

## *Curriculum Vitae*

### **Sandip Tiwari**

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Sandip Tiwari is the Charles N. Mellowes Professor in Engineering at Cornell University. His current research interests are in questions that arise when connecting large scales such as those of massively integrated electronic systems to small scales. In pursuit of answers, his group has developed ideas in adaptive electronics, small devices and their circuits, and three-dimensional and functional integration.

His widely cited experimental and theoretical contributions span electronic and optical devices and circuits. Among his contributions and inventions of note have been nanocrystal memories, back-side trapping memories, architectures and technologies of three-dimensional integration, and the early investigations of III-V and SiGe heterostructure bipolar transistors and their technologies. His theoretical efforts have provided the fundamental understanding of several device phenomena including the electron injection processes in coupled confined systems, frequency limitations of quantum-wire lasers due to gain compression, and surface recombination and injection and collection effects at high currents in heterostructure bipolar transistors. He is a frequent keynote and invited speaker at major conferences summarizing learning and articulating new themes, technical directions and their needs. His current efforts also include the societal, particularly the international, view of technology and the context of poverty, food, health and water.

Prior to joining Cornell in 1999, Sandip Tiwari was a Research Staff Member and Manager for Exploratory Devices and Device Modeling at IBM Thomas J. Watson Research Center. He has held visiting and adjunct faculty appointments at the University of Michigan (1988-89), Columbia University (1993) and Harvard University (2005-06). He is a Fellow of Institution of Electronic and Electrical Engineers (1994; for contributions to heterostructure devices) and American Physical Society (1998; for contributions to understanding of device physics and for innovations in small electronic and optical devices with strong quantum confinement). He received the Young Scientist Award of 1991 from Institute of Physics at the 18<sup>th</sup> International Symposium on GaAs and Related Compounds for contributions to the understanding and development of the metal-semiconductor field-effect transistor, the heterostructure field-effect transistor and the heterostructure bipolar transistor; the Distinguished Alumnus Award of 2003 from IIT-Kanpur for contributions in microelectronics and nanofabrication technologies; and the 2007 IEEE Brunetti Award for nanocrystal memory and quantum-effect devices. IBM recognized his scientific achievements with Outstanding Research Contribution (1991) and Outstanding Technical Contribution (1987, 1989) awards.

He serves on the Defense Sciences Research Council, National Advisory Committee of the University of Michigan Department of Electrical Engineering and Computer Sciences, and on the Technical Activities Board of Samsung Electronics, Anvik Corp and ADC Inc. He is the founding Editor-in-Chief of IEEE Transactions on Nanotechnology, a past Associate Editor and Guest Editor of IEEE Trans. on Electron Devices, and past Chair of many conferences and workshops. He is also the author of a widely used graduate text-book "Compound Semiconductor Device Physics" published by Academic Press, and holds many patents. His passion for teaching is reflected in a number of new courses that he has developed for advanced electrosiences-centered curriculum at Cornell.

Sandip Tiwari was educated at Indian Institute of Technology at Kanpur (B. Tech. in Electrical Engineering, 1976), Rensselaer Polytechnic Institute (M. Eng. in Electrical & Systems Engineering, 1977) and Cornell University (Ph.D. in Electrical Engineering, 1980). His college education was supported through fellowships (National Science Talent Scholarship and Shreedhar Memorial Scholarship for undergraduate education, and General Electric Fellowship for graduate education).

He has served as Lester B. Knight Director of Cornell Nanoscale Science and Technology Facility (1999-2005), director of National Nanofabrication Users Network (2000-2003), and currently serves as director of the National Nanotechnology Infrastructure Network (2004-). NNIN is a many university partnership funded by National Science Foundation (currently \$14M/year) to enable research in nanoscale science, engineering and technology and to conduct international, national and local outreach.

