SETH ROBERT BANK
sbank@ece.utexas.edu
http://lase.ece.utexas.edu

10100 Burnet Road, Bldg. 160
Austin, TX 78758
Phone: (512) 471-9669

RESEARCH INTERESTS

Developing novel solid-state hetero- and nano-structures for integrated (opto)electronic devices and sensors

CITIZENSHIP

United States of America

EDUCATION

Stanford University (9/00 – 4/06)
Doctor of Philosophy in Electrical Engineering, 4/6/06
Thesis: *High-Performance 1.55-μm GaAs-Based Dilute-Nitride Lasers*
Master of Science in Electrical Engineering, 7/03

University of Illinois at Urbana-Champaign (8/95 – 8/00)
Bachelor of Science in Electrical Engineering, 8/99
Coursework Pursuant to Master of Science in Electrical Engineering

EXPERIENCE

The University of Texas, Austin, TX
Cullen Trust for Higher Education Endowed Professorship in Engineering #6 (*effective 9/19*)
Temple Foundation Faculty Fellowship No. 5 (9/12 – 8/19)
Professor – Department of Electrical and Computer Engineering (9/18 – Present)
Associate Professor – Department of Electrical and Computer Engineering (9/12 – 8/18)
Assistant Professor – Department of Electrical and Computer Engineering (1/07 – 9/12)

- Device applications and synthesis of solid-state hetero- and nano-structures
  - Low noise III-V avalanche detectors
    - First realization of staircase avalanche photodetector
    - First demonstration of low multiplication noise from AlInAsSb materials
    - First low-noise III-V avalanche photodetector operating at 1.55 μm
    - Highest gain low noise InAs avalanche photodiodes
  - Epitaxial plasmonic materials and designer metals
    - Record III-V active Si doping of InAs, shifting plasmon resonance into mid-IR
    - First demonstration of compositional tuning of plasmonic properties (e.g. LaLuGdAs)
    - First demonstration of plasmonic response from rare earth monopnictides (e.g. ErAs)
  - Band-anticrossed semiconductors (e.g. dilute-nitride mid-IR lasers and detectors)
    - Longest wavelength GaSb-based diode laser with GaSb barriers
    - Demonstrations of high-quality, droplet-free GaInAsSbBi alloys
  - High-efficiency tunnel junctions employing semimetallic nanostructures
    - Enhanced tunneling currents by >225x over previous state-of-the-art
    - Successfully transferred technology to Solar Junction Corp.
    - First application to semiconductor lasers
  - Semiconductor/metal nanocomposites (e.g. THz generation/sensing and thermoelectrics)
- Built state-of-the-art molecular beam epitaxial (MBE) growth facility largely through extramural funding and equipment donations
- Teaching:
  - Introduction to Electrical and Computer Engineering (undergrad) – F'2011, 2012, 2014-2019
    - Revised lecture and lab components (w/Ed Yu)
    - Introduced Honors section of course in Fall 2018
  - Semiconductor Optoelectronic Devices (graduate) – Sp'2007-2013, 2015, 2017, 2019
  - Lasers and Optical Engineering (undergrad/grad) – F'2007, 2008, 2009, 2010, Sp'2016, 2018

University of California, Santa Barbara, CA (2/06 – 12/06)
Postdoctoral Scholar – Departments of Materials and Electrical and Computer Engineering

- Supervisors – **Professors Arthur Gossard and Mark Rodwell**
- MBE growth and application of semiconductor/metal nanocomposites
    - Semimetallic nanoparticles (e.g. ErAs) embedded in semiconductors
    - Applications to HBTs, tunnel junctions, and THz generation/detection
    - Electrically injected erbium-oxygen light emitters on silicon
- MBE growth of high-mobility channel materials for SRC Center on Si-based III-V MOSFETs
- Teaching:
    - Characterization of Electronic Materials – Co-developed and taught new graduate course

Stanford University, Stanford, CA (9/00 – 1/06)
Graduate Research Assistant – Solid State and Photonics Laboratory
Advisor – **Professor James Harris**

- MBE growth and fabrication of GaAs-based lasers from 1.3 to 1.55 μm
    - Demonstrated first continuous-wave (cw) 1.45–1.55 μm lasers grown on GaAs
        - Holds all GaAs-based laser performance records emitting >1.4 μm
    - Improved MBE growth of GaInNAs and GaInNAsSb films on GaAs
        - Co-enhanced luminescence efficiency ~10 fold and reduced linewidth >25%
        - Contributed to understanding of basic physical properties and growth kinetics
        - Developed new metric for evaluating laser active regions
    - Investigated physics governing temperature stability of lasers
    - Growth of GaInNAsSb on InP for sensing applications >2.0 μm
    - Growth of 1.55 μm absorption samples with strong and well-defined excitonic features
- External collaborations on novel GaAs-based device structures
    - First GaAs-based distributed feedback laser at 1.5 μm (w/Forchel at Würzburg)
    - GaInNAs-based avalanche photodiodes (w/Campbell at UT-Austin)
    - Modelocked lasers at 1.55 μm (w/Lester at U-New Mexico)
    - Hybrid MBE/MOCVD buried heterostructure lasers at 1.55 μm (w/Sumitomo)
- Preparation of AlGaAs/GaAs quantum wells for spin injection experiments (w/Parkin at IBM)
- Investigated luminescence mechanisms of boron implanted silicon (w/Patel at SLAC)

University of Illinois, Urbana, IL (6/00 – 8/00)
Teaching Assistant – ECE 344 Silicon IC Fabrication Laboratory

- Fabrication of MOSFETs and BJTs in silicon
- Taught one lab section, graded papers, wrote quizzes, maintained lab
- Students in section received seven of the nine A's awarded over three sections (~30 students total)

University of Illinois, Urbana, IL (5/99 – 8/00)
Graduate Research Assistant – Semiconductor Research Group
Advisors – **Professors Gregory Stillman and Kuang-Chien Hsieh**

- Fabrication and testing of dc and microwave InGaP/GaAs and InGaAs/InP HBTs
- Characterization of PIN photodetectors integrated into standard HBT process for smart pixel arrays

HONORS AND AWARDS

- (Supervisor) Electronic Materials Conference (EMC) Student Paper Award (2018)
- A "top reviewer" of Applied Physics Letters for 2017
- (Supervisor) Electronic Materials Conference (EMC) Student Paper Award (2016)
- (Supervisor) Electronic Materials Conference (EMC) Student Paper Award (2014)
- (Supervisor) Device Research Conference (DRC) Student Paper Award (2013)
- (Supervisor) Ben Streetman Research Prize (2013)
- (Supervisor) Electronic Materials Conference (EMC) Student Paper Award (2012)
- (Supervisor) Ben Streetman Research Prize (2012)

- High Gain Award from the ECE Department at UT-Austin (2010)
- Kavli Fellow (2010)
- ONR Young Investigator Program (YIP) (2010)
- NSF Faculty Early Career Development (CAREER) Program (2010)
- AFOSR Young Investigator Program (YIP) (2009)
- Presidential Early Career Award for Scientists and Engineers (PECASE) (2009)
- Young Scientist Award from the International Conf. on Compound Semiconductors (ISCS) (2009)
- ARO Young Investigator Program (YIP) (2008) – *superseded by PECASE*
- Young Investigator Award from North American Conf. on Molecular Beam Epitaxy (NAMBE) (2008)
- DARPA Young Faculty Award (YFA) (2008)
- The Rank Prize Funds Dilute-Nitride Mini-Symposium – Best Contributed Paper Award (2006)
- North American Conference on Molecular Beam Epitaxy (NAMBE) Student Paper Award (2005)
- Ross N. Tucker Award – Contributions to electronic materials (Stanford/UC-Berkeley, 2005)
- Electronic Materials Conference (EMC) Student Paper Award (2004)
- Gerald L. Pearson Graduate Fellowship – Fellowship in solid-state electronics (Stanford, 2000)
- John Bardeen Scholarship – Achievement and research potential in physical electronics (UIUC, 1999)

