

# Amit Verma

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## Brief Biosketch

Amit Verma obtained his B.Tech. degree from IIT-BHU (formerly IT-BHU), India, M.S. from Vanderbilt University, U.S.A, and Ph.D. from Georgia Institute of Technology, U.S.A. Since 2006 he has been a faculty at Texas A&M University-Kingsville, and currently also serves as Director of the Graduate Program in Electrical Engineering. Dr. Verma's current research interests include modeling and characterizing the electronic and optoelectronic properties of nanomaterials, as well as developing and characterizing solar cells utilizing those materials. He is also involved in developing high efficiency bulk crystalline silicon, as well as amorphous silicon based heterojunction solar cells. His recent work has also included developing a new class of ultra-thin metallic nanofilms and carbon nanotubes based microwave antenna, and a power electronic device. Dr. Verma also conducts research in undergraduate engineering education, and has helped develop concept inventories in undergraduate nanoelectronics course, as well as basic electricity concepts. In the past Dr. Verma worked on developing optical interconnects for silicon based ICs. He was a postdoctoral scholar at the University Affiliated Research Center at the NASA Ames Research Center, USA, and process automation engineer and Senior Officer at a steel plant. In 2015-2016 he served as President of the Texas A&M University-Kingsville Faculty Senate. He received the "Professor of the Year" award from the 2015 Electrical Engineering graduating class at Texas A&M University-Kingsville. He is also the author of the well-received work of literary fiction, *The Lives and The Times*, published in 2011 by Satyam Books. The sequel was released in March 2016.

## Education

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| 2001 – 2006 | <b>Georgia Institute of Technology</b> , Atlanta, Georgia<br>Ph.D. in Electrical and Computer Engineering  |
| 1999 – 2001 | <b>Vanderbilt University</b> , Nashville, Tennessee<br>Master of Science in Electrical and Computer Engineering  |
| 1993 – 1997 | <b>Indian Institute of Technology-BHU</b> (formally Institute of Technology-BHU), Varanasi, India<br>Bachelor of Technology in Electronics and Telecommunication Engineering |

## Work Experience

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|------------------|---|
| Fall 2018 -      | Professor, Department of Electrical Engineering & Computer Science, Texas A&M University – Kingsville, Kingsville, TX |
| Fall 2012 – Fall | Associate Professor, Department of Electrical Engineering & Computer  |

2018	Science, Texas A&M University – Kingsville, Kingsville, TX
Fall 2006 – Fall 2012	Assistant Professor, Department of Electrical Engineering & Computer Science, Texas A&M University – Kingsville, Kingsville, TX
Dec 2005 – May 2006	Postdoctoral fellow, UARC, NASA Ames Research Center, Moffett Field, CA
2001 – 2005	Research Assistant, School of Electrical and Computer Engineering, Georgia Institute of Technology
1999 – 2001	Research Assistant, Department of Electrical and Computer Engineering, Vanderbilt University
1997 – 1999	Process Automation Engineer and Senior Officer, Tata Iron and Steel Company, Jamshedpur, India
1996 – 1997	Undergraduate Research Assistant

## Research, Creative, and Scholarly Activity

### Funded Research

1. South Texas Navy Pathway  
Agency: Office of Naval Research  
Role: co-PI  
Amount: \$ 692,085  
Duration: 2018-2021
2. Comprehensive Investigation and Development of Silicon Nanowire Based Photovoltaic Technology  
Agency: Qatar Research Foundation  
Role: co-PI  
Amount: \$ 1,041,563  
Duration: 2012-2016
3. MRI: Acquisition of a Variable-Property Material Synthesizing Instrument  
Agency: National Science Foundation  
Role: co-PI  
Amount: \$ 349,200  
Duration: 2013-2016
4. NUE: Nanoengineering Education in an Under-Represented Minority University.  
Agency: National Science Foundation  
Role: co-PI  
Amount: \$ 199,868  
Duration: 2011-2014
5. Device and Circuit Behavior Investigation of Small Diameter Nanowires  
Agency: TAMUK