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### **Citizenship**

United States

### **Date of Birth**

May 17, 1955

### **Education**

Ph.D., Electrical Engineering, Cornell University, Ithaca (1980)

M.Eng., Electrical & Systems Engineering, Rensselaer Polytechnic Institute, Troy (1977)

B.Tech., Electrical Engineering, Indian Institute of Technology, Kanpur (1976)

### **Languages**

English, Hindi, Sanskrit, and reading of Gujarati, Marathi, Bengali and French

### **Employment**

11/2005-present	Charles N. Mellowes Professor of Engineering, Cornell University
3/2004-present	Network Director, National Nanotechnology Infrastructure Network (NNIN)
9/2005-7/2006	Gordon McKay Visiting Professor and Visiting Scientist, Harvard University
1/2000-3/2004	Network Director, National Nanofabrication Users Network (NNUN)
1/1999-8/2005	Lester B. Knight Director, Cornell NanoScale Facility
1/1999-present	Professor of Electrical & Computer Engineering, Cornell University
1/1990-1/1999	Manager and Research Staff Member, IBM T. J. Watson Research Center
1/1993-12/1993	Adjunct Professor, Columbia University
9/1989-8/1990	Visiting Associate Professor, University of Michigan
3/1982-1/1999	Research Staff Member, IBM T. J. Watson Research Center
6/1980-2/1982	Principal Technologist, M/A-COM Inc.

### **Miscellaneous Activities**

Member, Defense Science Research Council (2006-)

Technical Advisory Board, Samsung Electronics (2007-)

Science Advisory Board, Anvik Corporation (1999-)

Technical Advisory Board, ADC Inc (2004-)

Advisory Board, Nanoscale Informal Science Education (NISE) Network (2005-)

Advisory Board, Danchip (Technical University of Denmark) (2005-)

National Advisory Committee, Department of Electrical Engineering and Computer Science, University of Michigan (2004-)

Advisory Board, Wireless Integrated Microsystems Engineering Research Center, (2005-)

Advisory Board, Center for High Frequency Electronics, University of Michigan (1990-92)

## **Honors and Awards**

2007 IEEE Cleo Brunetti Award, “For pioneering contributions to nanocrystal memories and to quantum-effect devices”

Distinguished Alumnus Award of Indian Institute of Technology, Kanpur (2003) in recognition of “Contributions in Microelectronics and Nanofabrication Technologies”

Fellow of APS (1998) “For contributions to understanding of device physics and for innovations in small electronic and optical devices with strong quantum confinement”

Fellow of IEEE (1994) “For Contributions to Heterostructure Devices”

Young Scientist Award (1991) from Institute of Physics at the 18th International Symposium on GaAs and Related Compounds, “For contributions to the understanding and development of the MESFET, the HFET, and the HBT”

IBM Internal Outstanding Contribution (1991), Outstanding Technical Contributions (1987, 1989) and other Awards (1982-98) for contributions to heterostructure field-effect and heterostructure bipolar transistors and semiconductor technologies

During education, Institute Awards for Academic Excellence and education supported through Shreedhar Memorial, Institute Merit and National Science Talent Scholarships (undergraduate), and General Electric Graduate Research Fellowship (graduate)

## **Service**

Consultant to United Nations (1994-1995)

Reviewer - IEEE Electron Device Letters, IEEE Transactions on Electron Devices, Nature, Science, Applied Physics Letters, Journal of Applied Physics, Solid State Electronics, National Science Foundation, National Institutes of Health, etc.

Reviewer for IEEE Fellows Committee and member of IEEE Awards Committees

Member of Panel sessions of Conferences, Technical Committees of IEEE and IEEE conferences, and Government Advisory Councils

Organizer of Workshops and Conferences for Professional Societies and NNIN and NNUN

University Committees for Department Chair Searches; Department Committees for Tenure, Policy, etc.; Advisory Councils of Centers; Duffield Hall construction,; and Chair of department unit of electrosiences; among others.