PROFESSIONAL SOCIETIES AND ACTIVITIES

- General Chair:
  - 2016 IEEE Device Research Conference (DRC) – General Chair
  - 2016 IEEE/OSA Conference on Lasers and Electro Optics (CLEO) – S&I General Co-chair
- Program Chair:
  - 2015 IEEE Device Research Conference (DRC) – Program Chair
  - 2014 IEEE/OSA Conference on Lasers and Electro Optics (CLEO) – S&I Program Co-chair
  - 2010 North American Conference on MBE (NAMBE) – Program Chair
- Vice-Chair and related:
  - 2014 IEEE Device Research Conference (DRC) – Technical Vice-Chair
- Subcommittee Chair:
  - 2013 IEEE/OSA Conference on Lasers and Electro Optics (CLEO) – Semiconductor Lasers
  - 2013 IEEE Photonics Annual Meeting (IPC2013) – Photonic Materials and Metamaterials (PMM)
  - 2012 IEEE/OSA Conference on Lasers and Electro Optics (CLEO) – Semiconductor Lasers
  - 2012 IEEE Photonics Annual Meeting (IPC2012) – Photonic Materials Science and Technology (PMST) (Vice Chair)
  - 2011 International Conference on Indium Phosphide and Related Materials (IPRM) – Bulk Materials and Epitaxy
- Program Committees:
  - IEEE International Electron Devices Meeting (IEDM) (2015, 2016)
  - North American Conference on MBE (NAMBE) (2012, 2016)
  - Device Research Conference (DRC) (2011, 2012, 2013)
  - Electronic Materials Conference (EMC) (2009 – Present)
  - IEEE/OSA Conference on Lasers and Electro Optics (CLEO) – Semiconductor Lasers (2009, 2010, 2011, 2012, 2013)
  - IEEE Photonics Society Annual Meeting (IEEE IPC) – Photonic Materials and Metamaterials (PMM) (2008, 2009, 2010, 2011, 2012, 2014, 2015, 2016, 2017)
    - Formerly Lasers and Electro-Optics Society (LEOS)
  - Photonics Asia – Optoelectronic Devices and Integration (2010)
- Special Symposia:
  - Co-organizer of 50th Anniversary of the Semiconductor Laser Symposium, CLEO 2012
  - Co-organizer of Joint Symposium on Hybrid Quantum Nanoplasmonic Systems, CLEO 2011
- Other Conference Organization Duties:
  - DRC Board of Directors (2016-Present)
  - CLEO Steering Committee (IEEE Representative) (2016-2019)
  - EMC Recording Secretary (2015, 2016)

  - NAMBE Fundraising Chair (2010, 2011, 2012, 2013) – coordinated AFOSR/ONR support
  - DRC Fundraising (2014, 2015) – coordinated (w/MRS) NSF/MRS/IBM/Teledyne support
  - DRC Rump Session Co-Organizer – Next 50 Years: What's After the Transistor? (2013)
  - DRC Rump Session Co-Organizer – III-V Compound semiconductors on Si: "A happy marriage" or "Keep your filthy materials out of my fab"? (2012)
- Recent Workshops/Summits:
  - Northrop Grumman New Semiconductors and Devices Workshop (2014, 2017)
  - 4th International Workshop on Bismuth Containing Semiconductors (July 2013)
  - Stanford University Photonics Research (SUPR) Career panel participant (April 2012)
  - Army Research Office Electronics Strategy Meeting (Nov. 2011)
  - National Academy of Sciences (NAS) "22nd Annual Kavli Frontiers of Science" (Nov. 2010)
  - National Academy of Engineering (NAE) "2010 US Frontiers in Engineering Symposium" (Sept. 2010)
- Professional Society Committees:
  - Official Nominator for the "Japan Prize" (2017 – Present)
  - IEEE Representative to CLEO Steering Committee (2016 – Present)
  - IEEE Photonics Society representative to IEEE Nanotechnology Council (2014 – 2018)
  - IEEE Photonics Society Technical Affairs Council (2013 – 2016)
- Journal Reviewer: Applied Physics Letters, J. of Applied Physics, Nano Letters, Optics Letters, Optics Express, IEEE Photonics Technology Letters, IEEE Journal of Quantum Electronics, Electronics Letters, J. of Lightwave Technology, J. of Crystal Growth, Semiconductor Science and Technology, Physical Review Letters, Scientific Reports, Nature Photonics, AAAS Science Advances
  - Named one of Applied Physics Letters' top reviewers for 2017
- Panels: NSF EPMD Panel (2019), NSF EPMD Panel (2017), NSF DMR Panel (2017), NSF DMR Panel (2016), NSF SBIR (2016), NSF CAREER Panel (2015), NSF SBIR Panel (2015), NSF EPMD Panel (2014), NSF DMR Panel (2013), NSF EPMD Panel (2012), NSF DMR Review Panel (2012), NSF CAREER Review Panel (2011), NSF EPMD Panel (2010), NSF EPMD Panel (2009), NSF EPMD Panel (2008), NSF Graduate Research Fellowship Review (2008)
- Proposal Reviewer: Air Force Office of Scientific Research (AFOSR), Army Research Office (ARO), Department of Energy (DOE), National Science Foundation (NSF)
- Member: Senior Member of IEEE (SM'11, M'06, S'95), MRS, Eta Kappa Nu, Tau Beta Pi
- Outreach: Eta Kappa Nu: Fireside host (2007, 2008, 2010, 2011), Smoker (2008, 2009, 2010), Tech Area Night (2007, 2010, 2011, 2012, 2014x2), Women in Engineering Lunch with an Engineer (2008, 2009), Women in Engineering Dinner with an Engineer (2008), IGERT Summer Nanoscience Academy (2011), Austin Children's Museum: Tours of the Microelectronics Research Center (2010, 2011, 2012, 2013), Science Thursday's at Bullock History Museum (2015), NSF/SPIE/OSA Int'l Year of Light Family Science Fun Event (2015), NSF/ECCS Broader Impacts Workshop (2016).