- Role: PI  
Amount: \$24,957  
Duration: 2010-2011
6. Acquisition of Manual Probe System for Research and Education  
Agency: College of Engineering, TAMUK  
Role: PI  
Amount: \$ 24,000  
Duration: 2010 – 2011
7. Modeling of Organic Polymer-Carbon Nanotube Composites for Photovoltaic Applications  
Agency: College of Engineering, TAMUK  
Role: PI  
Amount: \$ 49,430  
Duration: 2010 – 2011
8. Circuit level behavior of single-wall carbon nanotube electronic and sensor devices  
Agency: TAMUK  
Role: PI  
Amount: \$27,389  
Duration: 2008-2009

### Patents

1. Patent: **A. Verma**, F. Urbani, and D.W. Stollberg, “Integration of an Aperture-Coupled Nanofilm Microstrip Antenna in an Integrated Circuit Chip,” United States Patent and Trademark Office, No. 9,679,828, June 2017
2. Patent: A.C.S. Ratcha, **A. Verma**, R. Nekovei, and M.M. Khader, “Heterojunction Schottky Gate Bipolar Transistor,” United States Patent and Trademark Office, No. 9,793,430, October 2017;  
Also filed as PCT/US2017/031742, &  
Chinese Patent Application No.2017800290608
3. Patent: **A. Verma**, F. Urbani, D.W. Stollberg, “Electronic Device with Microfilm Antenna and Related Methods,” United States Patent and Trademark Office, No. 9,881,883, January 2018
4. Patent A.C.S. Ratcha, **A. Verma**, R. Nekovei, and M.M. Khader, “Method For Fabricating a Heteojunction Schottky Gate Bipolar Transistor,” United States Patent and Trademark Office, No. 9,911,889, March 2018
5. Patent: Md Golam Rabbani, Manjeri P. Anantram, **A. Verma**, Reza Nekovei, Mahmoud M. Khader, “Dual-metal nanowire optoelectronic devices,” United States Patent and Trademark Office, No. 9,997,656, June 2018
6. Patent: **A. Verma**, F. Urbani, D.W. Stollberg, “Electronic Device with Microfilm Antenna and Related Methods,” United States Patent and Trademark Office, No. 10056341, August 2018
7. Patent Pending: Md Golam Rabbani, Manjeri P. Anantram, **A. Verma**, Reza Nekovei, Mahmoud M. Khader, “Photodetector Cell and Solar Panel With Dual Metal Contacts and Related Methods,” United States Patent and Trademark Office, No. 15/978,382

### Bibliography of Publications

Refereed journal articles:

