014 – Dec 2019

Birck Nanotechnology Center

Postdoctoral Research Associate – Birck Nanotechnology Center

Research topic: Plasmon-assisted single-photon sources and spin sensors

1. **Demonstrated the world's brightest room-temperature quantum emitter:** a nitrogen-vacancy center in diamond enhanced by a plasmonic nanoantenna, with a detected photon rate of over 30 million counts per second
2. **Demonstrated coherent spin dynamics from a single nitrogen-vacancy center deterministically coupled to a plasmonic nano-patch antenna.**
3. **Demonstrated record-high fluorescence lifetime shortening of 3500 times** at room temperature in nanodiamond-based nitrogen-vacancy centers through a deterministic coupling to plasmonic nanoantennas.
4. Designed and assembled an experimental setup for the automated large-scale optical characterization of single quantum emitters, including a custom-built confocal scanning microscope interfaced with an atomic force microscope, time-resolved photon correlation system and optical electron spin resonance characterization system.

Northwestern University, Evanston, IL

Sep 2008 – Apr 2014

Robert R. McCormick School of Engineering and Applied Science

Graduate Research Assistant – Center for Quantum Devices

Research topic: Type-II InAs/GaSb Superlattice Photodiodes

1. **Demonstrated the highest sensitivity in superlattice photodetectors operating at 10 μm**
2. Designed a wide bandgap p-n junction photodetector featuring the reduction of all bulk dark current mechanisms while preserving quantum efficiency
3. Proposed a shallow etch based processing technique for several orders of magnitude surface leakage current suppression in SiO₂ passivated long wavelength infrared photodiodes
4. Developed an experimental technique for in-plane minority carrier diffusion length measurement
5. Fabricated world's first type-II superlattice shallow etch microjunction detectors operating in mid-wavelength infrared range.

TEACHING AND MENTORING EXPERIENCE

Purdue University, West Lafayette, IN (2015 - present)

1. Supervised a female undergraduate student during an electromagnetic simulation project, resulting in her first-author publication in *Optics Letters*.
2. Supervised a female undergraduate student during the development of atomic force microscope-based manipulation techniques applied to nanodiamond and metal nanocube particles. **The project has resulted in the world's first demonstration of inter-substrate**

transfer of a pre-characterized single-photon emitter followed by its deterministic integration into a plasmonic gap nanoantenna.

3. Supervised two undergraduate students during the programming of an automated setup for optical fluorescence scanning and location of single-photon emitters.

Northwestern University, Evanston, IL (Winter 2012- Spring 2013)

Graduate student mentor

Trained two graduate students and one undergraduate student in processing and characterization of single photodiodes and integrated arrays

Teaching Assistant

1. Prepared course slides and teach lectures to a class of graduate and undergraduate students
2. Reviewed course material with students during office hours on an individual basis
3. Supervised and managed six lab projects to provide students with deeper understanding of concepts taught in class
4. Corrected homework assignments with emphasis on teaching students clear and concise scientific communication

Outreach activity

Held educational activities designed to teach children about light and lasers in the framework of Northwestern SPIE chapter's outreach to Evanston middle schools.

High School Jean Rostand, Mantes-la-Jolie, Ile-de-France, France (9/04-04/05)

Physics and Mathematics Teacher

1. Taught Physics and Mathematics to several classes of 10th-12th grade students
2. Reviewed course material with students during office hours on an individual basis

PROFESSIONAL AFFILIATIONS AND SERVICE TO PROFESSION

Member of the Optical Society of America

Member of the IEEE Photonics Society

Reviewer: *Nature Communications, Optica, Nano Letters, Advanced Optical Materials, Optics Letters, Optics Express, Journal of the American Chemical Society, Photonics Research, Applied Physics Letters, Nanophotonics, Optics Materials Express, OSA Continuum*

LANGUAGES

1. Russian, native
2. French, full command
3. English, full command
4. Swedish, intermediate
5. German, basic