ADMINISTRATIVE SERVICE

- Tau Beta Pi Chapter Advisor (2019 – Present)
- University Laboratory Safety Committee (2018 – Present)
- University Laser Safety Committee (2018 – Present)
- ECE Senior (FII) Hiring Committee (2017 – Present)
  - Co-chair 2018 – 2019
- ECE Curriculum Reform Committee (2015 *ad hoc;* 2016 formal)
- ECE Faculty Recruiting Committee (2014 – 2016)
- (Chair) ECE Future Directions Subcommittee (2014)
- ECE Nanofabrication Facility Planning Committee (2013 – 2016)
- ECE Joint Bsc/Msc Degree and Honors Track Committee (2013 – 2014)
- Faculty Council (2011 – 2013)
- Faculty Expectations Committee (2011 – 2013)
- Parking and Traffic Appeals Panel (2011 – 2013)
- ECE Committee for EERC Building (2010 – 2013)
- ECE Major Sequence Appeals Committee (2010 – Present)

- Solid-State Electronics Faculty Search Committee (2007, 2008, 2009)
    - Successfully hired two chaired and one junior faculty
- Undergraduate Curriculum Reform Committee (2008)
- Unified Qualifying Procedure Committee (2008)

CONSULTING

- Advantech Corporation, Beijing, China (10/18)
    - Technical evaluation of photonics startup
- Solar Junction Corporation, San Jose, CA (7/07 – 5/13; 8/18 – Present)
    - Informal Technical Advisor (7/07 – 5/13)
    - Consulting expert with respect to ongoing litigation (8/18 – Present)
- VecturaLux, Austin, TX (6/11 – 10/11)
    - Co-founder
    - Member of Scientific Advisory Board (6/11 – 10/11)
- ExxonMobil, Houston, TX (9/09 – Present)
    - Development of pressure gradient sensor
- TT electronics / OPTEK Technology, Carrollton, TX (10/07 – 8/08)
    - LED consulting
- EpiWorks, Champaign, IL (8/00 – 9/00)
    - Tech transfer

PUBLICATION LIST (>300 total, >4000 citations, Hirsch Index = 35)[1]

PEER-REVIEWED JOURNAL PUBLICATIONS

1. Y. Yuan, J. Zheng, K. Sun, A.H. Jones, A.K. Rockwell, S.D. March, Y. Shen, **S.R. Bank**, and J.C. Campbell, "Stark-Localization-Limited Franz-Keldysh Effect in InAlAs Digital Alloys," *Physica Status Solidi (RRL) - Rapid Research Letters*, pp. 1900272, June 2019.
2. E.S. Walker, S. Muschinske, C.J. Brennan, S.R. Na, T. Trivedi, S.D. March, Y. Sun, T. Yang, A. Yau, D. Jung, A.F. Briggs, E.M. Krivoy, M.L. Lee, K.M. Liechti, E.T. Yu, D. Akinwande, and **S.R. Bank**, "Composition-dependent structural transition in epitaxial $Bi_{1-x}Sb_x$ thin films on Si(111)," *Physical Review Materials*, vol. 3, no. 6, pp. 064201, June 2019.
3. Z. Yao, V. Semenenko, J. Zhang, S. Mills, X. Zhao, X. Chen, H. Hu, R. Mescall, T. Ciavatti, S. March, **S.R. Bank**, T.H. Tao, X. Zhang, V. Perebeinos, Q. Dai, X. Du, and M. Liu, "Photo-induced terahertz near-field dynamics of graphene/InAs heterostructures," *Optics Express*, vol. 27, no. 10, pp. 13611, May 2019.
4. N. Roschewsky, E.S. Walker, P. Gowtham, S. Muschinske, F. Hellman, **S.R. Bank**, and S. Salahuddin, "Spin-orbit torque and Nernst effect in Bi-Sb/Co heterostructures," *Phys. Rev. B*, vol. 99, pp. 195103, May 2019.
5. D.J. Ironside, R. Salas, P. Chen, K.Q. Le, A. Alu, and **S.R. Bank**, "Enhancing THz generation in photomixers using a metamaterial approach," *Optics Express*, vol. 27, no. 7, pp. 9481–9494, Mar. 2019.
6. J. Jeong, X. Meng, A.K. Rockwell, **S.R. Bank**, W. Hsieh, J. Lin, and Y. Wang, "Picosecond transient thermoreflectance for thermal conductivity characterization," *Nanoscale and Microscale Thermophysical Engineering*, Feb. 2019.
7. Y. Yuan, J. Zheng, A.K. Rockwell, S.D. March, **S.R. Bank**, and J.C. Campbell, "AlInAsSb Impact Ionization Coefficients," *IEEE Photonics Technology Letters*, vol. 31, no. 4, Feb. 2019.
8. D.J. Ironside, A.M. Skipper, T.A. Leonard, M. Radulaski, T. Sarmiento, P. Dhingra, M.L. Lee, J. Vuckovic, and **S.R. Bank**, "High-quality GaAs planar coalescence over embedded dielectric microstructures using an all-MBE approach," *Crystal Growth and Design*, 2019.
9. Y. Yuan, A. Rockwell, Y. Peng, J. Zheng, S. March, A.H. Jones, **S.R. Bank**, and J.C. Campbell, "Comparison of Different Period Digital Alloy Al0.7InAsSb Avalanche Photodiodes," *Journal of Lightwave Technology*, pp. 1–1, 2019.
10. J. Park, J. Kang, X. Liu, S.J. Maddox, K. Tang, P.C. McIntrye, **S.R. Bank**, and M.L. Brongersma, "Dynamic thermal emission control with InAs-based plasmonic metasurfaces," *Science Advances*, vol. 4, no. 12, Dec. 2018.
11. A.K. Rockwell, M. Ren, M. Woodson, A.H. Jones, S.D. March, Y. Tan, Y. Yuan, Y. Sun, R. Hool, S.J. Maddox, M.L. Lee, A.W. Ghosh, J.C. Campbell, and **S.R. Bank**, "Toward Deterministic Construction of Low Noise Avalanche Photodetector Materials," *Applied Physics Letters*, vol. 113, no. 10, pp. 102106, Sept. 2018.
12. Y. Liu, J. Lee, S. March, N. Nookala, D. Palaferri, J.F. Klem, **S.R. Bank**, I. Brener, and M.A. Belkin, "Difference-Frequency Generation in Polaritonic Intersubband Nonlinear Metasurfaces," *Advanced Optical Materials*, pp. 1800681, Aug. 2018.
13. Y. Yuan, J. Zheng, Y. Tan, Y. Peng, A. Rockwell, **S.R. Bank**, A. Ghosh, and J.C. Campbell, "Temperature dependence of the ionization coefficients of InAlAs and AlGaAs digital alloys," *Photon. Res.*, vol. 6, no. 8, pp. 794–799, Aug. 2018.
14. E.M. Krivoy, A.P. Vasudev, S. Rahimi, R.A. Synowicki, K.M. McNicholas, D.J. Ironside, R. Salas, G. Kelp, D. Jung, H.P. Nair, G. Shvets, D. Akinwande, M.L. Lee, M.L. Brongersma, and **S.R. Bank**, "Rare-earth monopnictide alloys for tunable, epitaxial, designer plasmonics," *ACS Photonics*, July 2018.
15. N. Nookala, J. Xu, O. Wolf, S.D. March, R. Sarma, **S.R. Bank**, J. Klem, I. Brener, and M. Belkin, "Mid-infrared second-harmonic generation in ultra-thin plasmonic metasurfaces without a full-metal backplane," *Applied Physics B*, vol. 124, no. 132, pp. 1–7, June 2018.
16. A.K. Rockwell, Y. Yuan, A.H. Jones, S.D. March, **S.R. Bank**, and J.C. Campbell, "$Al_{0.8}In_{0.2}As_{0.23}Sb_{0.77}$ Avalanche Photodiodes," *IEEE Photonics Technology Letters*, vol. 30, no. 11, pp. 1048–1051, June 2018.

[1] Google Scholar profile from 7/20/2019.