1. MD Raiyan Alam, Ganesh Alwarappan, Sherin Alfalah, Mohamed F. Shibl, Walid M.I. Hassan, R. Nekovei, **A. Verma**, "TDDFT Studies on Sheet Size-Dependency of Optoelectronic Properties of 2D Silicon doped With Alkali Metals," Emergent Materials, submitted
2. S. Alfalah, M. F. Shibl, **A. Verma**, R. Nekovei, and M. M. Khader, "Silicon Nanowires: Toward Single Molecule Detection?," Journal of Computational Chemistry, submitted
3. A. Bhandari and **A. Verma**, "A Tight-Binding Analysis of Models, Sheet Width, and Strain for 2D Monoatomic Germanium Sheets," Materials Express, submitted
4. A. S. Bhandari, W. M. I. Hassan, N. Al-Hashimi, M. F. Shibl, S. R. Patil, and **A. Verma**, "Role of doping and sheet size in tailoring optoelectronic properties of germanene: A TDDFT study," International Journal of Quantum Chemistry, vol. 118, iss. 19, e25700, 2018.
5. D. Shiri, **A. Verma**, Reza Nekovei, Andreas Isacsson, C. R. Selvakumar, M. P. Anantram, "Gunn Effect in Silicon Nanowires: Charge Transport under High Electric Field," Scientific Reports, Nature Publishing Group, vol. 8, p. 6273, 2018
6. S. Alfalah, W.M.I. Hassan, **A. Verma**, N. Al.-Hashimi, M.M. Khader, R. Nekovei, "CO<sub>2</sub> Reduction to Renewable Hydrocarbon Fuel - Mimicking Natural Photosynthesis," MRS Advances, vol. 2, iss. 55 (Energy Storage and Conversion), p. 3383, 2017
7. L. Costa, M. Al-Hashimi, M. Heeney, A. Terekhov, D. Rajput, W. Hofmeister, **A. Verma**, "Template-synthesis of conjugated poly(3-hexylselenophene) (P3HS) nanofibers using femtosecond laser machined fused silica templates," MRS Advances, vol. 2, iss. 51 (Electronic Devices and Materials), p. 2957, 2017
8. M. Golam Rabbani, Jency P. Sundarajan, **A. Verma**, R. Nekovei, Mahmoud M. Khader, R. B. Darling, Sunil R. Patil, "Photoresponse of silicon with asymmetric area contacts," Semiconductor Science and Technology, vol. 32, p. 015001, 2016
9. R. Jeyakumar, T. K. Maiti, Mahmoud M. Khader, **A. Verma**, Reza Nekovei, J. Kumar, Nagarajan Balaji, Junsin Yi, "High-efficiency c-Si based interdigitated point contact back heterojunction solar cells," Journal of Materials Science: Materials in Electronics, vol. 28 p. 9697, 2017
10. W.M.I. Hassan, M.P. Anantram, R. Nekovei, M.M. Khader, **A. Verma**, "Tailoring Optical Absorption in Silicon Nanostructures from UV to Visible Light: A TDDFT Study," Solar Energy, vol. 126, p. 44, 2016
11. M. Golam Rabbani, Sunil R. Patil, **A. Verma**, Julian E. Villarreal, Brian A. Korgel, Reza Nekovei, Mahmoud M. Khader, R. B. Darling, and M. P. Anantram, "Zero-bias photocurrents in highly-disordered networks of Ge and Si nanowires," Nanotechnology, vol. 27, p. 045201, 2016.
12. D. Shiri, **A. Verma**, and M. M. Khader "Photoconductive response of small diameter strained silicon nanowires: A Monte Carlo study," Journal of Applied Physics, vol. 115, p. 133708, 2014
13. Jeyakumar Ramanujam, **A. Verma**, M. M. B. Khader, B. González-Díaz, R. Guerrero-Lemus, Carlos del Canizo, Elisa Garcia-Tabares, Ignacio Rey-Stolle, Filip Granek, Lars Korte, Mario Tucci, Jatin Rath, Udai P. Singh, Teodor Todorov, Oki Gunawan, S. Rubio, J. L. Plaza, Ernesto Diéguez, Björn Hoffmann, Silke Christiansen, George E. Cirlin, "Review: Inorganic Photovoltaics – Planar and Nanostructured Devices," Progress in Materials Science, DOI: 10.1016/j.pmatsci.2016.03.005, October 2016.