## **Editorship, Conferences and Workshops**

Founding Editor-in-Chief, IEEE Transactions on Nanotechnology, (2001-2005)

Chair, Kavli Symposium on Complexity and Computing (2008)

Chair, Workshop on Nanotechnology Education, Society of Hispanic Professional Engineers (2007)

Chair, Solid-State Devices Subcommittee, International Electron Devices Meeting, San Francisco (2004)

Chair, NSF Workshop on Environmental Health and Safety in Nanotechnology Research (2004)  
Chair, US-India Workshop on Educational Issues of Nanotechnology, Bangalore (2004)  
Chair, US-Japan Symposium on Tools and Metrology for Nanotechnology, Ithaca (2003)  
Co-Organizer, MRS Symposium on Materials Issues in Novel Si-Based Technology, Boston (2001)  
Chair, US-India Workshop on Nanotechnology, Santa Barbara (2001)  
Chair, IEEE Silicon Nanoelectronics Workshop, Waikiki (2000)  
Chair, NSF/DARPA/NNUN Workshop on Chemical and Physical Nanotechnology, Washington (2000)  
Associate Editor of IEEE Transactions on Electron Devices for III-V and Microwave Devices (1986-90)  
Co-Guest Editor of Special Issue on Heterostructure Transistors of IEEE Transactions on Electron Devices (Oct. 1989)  
Member of Technical Committees of IEEE, MRS and SPIE Conferences and Organizer of sessions

### **Keynote and Plenary Addresses**

NSTI Nanotech, Boston (2008)  
Keck Nanotechnology Symposium, Howard University (2007)  
Society of Hispanic Professional Engineers Nanotechnology Symposium (2007)  
25<sup>th</sup> Microelectronic Engineering Conference (2007)  
National Academy of Sciences Workshop on Condensed Matter and Materials Physics (2007)  
20<sup>th</sup> International Conference on VLSI Design, Bangalore (2007)  
IEEE Nanotechnology Materials and Devices Conference, Gyeongju (2006)  
SPIE Photonics Europe, Strasbourg (2006)  
IEEE Conference on Emerging Technologies – Nanoelectronics, Singapore (2006)  
International Electron Devices and Materials Symposium, Tsin-Chu (2004)  
SPIE Conf. on Microtechnologies for the New Millenium, Las Palamas (2003)  
Next Generation Growth Engine of Future Industries, Seoul (2003)  
Nano-7 and European Conference on Surface Science-21 (2002)  
SEMI - South Korea, Seoul (2001)  
IEEE Silicon Nanoelectronics Workshop, Kyoto (1999)  
International Conference on Solid State Devices and Materials, Hiroshima (1998)  
International Conference on Micro- and Nanofabrication, Leuven (1998)  
IX<sup>th</sup> European Workshop on Dielectrics in Microelectronics, Toulouse (1998)  
Annual Meeting of Electrochemical Society, Boston (1998)  
2nd International Symposium on Formation, Physics and Device Applications of Quantum Dot Structures, Hokkaido (1998)  
European National Symposium on Nanometer Structures, Lund (1997)  
3rd International Symposium on the Physics and Chemistry of SiO<sub>2</sub> and the Si-SiO<sub>2</sub> Interface, Electrochemical Society, May (1996)

### **Books**

- S. Tiwari, *Compound Semiconductor Device Physics*, Academic Press, Inc. (1992)
- S. Tiwari, (Editor), *Compound Semiconductor Transistors: Physics and Technology*, IEEE Press (1993)
- W.G. En, E. C. Jones, J.C. Sturm, M.J. Chan, S. Tiwari and M. Hirose (Editors), *Materials Issues in Novel Si-Based Technology*, Vol. 686, MRS Press (2001)

### **Book Chapters and Short Courses**

- S. Tiwari, *Compound Semiconductor HBTs: Device Physics*, IEEE GaAs IC Symposium, Miami (1992)
- S. Tiwari, *High Speed Optoelectronic Elements*, International Electron Devices and Materials Symposium Taipei (1992)
- S. Tiwari, *Silicon Memories Using Quantum and Single-Electron Effects*, Book Chapter in *Nanoelectronics*, Ed. S. Oda and D. Ferry, Marcel Dekker (2006)
- S. Tiwari, *Potential, Characteristics and Issues of 3D SOI: 3D SOI Opportunities*, IEEE Silicon on Insulators Conference (2005)
- C. C. Liu and S. Tiwari, *3D Architectures and the Role of Interconnects*, VLSI Multi-Level Interconnections Conference (2005)
- S. Tiwari, *Silicon Nanoelectronics: From Devices to Systems*, IEEE Conference on Emerging Technologies – Nanoelectronics (2006)
- S. Tiwari, *Devices and Circuits of the Nanoscale*, IEEE NMDC (2006)