17. ***(Invited)*** **S.R. Bank**, J.C. Campbell, S.J. Maddox, M. Ren, A.K. Rockwell, M.E. Woodson, and S.D. March, "Avalanche Photodiodes Based on the AlInAsSb Materials System," *IEEE J. Sel. Top. Quantum Electron.*, vol. 24, no. 2, Mar. 2018.
18. D. Jung, D.J. Ironside, **S.R. Bank**, A.C. Gossard, and J.E. Bowers, "Effect of growth interruption in 1.55 um InAs/InAlGaAs quantum dots on InP grown by molecular beam epitaxy," *Journal of Applied Physics*, vol. 123, no. 20, pp. 205302, 2018.
19. J. Jeong, K. Chen, E.S. Walker, N. Roy, F. He, P. Liu, C.G. Willson, M. Cullinan, **S.R. Bank**, and Y. Wang, "In-Plane Thermal Conductivity Measurement with Nanosecond Grating Imaging Technique," *Nanoscale and Microscale Thermophysical Engineering*, vol. 22, no. 2, pp. 83–96, Dec. 2017.
20. D. Jung, **S.R. Bank**, M.L. Lee, and D. Wasserman, "Next generation mid-infrared sources," *J. Opt*, vol. 19, no. 12, pp. 123001, Nov. 2017.
21. A.H. Jones, Y. Yuan, M. Ren, S.J. Maddox, **S.R. Bank**, and J.C. Campbell, "$Al_xIn_{1-x}As_ySb_{1-y}$photodiodes with low avalanche breakdown temperature dependence," *Optics Express*, vol. 25, no. 20, pp. 24340–24345, Oct. 2017.
22. R. Salas, S. Guchhait, S.D. Sifferman, K.M. McNicholas, V.D. Dasika, D. Jung, E.M. Krivoy, M.L. Lee, and **S.R. Bank**, "Growth rate and surfactant-assisted enhancements of rare-earth arsenide InGaAs nanocomposites for terahertz generation," *APL Materials*, vol. 5, no. 9, pp. 096106, Sept. 2017.
23. T. Trivedi, A. Roy, H.C.P. Movva, E.S. Walker, **S.R. Bank**, D.P. Neikirk, and S.K. Banerjee, "Versatile Large-Area Custom-Feature van der Waals Epitaxy of Topological Insulators," *ACS Nano*, July 2017.
24. M. Ren, S.J. Maddox, M.E. Woodson, J. Chen, **S.R. Bank**, and J.C. Campbell, "Characteristics of $Al_xIn_{1-x}As_ySb_{1-y}$ (x:0.3~0.7) Avalanche Photodiodes," *IEEE/OSA Journal of Lightwave Technology*, vol. 35, pp. 2380, June 2017.
25. K. Chen, N.T. Sheehan, F. He, X. Meng, S.C. Mason, **S.R. Bank**, and Y. Wang, "Measurement of Ambipolar Diffusion Coefficient of Photoexcited Carriers with Ultrafast Reflective Grating-Imaging Technique," *ACS Photonics*, vol. 4, pp. 1440–1446, May 2017.
26. C. Lee, H. Yeh, F. Cheng, P. Su, T. Her, Y. Chen, C. Wang, S. Gwo, **S.R. Bank**, C. Shih, and W. Chang, "Low-Threshold Plasmonic Lasers on a Single-Crystalline Epitaxial Silver Platform at Telecom Wavelength," *ACS Photonics*, vol. 4, pp. 1431–1439, May 2017.
27. D. Jung, J. Faucher, S. Mukherjee, A. Akey, D.J. Ironside, M. Cabral, X. Sang, J. Lebeau, **S.R. Bank**, T. Buonassisi, O. Moutanabbir, and M.L. Lee, "Highly tensile-strained Ge/InAlAs nanocomposites," *Nature Communications*, vol. 8, pp. 14204, Jan. 2017.
28. E.S. Walker, S.R. Na, D. Jung, S.D. March, J. Kim, T. Trivedi, W. Li, L. Tao, M.L. Lee, K.M. Liechti, D. Akinwande, and **S.R. Bank**, "Large-Area Dry Transfer of Single-Crystalline Epitaxial Bismuth Thin Films," *Nano Letters*, Oct. 2016.
29. K. Chen, M.N. Yogeesh, Y. Huang, S. Zhang, F. He, X. Meng, S. Fang, N.T. Sheehan, T.H. Tao, **S.R. Bank**, J. Lin, D. Akinwande, P. Sutter, T. Lai, and Y. Wang, "Non-destructive measurement of photoexcited carrier transport in graphene with ultrafast grating imaging technique," *Carbon*, vol. 107, pp. 233–239, Oct. 2016.
30. Z. Wu, G. Kelp, M.N. Yogeesh, W. Li, K.M. McNicholas, A. Briggs, B.B. Rajeeva, D. Akinwande, **S.R. Bank**, G. Shvets, and Y. Zheng, "Dual-Band Moire Metasurface Patches for Multifunctional Biomedical Applications," *Nanoscale*, Sept. 2016.
31. Z. Wu, W. Li, M.N. Yogeesh, S. Jung, A.L. Lee, K. McNicholas, A. Briggs, **S.R. Bank**, M.A. Belkin, D. Akinwande, and Y. Zheng, "Tunable Graphene Metasurfaces with Gradient Features by Self-Assembly-Based Moire Nanosphere Lithography," *Advanced Optical Materials*, Aug. 2016.
32. S.J. Maddox, S.D. March, and **S.R. Bank**, "Broadly Tunable AlInAsSb Digital Alloys Grown on GaSb," *ACS Crystal Growth & Design*, vol. 16, no. 7, pp. 3582–3586, June 2016.
33. M. Ren, S.J. Maddox, M.E. Woodson, Y. Chen, **S.R. Bank**, and J.C. Campbell, "AlInAsSb separate absorption, charge, and multiplication avalanche photodiodes," *Applied Physics Letters*, vol. 108, no. 19, pp. 191108, May 2016.
34. R. Salas, S. Guchhait, K.M. McNicholas, S.D. Sifferman, V.D. Dasika, D. Jung, E.M. Krivoy, M.L. Lee, and **S.R. Bank**, "Surfactant-assisted growth and properties of rare-earth arsenide InGaAs nanocomposites for terahertz generation," *Appl. Phys. Lett.*, vol. 108, no. 18, pp. 182102, May 2016.
35. H.R. Seren, J. Zhang, G.R. Keiser, S.J. Maddox, X. Zhao, K. Fan, **S.R. Bank**, X. Zhang, and R.D. Averitt, "Nonlinear terahertz devices utilizing semiconducting plasmonic metamaterials," *Light: Science & Applications*, vol. 5, no. 5, pp. e16078, May 2016.

36. C.S. Schulze, X. Huang, C. Prohl, V. Fullert, S. Rybank, S.J. Maddox, S.D. March, **S.R. Bank**, M.L. Lee, and A. Lenz, "Atomic structure and stoichiometry of In(Ga)As/GaAs quantum dots grown on an exact-oriented GaP/Si(001) substrate," *Appl. Phys. Lett.*, vol. 108, no. 14, pp. 143101, Apr. 2016.
37. ***(Invited)*** S.J. Maddox, M. Ren, M.E. Woodson, **S.R. Bank**, and J.C. Campbell, "Recent progress in avalanche photodiodes for sensing in the IR spectrum," *Proc. SPIE*, vol. 9854, pp. 985405–985405–6, Apr. 2016.
38. W. Zhu, S. Park, M.N. Yogeesh, K.M. McNicholas, **S.R. Bank**, and D. Akinwande, "Black phosphorus flexible thin film transistors at gigahertz frequencies," *Nano Letters*, vol. 16, no. 4, pp. 2301–2306, Mar. 2016.
39. M. Ren, S.J. Maddox, Y. Chen, M. Woodson, J.C. Campbell, and **S.R. Bank**, "AlInAsSb/GaSb staircase avalanche photodiode," *Appl. Phys. Lett.*, vol. 108, no. 8, pp. 081101, Feb. 2016.
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CONFERENCE PRESENTATIONS