14. M. Golam Rabbani, **A. Verma**, Michael M. Adachi, Jency P. Sundararajan, Mahmoud M. Khader, R. Nikovei, and M. P. Anantram, "Study of dual-metal Schottky contacts based Silicon micro and nano wire solar cells," Solar Energy Materials and Solar Cells, vol. 130, p. 456, 2014
15. R. Jeyakumar, T. K. Maiti, and **A. Verma**, "Two-dimensional simulation studies on high-efficiency point contact back heterojunction (a-Si:H/c-Si) solar cells", Solar Energy, vol. 105, p. 109, 2014
16. G. Singh, **A. Verma**, and R. Jeyakumar, "Fabrication of c-Si solar cells using boric acid as spin-on dopant for back surface field," Royal Society of Chemistry Advances, no. 4, p. 4225, 2014
17. A. Buin, **A. Verma**, and Simarjeet Saini, "Optoelectronic response calculations in the framework of k·p coupled to non-equilibrium Green's functions for one-dimensional systems in the ballistic limit," Journal of Applied Physics, vol. 114, p. 033111, 2013
18. D. Shiri, **A. Verma**, C.R. Selvakumar, and M. P. Anantram, "Reversible Modulation of Spontaneous Emission by Strain in Silicon Nanowires," Scientific Reports, Nature Publishing Group, vol. 2, p. 461, 2012
19. J. Ramanujam, T.K.Maiti, and **A. Verma**, "Influence of Emitter Bandgap on Interdigitated Point Contact Back Heterojunction (a-Si:H/c-Si) Solar Cell Performance," Solar Energy Materials and Solar Cells, vol. 109, p. 199, 2013
20. J. Ramanujam and **A. Verma**, "Properties of PECVD a-Si:H Films for Photovoltaics: A Review," Materials Express, Vol. 2, No. 3, p. 177, 2012
21. S. Basavaraju, **A. Verma**, S.P. Morusupalli, and A. K. Buin, "Monte Carlo Study of Small Diameter Silicon Nanowire Field Effect Transistor," Materials Express, Vol. 2, p. 164, 2012
22. F. Urbani, D.W. Stollberg, and **A. Verma**, "Experimental Characterization of Nanofilm Microstrip Antennas", IEEE Transactions on Nanotechnology, vol. 11, p. 406, 2012
23. J. Ramanujam, D.Shiri, and **A. Verma**, "Silicon Nanowire Growth and Properties: A Review", Materials Express, vol. 1, No. 2, p. 105, 2011
24. **A. Verma**, A.K. Buin, and M. P. Anantram, "High-field hole transport in silicon nanowires", Journal of Applied Physics, vol. 106, p. 113713, 2009; *also selected for the December 21, 2009 issue of Virtual Journal of Nanoscale Science & Technology for frontier research*.
25. A.K. Buin, **A. Verma**, and M. P. Anantram, "Carrier-phonon interaction in small diameter silicon nanowires", Journal of Applied Physics, vol. 104, p. 053716, 2008
26. A.K. Buin, **A. Verma**, A. Svizhenko, and M. P. Anantram, "Significant enhancement of hole mobility in [110] silicon nanowires compared to electrons and bulk silicon", Nano Letters, vol. 8, p. 760, 2008
27. M.Z.Kauser, **A.Verma**, and P.P.Ruden, "Low and High field Transport for Semiconducting Carbon Nanotubes", Physica E, Vol. 34, page 666, 2006
28. **A. Verma**, M. Z. Kauser, and P. P. Ruden, "Effects of radial breathing modes on carrier transport in semi-conducting carbon nanotubes," Appl. Phys. Lett., vol. 87, pp. 123101, 2005
29. **A. Verma**, M. Z. Kauser, and P. P. Ruden, "Ensemble Monte Carlo Transport simulation for semi-conducting carbon nanotubes," J. Appl. Phys., vol. 97, pp. 114319, 2005; *also selected for the June 13, 2005 issue 23 of Virtual Journal of Nanoscale Science & Technology for frontier research*.

30. A. Chatterjee, P. Mongkolkachit, B.Bhuvu, and **A. Verma**, “All Si-based optical interconnect for interchip signal transmission”, IEEE Photonics Technology Letters, Volume 15, Issue 11, pp. 1663–1665, Nov. 2003

Refereed Conference Proceedings:

1. Ganesh Alwarappan, Aashik Padmanabachary, Raiyan Alam, Aashka Bhandari, Walid M.I. Hassan, Sunil Patil, Jeyakumar Ramanujam, Mohamed F. Shibl, R. Nekovei, **A. Verma**, “TDDFT Investigation of the Hybrid Organic Inorganic Perovskite:  $\text{CH}_3\text{NH}_3\text{PbCl}_3$ ,” abstract accepted to the 2018 IEEE Nanomaterials and Devices Conference
2. MD Raiyan Alam, Ganesh Alwarappan, Aashka Bhandari, Walid M.I. Hassan, Mohamed F. Shibl, Sunil Patil, Sherin Alfalah, R. Nekovei, **A. Verma**, “TDDFT Studies on Sheet Size-dependency of Optoelectronic Properties of 2D Silicon,” abstract accepted to the 2018 IEEE Nanomaterials and Devices Conference
3. H. Shah, S. Islam, D. Shiri, R. Nekovei, and **A. Verma**, “Ab-initio Calculation of Nonlinear Optical Susceptibilities in Germanium Quantum Dots,” abstract accepted to the 2018 IEEE Nanomaterials and Devices Conference
4. L. Costa, M. Al-Hashimi, K. Lansford, A. Terekhov, W. Hofmeister, R. Jeyakumar, **A. Verma**, “Novel Method for the Synthesis of Conjugated Polymer - Single-Wall Carbon Nanotube Nanowires,” Proceedings of the 2017 IEEE International Conference on Nanotechnology, p. 942, 2017.
5. A. Bhandari, S. Alfalah, W. M. I. Hassan, N. Al-Hashimi, M. F. Shibl, S. Patil, R. Nekovei, **A. Verma**, “TDDFT Studies on Effects of the Size on Optoelectronic Properties of 2D Germanene Sheets,” Proceedings of the 2017 IEEE International Conference on Nanotechnology, p. 921, 2017.
6. W.M.I. Hassan, **A. Verma**, R. Nekovei, R. Jeyakumar, M.M. Khader, “Theoretical Investigation of The Oxygen Bond Dissociation Energies in Graphene Oxide,” 2015 IEEE Nanomaterials and Devices Conference, p. 1-2, 2015
7. W.M.I. Hassan, **A. Verma**, R. Nekovei, M.M. Khader, and M.P. Anantram, “Oxygen passivation as effective technique for tailoring the nature of band gap of silicon nanowires,” Proceedings of the 15<sup>th</sup> IEEE International Conference on Nanotechnology, p. 951, 2015
8. W.M.I. Hassan, **A. Verma**, R. Nekovei, M.M. Khader, and M.P. Anantram, “Tailoring the nature of band gap using passivation of silicon quantum nanostructures,” Proceedings of the 249<sup>th</sup> ACS National Meeting, vol. 60, is. 1, p. 616, 2015.
9. M. Golam Rabbani, **A. Verma**, R. Nekovei, M.M.Khader, and M.P. Anantram, “Simulation Study of Schottky Contact Based Single Si Wire Solar Cells,” Proceedings of the 40<sup>th</sup> IEEE Photovoltaic Specialists Conference (PVSC), p. 2896-2899, 2014.
10. W.M.I. Hassan, **A. Verma**, R. Nekovei, M.M. Khader, and M.P. Anantram, “Theoretical Study of the effect of length of silicon nanowires on the Band Gap,” Proceedings of the 248<sup>th</sup> ACS National Meeting, Division of Energy & Fuels, Vol. 59, Iss. 2, p. 724, 2014.
11. W.M.I. Hassan, **A. Verma**, R. Nekovei, M.M. Khader, and M.P. Anantram, “Effect of the Length of Silicon Nanodot/Wire on Band Gap,” Proceedings of the 14<sup>th</sup> IEEE International Conference on Nanotechnology, p. 373, 2014.
12. S.I. Omar, **A. Verma**, and R. Nekovei, “A NanoElectronics Concept Inventory: a tool to assess learning of fundamental concepts,” Proceedings of the 2013 ASEE Annual Conference