### **Advisory Talks (2006 onwards)**

- S. Tiwari, *Hedgehogs, Foxes and Wolfpacks in Science and Engineering; You and Your Research* (2008)
- S. Tiwari, *Terachip: Blank Slate Co-Design of Hardware, Software, Communication and Computation*, to DARPA (2008)
- S. Tiwari, *Nanoscale Science and Engineering and our Place in the World*, Keck Symposium (2007)
- S. Tiwari, *Nanoscale Technology: From Ideas in Laboratories to Useful Electronics and the Role of Complexity and Scales*, to JASONS (2007)
- S. Tiwari, *Thermodynamics, Processing, Memories and Nanoscale: It is time to think*, Samsung Board (2007)
- S. Tiwari, *Complexity and Energy: Experiments in Adaptation and Hierarchy in Electronics at Nanoscale*, to Intel Corporation (2007)
- S. Tiwari, *Supporting Experimental Condensed Matter Science; the NNIN Experience*, to National Academy of Sciences CMMP Committee (2007)
- S. Tiwari, *Past 25 Years and Next 25 Years in Electronics; Reality, Dreams and “MicroElectronics in a Changing World*, to Microelectronic Engineering Conference (2007)
- S. Tiwari, *Nanoscale Science and Engineering: Undergraduate Education and Nanotechnology*, to Society of Hispanic Professional Engineers (2007)
- S. Tiwari, *Experimental Usage and Diversity in Science and Engineering; the NNIN Experience*, to National Science Foundation Facilities Meeting (2007)
- S. Tiwari, *Ultra-Low Power or, How to Achieve Efficiency by Reducing Energy Used?*, to DARPA (2006)
- S. Tiwari, *Ultra-Low Power: The “Really” Intelligent Design Approach*, DARPA (2006)
- S. Tiwari, *Nanotechnology and Nikon; An Academic’s Perspective*, to Nikon Instrument Annual Meeting (2006)

- S. Tiwari, *Electronics at Nanoscale: Fundamental and Practical Challenges, and Emerging Directions*, to University of West Indies (2006)
- S. Tiwari, *NNIN and Support of Research and Development*, International Nanotechnology Conference 2 (2006)
- S. Tiwari, *Electronics at Nanoscale: Fundamental and Practical Challenges, and Emerging Directions*, NSF-Korea Workshop (2006)
- S. Tiwari, *Grand Challenges of Nanoscale in Electronics*, NanoFrontiers Workshop (2006)
- S. Tiwari, *Energy Constrained Limits to Operation and Assembly of Information Processing Systems: Lessons for Directions of Nanoscale Systems*, NMDC Korea (2006)
- S. Tiwari, *Adaptive Electronics*, to DARPA (2006)