1. A.K. Rockwell, M. Ren, M. Woodson, A.H. Jones, S.D. March, Y. Tan, Y. Yuan, S.J. Maddox, A.W. Ghosh, J.C. Campbell, and **S.R. Bank**, "Band Structure Influence on Noise Properties of III-V Digital Alloys," *61st Electronic Materials Conf. (EMC)*, Ann Arbor, MI, June 2019.
2. A.M. Skipper, D.J. Ironside, Y. Fang, J.v.d. Groep, J. Song, P. Dhingra, M.L. Lee, M.L. Brongersma, M.J.W. Rodwell, and **S.R. Bank**, "Epitaxial Integration of Arbitrarily Patterned Metal Nanostructures for Photonic Applications," *to be presented at the 61st Electronic Materials Conf. (EMC)*, Ann Arbor, MI, June 2019.
3. A.F. Briggs, S.D. Sifferman, K.J. Underwood, J.P. Gopinath, and **S.R. Bank**, "Externally Applied Strain on GaSb Based InGaAsSb Quantum Well Membranes," *to be presented at the 61st Electronic Materials Conf. (EMC)*, Ann Arbor, MI, June 2019.
4. A.F. Briggs, D. Silva, L.J. Nordin, D. Wasserman, and **S.R. Bank**, "Tunable InGaSb Emitters Coupled with InAs:Si through Molecular Beam Epitaxy," *to be presented at the 61st Electronic Materials Conf. (EMC)*, Ann Arbor, MI, June 2019.
5. R.H. El-Jaroudi, K.M. McNicholas, B.A. Bouslog, J. Kopaczek, R. Kudrawiec, and **S.R. Bank**, "BGaInAs/GaAs quantum wells for 1.3µm lasers," *to be presented at the 61st Electronic Materials Conf. (EMC)*, Ann Arbor, MI, June 2019.
6. S.D. March, A.H. Jones, A.K. Rockwell, M. Ren, Y. Chen, M. Woodson, S.J. Maddox, J.C. Campbell, and **S.R. Bank**, "Modeling and Measurement of Carrier Trapping and Tunneling in $Al_xIn_{1-x}As_ySb_{1-y}$ Digital Alloys," *to be presented at the 61st Electronic Materials Conf. (EMC)*, Ann Arbor, June 2019.
7. K.M. McNicholas, R.H. El-Jaroudi, D. J. Ironside, A.H. Jones, J.C. Campbell, and **S.R. Bank**, " Progress towards B-III-V optoelectronic devices on silicon," *to be presented at the 61st Electronic Materials Conf. (EMC)*, Ann Arbor, MI, June 2019.
8. R.H. El-Jaroudi, K.M. McNicholas, B.A. Bouslog, I.E. Olivares, R.C. White, J.A. McArthur, and **S.R. Bank**, "Boron Alloys for GaAs-based 1.3µm Semiconductor Lasers," *to be presented at IEEE/OSA Conf. on Lasers and Electro Optics (CLEO)*, San Jose, CA, May 2019.
9. E. Simmons, K. Li, A.F. Briggs, **S.R. Bank**, D. Wasserman, E.N. , and V.A. Podolskiy, "Quantum to Classical Transitions in Multilayer Plasmonic Metamaterials," *to be presented at IEEE/OSA Conf. on Lasers and Electro Optics (CLEO)*, San Jose, CA, May 2019.
10. Z. Yao, J. Zhang, S. Mills, X. Zhao, X. Chen, V. Semenenko, H. Hu, T. Ciavatti, S. March, **S. Bank**, H. Tao, V. Perebeinos, X. Zhang, Q. Dai, X. Du, and M. Liu, "Near Field Optical-Pump-Terahertz-Probe Experiments on Graphene/InAs Heterostructure," *American Physical Society March Meeting (APS)*, Boston, MA, Mar. 2019.
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14. ***(Invited)*** **S.R. Bank**, J.C. Campbell, S.J. Maddox, A.K. Rockwell, M.E. Woodson, M. Ren, A. Jones, S. March, J. Zheng, and Y. Yuan, "Digital alloy growth of low-noise avalanche photodiodes," *IEEE RAPID*, Miramar Beach, FL, Aug. 2018.
15. ***(Invited)*** **S.R. Bank**, J.C. Campbell, S.J. Maddox, M. Ren, A.K. Rockwell, M.E. Woodson, A. Jones, S. March, J. Zheng, and Y. Yuan, "Low-Noise Staircase and Conventional Avalanche Photodiodes," *International Nano-Optoelectronics Workshop (iNOW)*, Berkeley, CA, July 2018.

16. A.F. Briggs, A. Kamboj, Z. Dong, L.J. Nordin, D. Wasserman, and **S.R. Bank**, "Pairing Mid-Infrared Emitters with Epitaxial Epsilon-Near-Zero Metamaterial Grown by Molecular Beam Epitaxy," *60th MRS Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2018.
17. A.K. Rockwell, Y. Yuan, S.D. March, A.H. Jones, M. Woodson, M. Ren, S.D. Sifferman, S.J. Maddox, J.C. Campbell, and **S.R. Bank**, "III-V Digital Alloys for Mid-IR Photodetectors," *60th MRS Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2018.
18. ***(Received Student Paper Award)*** K.M. McNicholas, D.J. Ironside, R.H. El-Jaroudi, H. Maczko, G. Cossio, L.J. Nordin, S.D. Sifferman, R. Kudrawiec, E.T. Yu, D. Wasserman, and **S.R. Bank**, "BGaAs/GaP heteroepitaxy for strain-free luminescent layers on Si," *60th MRS Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2018.
19. A.M. Skipper, D.J. Ironside, and **S.R. Bank**, "Monolithic Fabrication of Air Gratings in MBE-Grown GaAs," *60th MRS Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2018.
20. D.J. Ironside, P. Dhingra, .A.M. Skipper, .M.L. Lee, and **.S.R. Bank**, "Defect Reduction in All-MBE-grown InAs/GaAs Heteroepitaxy using Epitaxial Lateral Overgrowth," *60th MRS Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2018.
21. D.J. Ironside, A.M. Skipper, and **S.R. Bank**, "Self-formed Embedded Conical-like Air Voids in MBE-grown Materials using Dielectric-templated Pillar Arrays on (001) III-V Substrates," *60th MRS Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2018.
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25. N. Nookala, P. Chang, D. Sounas, O. Wolf, S. March, **S. Bank**, I. Brener, A. Alu, and M. Belkin, "Optical Power Limiting from Plasmonic Metasurfaces Coupled to Intersubband Transitions," *IEEE/OSA Conf. on Lasers and Electro Optics (CLEO)*, San Jose, CA, May 2018.
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29. ***(Invited)*** **S.R. Bank**, "AlInAsSb avalanche detectors for single photon counting," *SPIE Commercial+ Scientific Sensing and Imaging (SPIE)*, vol. 10212, pp. 1021206, Orlando, FL, Apr. 2018.
30. ***(Invited)*** J.C. Campbell, O. Pfister, P.A. Beling, and **S.R. Bank**, "Quantum avalanche detection science," *SPIE Commercial+ Scientific Sensing and Imaging (SPIE)*, vol. 10212, pp. 1021206, Orlando, FL, Apr. 2018.
31. ***(Invited)*** **S.R. Bank**, "New approaches to the seamless integration of plasmonics, metasurfaces, and dielectric scatters into photonic devices," *Materials Research Symposium (MRS) Fall Meeting*, Boston, MA, Nov. 2017.
32. ***(Invited)*** **S.R. Bank**, "New materials approaches to single photon counting with semiconductors," *to be presented at the NIST Single Photon Counting Workshop*, Boulder, CO, July 2017.
33. **(*Invited)* S.R. Bank**, "Recent Advances in Low Noise Staircase and Conventional Avalanche Photodiodes," *presented at the* 75th Device Research Conf. (DRC), South Bend, IN, June 2017.
34. **(*Invited)* S.R. Bank**, "Alternative materials platform for plasmonic- and metasurface-based devices," *presented at the* IEEE-NEMS Conference, Los Angeles, CA, April 2017.