13. S.I. Omar, R. Nekovei, **A. Verma**, and D.W.Stollberg, “A Modular Approach for Teaching a First Undergraduate Course in NanoElectronics,” Proceedings of the 2012 ASEE Annual Conference, AC 2012-3735
14. D.W.Stollberg, F. Urbani, and **A. Verma**, “Outstanding Performance of an All-carbon nanotube Patch,” Proceedings of the 2011 MRS Spring Meeting, vol. 1359, mrss11-1359-nn09-04, 2011
15. F. Urbani, D.W.Stollberg, **A. Verma**, “Outstanding performance of a nanofilm microstrip antenna”, Proceedings of the 2010 IEEE Nanomaterials and Device Conference, p. 160, 2010
16. S.P. Morusupalli, **A. Verma**, S. Basavaraju, A.K.Buin, R. Nekovei, “Modeling of switching response of small diameter nanowire field effect transistors”, Proceedings of the 2010 IEEE Nanomaterials and Device Conference, p. 278, 2010
17. **A. Verma**, A.K.Buin, and M.P. Anantram, “Comparative Study of Charge Transport in Si and Ge Nanowires”, Proceedings of the 2009 IEEE Nanotechnology Materials and Devices Conference, Traverse City, MI, June 2009, p. 64, 2009
18. **A. Verma**, A.K. Buin, M. P. Anantram, and R. Nekovei, “High-field hole transport in small diameter silicon nanowires”, Proceedings of the 2008 IEEE conference on Nanotechnology, pp. 374-376, 2008
19. D. Holton, **A. Verma**, and G. Biswas, “Assessing Student Difficulties with Understanding the Behavior of AC Circuits”, 2008 American Society for Engineering Education (ASEE) conference proceedings, AC 2008-542
20. M. Z. Kauser, **A. Verma** and, P. P. Ruden: “Electron Transport in Semiconducting Chiral Carbon Nanotubes,” in Organic and Inorganic Nanotubes -- From Molecular to Submicron Structures, edited by K. Nielsch, O. Hayden, H. Ihara, D. Wang, Material Research Society Symp. Proc. 922E, Warrendale, PA, 2006), pp.0922-U07-50
21. **A. Verma**, M. Z. Kauser, B. W. Lee, K. F. Brennan and, P. P. Ruden, “Ensemble Monte Carlo Transport Simulations for Semiconducting Carbon nanotubes,” in proceedings of 27th International Conference on the Physics of Semiconductors (ICPS-27) Flagstaff, Arizona, 2004
22. **A. Verma**, A. Chatterjee, B. Bhuvu, and E.D. Jansen, “All Si-based optical interconnect for signal transmission”, Proceedings of the IEEE International Interconnect Technology Conference, pp. 69–71, June 2001
23. A. Chatterjee, **A. Verma**, B. Bhuvu, E.D. Jansen, and C.L. Wei, “Accelerated stressing and degradation mechanisms for Si-based photo-emitters”, Proceedings of the IEEE International Reliability Physics Symposium, pp. 200-205, May 2001

Recent (last 5 years) Regular and Invited Talks at International Conferences: IWPSD, ACS, APS

Book Chapters:

D. L. Holton and **A. Verma**, “Designing Animated Simulations and Web-based Assessments to Improve Engineering Education”, In A. K. Haghi and D. L. Russell (Eds.), Web-Based Engineering Education: Critical Design and Effective Tools, IGI Global, 2010

Other Publications:

Literary Fiction Novel, **Amit Verma**, “The Lives and the Times,” Satyam Books, 2011  
Literary Fiction Novel, **Amit Verma**, “The Lives and the Times II,” Satyam Books, 2016

### Other Professional Activities

1. Senior Member IEEE, Member ACS
2. President, Texas A&M University-Kingsville Faculty Senate, 2015-2016
3. Graduate Program Director, Electrical Engineering, Texas A&M University-Kingsville
4. Secretary and Webmaster, IEEE Corpus Christi Section, 2012
5. Session co-Chair, 8<sup>th</sup> IEEE conference on Nanotechnology, Sessions Presider 247 ACS National Meeting
6. Technical Reviewer: Reviewer for several international journals, conferences, and technical book publishers
7. Proposal reviewer for CASIS (projects for International Space Station), Israeli Science Foundation