## Refereed Journal Publications

- S. Tiwari and S. Ashok, "A Simple Power Control Technique," *Electronics Letters*, **14**, No. 13, 393(1978)
- R.J. Lender, S. Tiwari, J.M. Borrego, and S.K. Ghandhi, "Diffusion-Length Measurements in Schottky-Barrier GaAs Solar Cells," *Solid State Electronics*, **V22**, No. 2, 213(1979)
- K. Pande, D. Reep, A. Srivastava, S. Tiwari, J.M. Borrego, and S.K. Ghandhi, "Device Quality Polycrystalline Gallium Arsenide on Germanium/Molybdenum Substrates," *Journal of Electrochemical Society*, **V126**, No. 2, 213(1979)
- L.F. Eastman, S. Tiwari, and M.S. Shur, "Design Criteria for GaAs MESFETs Related to Stationary High Field Domains," *Solid State Electronics*, **V23**, No. 4, 383(1980)
- S. Tiwari, L.F. Eastman and L. Rathbun, "Physical and Materials Limitation on Burn-Out Voltage of GaAs Power MESFETs," *IEEE Transactions on Electron Devices*, **ED-27**, No. 6, 1045(1980)
- T.S. Low, G.E. Stillman, D.M. Collins, C.M. Wolfe, S. Tiwari, and L.F. Eastman, "Spectroscopic Identification of Si Donors in GaAs," *Applied Physics Letters*, **V40**, No. 12, 1034(1982)
- W. Camp and S. Tiwari, "A Quantum Jump: Gallium Arsenide Monolithic Microwave Circuits," *IBM Technical Directions*, **9**, No. 1, 27(1983)
- S. Tiwari, "Threshold and Sheet Concentration Sensitivity of High Electron Mobility Transistors," *IEEE Transactions on Electron Devices*, **ED-31**, No. 7, p. 879 (1984)
- S. Tiwari and W.I. Wang, "p-channel MODFETs Using GaAlAs/GaAs Two-Dimensional Hole Gas," *IEEE Electron Device Letters*, **EDL-5**, p. 333 (1984)
- S. Tiwari and W. Price, "Platinum Intermetallic Resistors for GaAs-Based Circuits," *Electronics Letters*, **V21**, No. 10, p. 429 (1985)
- S. Tiwari, "Performance of Heterostructure FETs in LSI," *IEEE Transactions on Electron Devices*, **ED-33**, No. 5, p. 554 (1986)
- S.L. Wright, R.F. Marks, S. Tiwari, T.N. Jackson and H. Baratte, "In-situ Contacts to GaAs Based on InAs," *Applied Physics Letters*, **V49**, No. 22, p. 1545 (1986)
- S. Tiwari, S.L. Wright, and A.W. Kleinsasser, "Transport and Related Properties of (Ga,Al)As/GaAs Double Heterostructure Bipolar Junction Transistors," *IEEE Transactions on Electron Devices*, **ED-34**, No. 2, p. 185 (1987)
- S. Tiwari and S.L. Wright, "Symmetric Gain and Zero Offset Self-Aligned Refractory Contact Double Heterostructure Bipolar Transistors," *IEEE Electron Device Letters*, **EDL-8**, No. 9, p. 417 (1987)
- M. Murakami, W.H. Price, Y-C. Shih, K.D. Childs, B.K. Furman and S. Tiwari, "Thermally Stable Ohmic Contact to n-type GaAs: 1. MoGeW Contact Metal," *Journal of Applied Physics*, **V62**, No. 8, p. 3288 (1987)