35. ***(Invited)*** **S.R. Bank**, S. J. Maddox, M. Ren, M. Woodson, A.K. Rockwell, J.C. Campbell, "Staircase and Homojunction Avalanche Detectors in InAlAsSb," presented at the Workshop on Innovative Nanoscale Devices and Systems (WINDS), Kohala Coast, Hawaii, Dec. 2016.
36. ***(Invited)*** **S.R. Bank**, "Digital Alloy Growth of AlInAsSb for Low Noise Avalanche Photodetectors," presented at the 5th International Conference and Exhibition on Lasers, Optics & Photonics, Atlanta, GA, Nov. 2016.
37. M. Ren, M. Woodson, Y. Chen and J. Campbell, S.J. Maddox and **S.R. Bank**, "AlInAsSb Separate Absorption, Charge, and Multiplication Avalanche Photodiodes," 29th IEEE Photonics Conference, Waikoloa Village, HA, Oct. 2016.
38. A.K. Rockwell, S. Maddox, S. March, Y. Sun, D. Jung, M.L. Lee, **S.R. Bank**, "Growth and Properties of Broadly-Tunable AlInAsSb DigitalAlloys on GaSb," 32nd North American Conference on Molecular Beam Epitaxy (NAMBE 2016), Saratoga Springs, NY, Sept. 2016.
39. ***(Invited)*** **S. R. Bank**, S. J. Maddox, A. K. Rockwell, W. Sun, and J.C. Campbell, "Digital Alloy Growth of AlInAsSb for Low Noise Avalanche Photodetectors," 18th International Conference on Crystal Growth and Epitaxy (ICCGE18), Nagoya, Japan, Aug. 2016.
40. K. Chen, D. Akinwande, **S. Bank**, and Y. Wang, "A Novel Optical Grating Technique to Measure Photo-Excited Carrier Transport Property in Electronic Materials," *58th Electronic Materials Conf. (EMC)*, Newark, DE, June 2016.
41. ***(Received Student Paper Award)*** D.J. Ironside, A.M. Crook, A.M. Skipper, and **S.R. Bank**, "Optimal Integration of Rare-Earth Monopnictide Nanostructures in III-V for High Optical Quality Applications," *submitted to 58th Electronic Materials Conf. (EMC)*, Newark, DE, June 2016.
42. A.K. Rockwell, S.J. Maddox, D. Jung, Y. Sun, S.D. Sifferman, W. Sun, M. Ren, J. Guo, J.C. Campbell, M.L. Lee, and **S.R. Bank**, "The Effect of Period Thickness on AlInAsSb Digital Alloys on GaSb," *58th Electronic Materials Conf. (EMC)*, Newark, DE, June 2016.
43. E.S. Walker, S.R. Na, D. Jung, S.D. March, Y. Liu, T. Trivedi, W. Li, L. Tao, M.L. Lee, K.M. Liechti, D. Akinwande, and **S.R. Bank**, "Growth and Transfer of Epitaxial Bismuth Films for Flexible Electronics," *58th Electronic Materials Conf. (EMC)*, Newark, DE, June 2016.
44. ***(Late News)*** M. Ren et al. **S.R. Bank**, and J.C. Campbell, "AlInAsSb Separate Absorption, Charge, and Multiplication Avalanche Photodiodes," Presented at the 74th Device Research Conf. (DRC), Newark, DE, June 2016.
45. S. J. Maddox et al. and **S.R. Bank**, "Low-Noise High-Gain Tunneling Staircase Photodetector," Presented at the 74th Device Research Conf. (DRC), Newark, DE, June 2016.
46. ***(Upgraded to Invited)*** M. Ren, S. J. Maddox, M. Woodson, Y. Chen, **S.R. Bank**, and J. Campbell, Low Excess Noise AlxIn1-xAsySb1-y (x: 0.3~0.7) Avalanche Photodiodes," IEEE/OSA Conf. on Lasers and Electro Optics (CLEO), San Jose, CA, May 2016.
47. ***(Invited)*** **S.R. Bank**, S.J. Maddox, S.D. March, W. Sun, M. Ren, and J.C. Campbell, "Advances in IR APD materials research," *SPIE Defense and Commercial Sensing*, Baltimore, MD, Apr. 2016.
48. ***(Invited)*** J.C. Campbell, and **S.R. Bank**, "Recent progress in avalanche photodiodes for sensing in the IR spectrum," *SPIE Defense and Commercial Sensing*, Baltimore, MD, Apr. 2016.
49. K. Chen, Y. Wang, D. Akinwande, **S. Bank**, and J.-F. Lin, "A novel grating-imaging method to measure carrier diffusion coefficient in graphene," *American Physical Society (APS) March Meeting*, Baltimore, MD, Mar. 2016.
50. ***(Invited)*** **S.R. Bank**, S.D. Sifferman, H.P. Nair, N.T. Sheehan, R. Salas, S.J. Maddox, and A.M. Crook, "Highly strained type-I diode lasers on GaSb," *SPIE Photonics West*, San Francisco, CA, Feb. 2016.
51. ***(Invited)*** **S.R. Bank**, S.J. Maddox, W. Sun, H.P. Nair, and J.C. Campbell, "Recent progress in high gain InAs avalanche photodiodes," *SPIE Optics and Photonics Meeting*, San Diego, CA, Aug. 2015.
52. H.R. Seren, G.R. Keiser, J. Zhang, S.J. Maddox, X. Zhao, K. Fan, **S.R. Bank**, X. Zhang, and R.D. Averitt, "THz materials discovery and integration: the search for novel functionality," *International Conf. on Infrared, Millimeter, and Terahertz Waves*, Hong Kong, Aug. 2015.
53. S.J. Maddox, S.D. March, W. Sun, J.C. Campbell, and **S.R. Bank**, "Growth and Properties of Broadly Tunable AlInAsSb Digital Alloys on GaSb," *57th Electronic Materials Conf. (EMC)*, Columbus, OH, June 2015.
54. K.M. McNicholas, E.M. Krivoy, R. Salas, S.D. Sifferman, and **S.R. Bank**, "Tunable, lattice-matched, epitaxial semimetals," *57th Electronic Materials Conf. (EMC)*, Columbus, OH, June 2015.

55. R. Salas, N.T. Sheehan, S. Guchhait, K.M. McNicholas, S.D. Sifferman, V.D. Dasika, E.M. Krivoy, and **S.R. Bank**, "Properties of Growth Enhanced ErAs:InGaAs Nanocomposites," *57th Electronic Materials Conf. (EMC)*, Columbus, OH, June 2015.
56. S.D. Sifferman, R. Salas, S.J. Maddox, H.P. Nair, N.T. Sheehan, E.M. Krivoy, E.S. Walker, and **S.R. Bank**, "Surfactant-mediated growth of highly strained materials for mid-infrared applications," *57th Electronic Materials Conf. (EMC)*, Columbus, OH, June 2015.
57. E.S. Walker, W. Li, S. Guchair, M. Yogeesh, F. He, Y. Wang, D. Akinwande, and **S.R. Bank**, "In Situ Oxidation of Bismuth Thin Films Grown by Molecular Beam Epitaxy for Device Applications," *57th Electronic Materials Conf. (EMC)*, Columbus, OH, June 2015.
58. ***(Late News)*** M. Ren, S.J. Maddox, Y. Chan, M. Woodson, **S.R. Bank**, J.C. Campbell, "Low Excess Noise AlInAsSb Staircase Avalanche Photodiode," *73rd Device Research Conf. (DRC)*, Santa Barbara, Ca, June 2015.
59. H.R. Seren, J. Zhang, X. Zhao, K. Fan, **S. Bank**, R.D. Averitt, and X. Zhang, "InAs Metamaterials on Flexible Substrate," *2014 Materials Research Society (MRS) Fall Meeting*, Boston, MA, Dec. 2014.
60. D.J. Ironside, R. Salas, P. Chen, K.Q. Le, A. Alu, and **S.R. Bank**, "Employing Metamaterials for Enhanced THz Generation in Photomixers," *IEEE Photonics Conf. (IPC)*, San Diego, CA, Oct. 2014.
61. D.J. Ironside, E.M. Krivoy, V.D. Dasika, and **S.R. Bank**, "Dislocation-filtering with Rare-earth Monopnictide Nanoparticles Embedded in Metamorphic Buffer Layers," *International Molecular Beam Epitaxy Conf. (ICMBE)*, Flagstaff, AZ, Sept. 2014.
62. R. Salas, S. Guchhait, S.D. Sifferman, K.M. McNicholas, V.D. Dasika, D. Jung, M.L. Lee, and **S.R. Bank**, "Surfactant-Mediated Growth of RE-As:InGaAs Nanocomposites," *International Molecular Beam Epitaxy Conf. (IMBE)*, Flagstaff, AZ, Sept. 2014.
63. ***(Received Student Paper Award)*** S.J. Maddox, A.P. Vasudev, V.D. Dasika, S. March, M.L. Brongersma, and **S.R. Bank**, "Effects of Growth Rate, Substrate Temperature, and a Bi Surfactant on Doping Limits in InAs:Si Grown by Molecular Beam Epitaxy," *56th Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2014.
64. K.M. McNicholas, E.M. Krivoy, R. Salas, and **S.R. Bank**, "GdAs Thin Films Grown By Molecular Beam Epitaxy," *56th Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2014.
65. A.K. Rockwell, S.J. Maddox, R. Salas, V. Dasika, and **S.R. Bank**, "Rapid Thermal Annealing of Ion Implanted InAs:S for Mid-IR Plasmonics," *56th Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2014.
66. R. Salas, S. Guchhait, S.D. Sifferman, K.M. McNicholas, V.D. Dasika, D.J. Ironside, E.M. Krivoy, S.J. Maddox, D. Jung, M.L. Lee, and **S.R. Bank**, "Properties of RE-As:InGaAs Nanocomposites," *56th Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2014.
67. S.D. Sifferman, J.W. Schwede, D.C. Riley, R.T. Howe, Z. Shen, N.A. Melosh, and **S.R. Bank**, "Compositionally-Graded Structures for Photon-Enhanced Thermionic Emitters," *56th Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2014.
68. E.S. Walker, E. Krivoy, M. Yogeesh, D. Akinwande, and **S.R. Bank**, "Semiconducting Bismuth Thin Films Grown by Molecular Beam Epitaxy for Device Applications," *56th Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2014.
69. W. Sun, S.J. Maddox, **S.R. Bank**, and J.C. Campbell, "Record High Gain from InAs Avalanche Photodiodes at Room Temperature," *72nd Device Research Conf. (DRC)*, Santa Barbara, Ca, June 2014.
70. ***(Invited)*** **S.R. Bank**, "Epitaxy of terahertz, plasmonic and infrared devices," *2014 Lawrence Symposium of Epitaxy*, Scottsdale, AZ, Feb. 2014.
71. S.J. Maddox, A.P. Vasudev, V.D. Dasika, M.L. Brongersma, and **S.R. Bank**, "Exploring the Limits of Silicon Doping in InAs for Mid-Infrared Plasmonics," *North American Molecular Beam Epitaxy Conf. (NAMBE)*, Banff, Alberta, Canada, Oct. 2013.
72. ***(Invited)*** **S.R. Bank**, "Recent Advances in InAs Avalanche Photodiodes," *2013 IEEE Photonics Society Conference (IPC)*, Bellevue, WA, Sept. 2013.
73. ***(Invited)*** **S.R. Bank**, E.M. Krivoy, and S.J. Maddox, "Growth of epitaxial doped semiconductor and semimetallic plasmonic materials," *SPIE Optics and Photonics Meeting*, San Diego, Ca, Aug. 2013.
74. ***(Received Student Paper Award)*** H.P. Nair, R. Salas, N.T. Sheehan, S.J. Maddox, and **S.R. Bank**, "3.4 μm Diode Lasers Employing Al-Free GaInAsSb/GaSb MQW Active Regions at 20 °C," *71st Device Research Conf. (DRC)*, South Bend, IN, June 2013.

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185. M.A. Wistey, **S.R. Bank**, H.B. Yuen, L.L. Goddard, and J.S. Harris, "Real-Time Ion Count from Nitrogen Plasma Source," *North American Molecular Beam Epitaxy Conf. (NAMBE)*, 2003.
186. H.B. Yuen, V. Lordi, **S.R. Bank**, M.A. Wistey, J.S. Harris, and A. Moto, "Analysis of Material Properties of GaNAs(Sb) Grown by MBE," *Materials Research Symposium (MRS)*, 2003.
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188. V. Gambin, W. Ha, M. Wistey, **S.R. Bank**, H. Yuen, S. Kim, and J. Harris, "Long Wavelength, High Efficiency Photoluminescence from MBE Grown GaInNAsSb," *44th Electronic Materials Conf. (EMC)*, Santa Barbara, CA, June 2002.
189. W. Ha, V. Gambin, **S.R. Bank**, M. Wistey, S. Kim, and J.S. Harris, "Long Wavelength GaInNAs(Sb) Lasers on GaAs," *Conf. on Lasers and Electro-Optics (CLEO)*, Long Beach, CA, May 2002.
190. V. Lordi, V. Gambin, W. Ha, **S.R. Bank**, and J. Harris, "Examination of N Incorporation into GaInNAs," *Materials Research Symposium (MRS), April*, Apr. 2002.
191. D.S. Gardner, **S.R. Bank**, P. Griffin, J.S. Harris, R. Swanson, and J.R. Patel, "On the Luminescence Efficiency of Silicon Diodes," *Optical Amplification and Stimulation in Silicon (OASIS)*, 2002.
192. W. Ha, V. Gambin, **S.R. Bank**, M. Wistey, J.S. Harris, and S. Kim, "Long wavelength GaInNAs(Sb) lasers on GaAs," *Lasers and Electro-Optics, 2002. CLEO '02. Technical Digest. Summaries of Papers Presented at the*, p. 269 - 270 vol.1, 2002
193. W. Ha, V. Gambin, **S.R. Bank**, M. Wistey, S. Kim, and J.S. Harris, "A 1.5 μm GaInNAs(Sb) Laser Grown on GaAs by MBE," *60th Device Research Conf. (DRC)*, 2002.
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195. W. Ha, V. Gambin, **S.R. Bank**, M. Wistey, H. Yuen, L. Goddard, S. Kim, and J.S. Harris, "A 1.5 μm GaInNAs(Sb) Laser Grown on GaAs by MBE," *International Conf. on Molecular Beam Epitaxy (MBE)*, 2002.
196. W. Ha, V. Gambin, **S.R. Bank**, M. Wistey, H. Yuen, S. Kim, and J.S. Harris, "A 1.5 μm GaInNAs(Sb) Laser Grown on GaAs by MBE," *Proc. 18th IEEE International Semiconductor Laser Conf. (ISLC)*, 2002.