- M.I. Nathan, S. Tiwari, S. Wright, and P. Mooney, "DX Centers in AlGaAs p-n Heterojunctions and Heterojunction Bipolar Transistors," *Journal of Applied Physics*, **V62**, No. 8, p. 3234 (1987)
- S. Tiwari, J. Hintzman, and A.C. Callegari, "Rapid Thermal Diffusion and Ohmic Contacts Using Zinc in GaAs and GaAlAs," *Applied Physics Letters*, **V51**, No. 25, p. 2118 (1987)
- M.I. Nathan, W.P. Dumke, K. Wrenner, S. Tiwari, S.L. Wright and K.A. Jenkins, "Electron Mobility in p-type GaAs," *Applied Physics Letters*, **V52**, No. 8, p. 654 (1988)
- S. Tiwari and D.J. Frank, "Barrier and Recombination Effects in the Base-Emitter Junction of Heterostructure Bipolar Transistors," *Applied Physics Letters*, **V52**, No. 12, p. 993 (1988)
- S. Tiwari, "A New Effect at High Currents in Heterostructure Bipolar Transistors," *IEEE Electron Device Letters*, **EDL-9**, No. 3, p. 142 (1988)
- G.L. Patton, S.S. Iyer, S.L. Delage, S. Tiwari and J.M.C. Stork, "Silicon-Germanium Base Heterojunction Bipolar Transistors by Molecular Beam Epitaxy," *IEEE Electron Device Letters*, **EDL-9**, No. 4, p. 165 (1988)
- R.A. Kiehl, S. Tiwari, S.L. Wright, and M.A. Olson, "p-channel Quantum-Well Heterostructure MI3SFET," *IEEE Electron Device Letters*, **EDL-9**, No. 9, p. 309 (1988)
- S. Tiwari, A. Ginzberg, S. Akhtar, S.L. Wright, R.F. Marks, Y.H. Kwark and R. Kiehl, "Heterostructure Devices Using Self-Aligned p-type Diffused Ohmic Contacts," *IEEE Electron Device Letters*, **EDL-9**, No. 8, p. 422 (1988)
- S. Tiwari, S.L. Wright and J. Batey, "Unpinned GaAs MOS Capacitors and Transistors," *IEEE Electron Device Letters*, **EDL-9**, No. 9, p. 488 (1988)
- S. Tiwari, D.J. Frank and S.L. Wright, "Surface Recombination in GaAlAs/GaAs Heterostructure Bipolar Transistors," *Journal of Applied Physics*, **V64**, No. 10, p. 5009 (1988)
- J.L. Freeouf, J.A. Silberman, S.L. Wright, S. Tiwari and J.J. Batey, "Spectroscopic and Electrical Studies of GaAs Metal-Oxide Semiconductor Structures," *J. Vac. Sci. Technol.*, **B 7**, No. 4, p. 854 (1989)
- S. Tiwari, and D.J. Frank, "Analysis of the Operation of GaAlAs/GaAs HBTs," *IEEE Transactions on Electron Devices*, **ED-36**, No. 10, p. 2105 (1989)
- S. Tiwari, "Frequency Dependence of the Unilateral Gain in Bipolar Transistors," *IEEE Electron Device Letters*, **EDL-10**, No. 12, p. 574 (1989)
- S. Tiwari and S.L. Wright, "Material Properties of p-type GaAs at Large Dopings," *Applied Physics Letters*, **V56**, No. 6, p. 563 (1990)
- S. Tiwari, W.I. Wang and J. East, "An Analytic Theory of the Auger Transistor: A Hot Electron Bipolar Transistor," *IEEE Transactions on Electron Devices*, **ED-37**, No. 4, p. 1121 (1990)
- T.J. de Lyon, J.A. Kash, S. Tiwari, J. Woodall, D. Yan and F.H. Pollack, "Low Surface Recombination Velocity and Contact Resistance Using p<sup>+</sup>/p Carbon Doped GaAs Structures," *Applied Physics Letters*, **56**, No. 24, p. 2442, 11 June (1990)
- S. Tiwari, S.L. Wright and D.J. Frank, "Compound Semiconductor Heterostructure Bipolar Transistors," *IBM Journal of Research and Development*. **34**, No. 4, p. 550 (1990)
- S. Akhtar and S. Tiwari, "Distributed Modeling of Switching Transients in GaAs MESFETs," *IEEE Transactions on Electron Devices*, **ED-39**, No. 12, p. 2819 (1992)
- S. Akhtar and S. Tiwari, "Non-Quasi-Static Transient and Small-Signal Two-Dimensional Modeling of GaAs MESFETs with Emphasis on Distributed Effects," *IEEE Transactions on Electron Devices* **ED-40**, No. 12, p. 2154 (1993)
- S. Tiwari, J. Burroughes, M.S. Milshtein, M.A. Tischler and S.L. Wright, "Lateral p-i-n Photodetectors by Self-Aligned Diffusion," *IEEE Photonic Technology Letters*, **4**, No. 4, p. 396 (1992)