RECENT INVITED SEMINARS AND WORKSHOPS

1. **S.R. Bank**, "Engineering new functionality into III-V semiconductors: From atomically-engineered detectors to heterogenous epitaxial integration," *UCLA MSE Colloquium*, June 2019, Los Angeles, CA.
2. **S.R. Bank** *et al.*, "Quantum Materials for the Quantum Internet (Emerging Semiconductor Single Photon Counters)," *Enabling Quantum Materials Workshop*, Feb. 2019, Baton Rouge, LA.
3. **S.R. Bank,** "Epitaxial Approaches to Plasmonics and Metamaterials," *Boston Univ. Workshop on Plasmonics and Metamaterials*, Sept. 2017, Boston, MA.
4. **S.R. Bank,** "New Materials for Photonics in the Mid-Infrared: From Lasers and Detectors to Plasmonics and Metamaterials," *ECE Colloquium CU-Boulder*, July 2017, Boulder, CO.
5. **S.R. Bank,** "Emerging Semiconductor Single Photon Counters," *NIST Single Photon Workshop*, July 2017, Boulder, CO.
6. **S.R. Bank,** "New Materials for Photonics in the Mid-Infrared: From Lasers and Detectors to Plasmonics and Metamaterials," *EDS Seminar Cornell*, April 2017, Ithaca, NY.
7. **S.R. Bank,** "New Materials for Photonics in the Mid-Infrared: From Lasers and Detectors to Plasmonics and Metamaterials," *EE USC*, April 2017, Los Angeles, CA.
8. **S.R. Bank,** "New Materials for Photonics in the Mid-Infrared: From Lasers and Detectors to Plasmonics and Metamaterials," *EE UCLA*, April 2017, Los Angeles, CA.
9. **S.R. Bank,** "New Materials for Photonics in the Mid-Infrared: From Lasers and Detectors to Plasmonics and Metamaterials," *IOptics Colloquium UIUC*, April 2017, Urbana, IL.
10. **S.R. Bank,** "New Materials for Photonics in the Mid-Infrared: From Lasers and Detectors to Plasmonics and Metamaterials," *CQIQC Seminar*, *University of Toronto*, March 2017, Toronto, Canada.
11. **S.R. Bank,** "New Materials for Photonics in the Mid-Infrared: From Lasers and Detectors to Plasmonics and Metamaterials," *ECE Colloquium Boise State*, March 2017, Boise, ID.
12. **S.R. Bank,** "Emerging electronic, thermal and photonic materials," *Northrup Grumman Workshop*, Jan. 2017, Los Angeles, CA.
13. **S.R. Bank,** "New Materials for Photonics in the Mid-Infrared: From Lasers and Detectors to Plasmonics and Metamaterials," *ECE Colloquium Lehigh University*, March 2016, Philadelphia, PA.
14. **S.R. Bank,** "Recent progress in high gain InAs- and GaSb-based avalanche photodiodes (APDs)," *Seminar at Army Night Vision Lab*, Oct 2015, Fort Belvoir, VA.
15. **S.R. Bank,** "Mid-infrared photonic devices and materials," *University of Pennsylvania Seminar*, July 2015, Philadelphia, PA.
16. **S.R. Bank,** "Advanced Electronic and Photonic Materials and Devices," *Northrup Grumman Workshop*, Dec. 2014, Los Angeles, CA.
17. **S.R. Bank**, "New Materials for Photonics in the Mid-Infrared: From Lasers and Detectors to Plasmonics and Metamaterials," *University of Illinois at Urbana-Champaign NanoEP Graduate Seminar*, April 2014, Urbana, IL.
18. **S.R. Bank**, "Epitaxy of terahertz, plasmonic and infrared devices," *2014 Lawrence Symposium of Epitaxy*, 2014 Lawrence Symposium on Epitaxy, Scottsdale, AZ, Feb. 2014.
19. **S.R. Bank**, "Terahertz Materials," *CATS Workshop at Rice University*, Oct. 2013, Houston, TX.
20. **S.R. Bank**, "Recent Advances in InAs Avalanche Photodiodes," *2013 IEEE Photonics Society Conference (IPC)*, Bellevue, WA, Sept. 2013.
21. **S.R. Bank**, E.M. Krivoy, and S.J. Maddox, "Growth of epitaxial doped semiconductor and semimetallic plasmonic materials," *SPIE Optics and Photonics Meeting*, San Diego, CA, Aug. 2013.
22. **S. R. Bank**, "Plasmonics with Crystalline Semiconductors and Semimetals: Opportunities to Mitigate Loss and Add Functionality," *UC Berkeley SINAM Seminar*, Oct 2013, Berkeley, CA.
23. **S. R. Bank**, "New Materials for Photonics in the Mid-Infrared: From Lasers and Detectors to Plasmonics and Metamaterials," *Stanford Univ. Applied Physics Electronics and Photonics Seminar*, Oct 2013, Stanford, CA.
24. **S. R. Bank**, S. J. Maddox, A. P. Vasudev, V. D. Dasika, M. L. Brongersma, "InAs(Bi): Bismuth as a Surfactant and Lattice Constituent for Photodetectors and Plasmonics," *4th International Workshop on Bismuth Containing Semiconductors*, July 2013, Fayetteville, AR.
25. **S.R. Bank**, "Reengineering THz Photomixers at the Materials and Device Levels," *Air Force Research Laboratory Seminar,* Nov. 2012, San Antonio, TX.
26. **S.R. Bank**, "LuAs Films and Nanostructures," *Embedded Nanoparticle Workshop,* June 2011, Santa Barbara, CA.

27. **S.R. Bank**, "Harnessing the Electrical, Optical, and Structural Properties of Metal:Semiconductor Nanocomposites for Device Applications," *Notre Dame Solid State Seminar (S3)*, Feb. 2011, South Bend, IN.
28. **S.R. Bank**, "Epitaxial Metal:Semiconductor Nanocomposites (Harnessing Their Electrical, Optical, and Structural Properties)," *22nd Annual Kavli Frontiers of Science Symposium*, Nov. 2010, Irvine, CA.**S.R. Bank**, "Harnessing the Electrical, Optical, and Structural Properties of Metal:Semiconductor Nanocomposites for Device Applications," *Stanford Univ. EE Seminar*, April 2010, Stanford, CA.
29. **S.R. Bank**, "Applications of Epitaxial Nanostructures to Nanophotonics," *Yale University Seminar*, April 2010, New Haven, CT.
30. **S.R. Bank**, E.T. Yu, A. Alu, S.K. Banerjee, B. Korgel, "Metamaterials-Based Integration of Photovoltaics Into Displays," *Intel Workshop on Multifunctional Photovoltaic Systems*, Feb. 2010, Santa Clara, CA.
31. **S.R. Bank**, "Potential Applications of Metallic Nanostructures for Electronic Devices," *Office of Naval Research Electronic Materials Frontier Workshop*, Jan. 2010, Washington, DC.
32. **S.R. Bank**, "Enhancing Photonic Devices with Metallic Nanostructures," *University of Illinois at Urbana-Champaign Graduate Seminar*, April 2009, Urbana, IL.