- S. Tiwari and D.J. Frank, "An Empirical Fit to Band Discontinuities and Barrier Heights in III-V Alloy Systems," *Applied Physics Letters*, **60**, No. 5, p. 630, 3 Feb. (1992)
- S. Tiwari, M.C. Hargis, Y. Wang, M.C. Teich and W.I. Wang, "1.3  $\mu\text{m}$  GaSb Metal-Semiconductor-Metal Photodetectors," *IEEE Photonic Technology Letters*, **4**, No. 3, p. 256 (1992)
- S. Tiwari, "On the Role of Mobility and Saturated Velocity in the Dynamic Operation of p-i-n and Metal-Semiconductor-Metal Photodetectors," *Applied Physics Letters*, **60**, No. 9, p. 1135, 2 Mar (1992)
- S. Tiwari, "Transmission-Line Delay Limitations of Laser Bandwidths," *IEE Proceedings of Optoelectronics*, **141**, p. 163 (1994)
- S. Tiwari, R.S. Bates, C.S. Harder and A. Behfar-Rad, "Effects of Compressive and Tensile Uniaxial Stress on the Operation of Quantum-Well Lasers," *Applied Physics Letters*, **60**, No. 4, p. 413, 27 Jan. (1992)
- S. Tiwari and D.J. Frank, "Response to "Comments on An Empirical Fit to Band Discontinuities and Barrier Heights in III-V Alloy Systems,"" *Applied Physics Letters*, **61**, 2 Nov. (1992)
- S. Tiwari, G.D. Pettit, K.R. Milkove, F. Legoues, R.J. Davis and J.M. Woodall, "High Efficiency and Low Threshold Current Strained V-Groove Quantum-Wire Lasers," *Applied Physics Letters*, **64**, p. 3536, 27 June (1994)
- S. Tiwari and J.M. Woodall, "Experimental Comparison of Strained Quantum-Wire and Quantum-Well Laser Characteristics," *Applied Physics Letters*, **64**, p. 2211, 25 April (1994)
- S. Tiwari, "Operation of Strained Multi-Quantum Wire Lasers," in *Low Dimensional Structures Prepared by Epitaxial Growth or Regrowth on Patterned Substrates - NATO Series* (Ed. K. Eberl, P. M. Petroff and P. Demeester), p. 335, Kluwer (1995)
- S. Tiwari, H. Hanafi, A. Hartstein, E. Crabbe and K. Chan, "A Silicon Nano-Crystals Based Memory," *Applied Physics Letters*, **68**, p.1377, 4 Mar. (1996)
- S. Tiwari, "Silicon Nano-Crystal Memories: Devices in the Limit of Conventional Miniaturization," *Physics and Chemistry of SiO<sub>2</sub> and the Si-SiO<sub>2</sub> Interface*, Ed. H. Massoud and B. E. Deal, Electrochemical Society (1996)
- S. Tiwari, "Technology Challenges: A Silicon Device and Integration Perspective," *Journal of American Vacuum Society B*, (1996)
- F. Rana, S. Tiwari, and D. Buchanan, "Self-consistent Modeling of Accumulation Layers and Calculation of Tunneling Currents through Very Thin Oxides," *Applied Physics Letters*, **69**, p. 1104, 19 Aug. (1996)
- S. Tiwari, F. Rana, K. Chan and W. Chen, "Single Charge and Confinement Effects in Nano-Crystal Memories," *Applied Physics Letters*, **69**, p.1232, 26 Aug. (1996)
- H. I. Hanafi, S. Tiwari, and I. Khan., "Fast and Long Retention-Time Nano-Crystal Memory," *IEEE Transactions on Electron Devices*, **ED43**, p. 1553 (1996)
- S. Tiwari, "Semiconductors, Compound - Electronic Properties," *Encyclopedia of Physics* (G. Trigg Ed.) American Institute of Physics (1997)
- J.J. Welser, S. Tiwari, S. Rishton, K.Y. Lee and Y. Lee, "Room Temperature Operation of Quantum-Dot Flash Memory," *IEEE Electron Device Letters*, **EDL18**, p. 278 (1997)
- S. Tiwari, "Single Electron Transistor and Memory," *McGraw-Hill Yearbook of Science and Technology* (1997)
- F. Rana, S. Tiwari and J.J. Welser, "Modeling of Electron Tunneling Processes in Quantum-Dots Coupled to Field-Effect Transistors," *Superlattices and Microstructures*, **23**, p. 757, Mar. (1998)
- S. Tiwari, F. Rana, A. Kumar, J.J. Welser and C.T. Black, "Role of Small Dimensions and Quantum Confinement in Small Silicon Memories," *Invited paper*, Proc. of Fifth International Symposium - Quantum Confinement: Nanostructures, Electrochemical Society, Nov. (1998)



- S. Tiwari, P. Solomon, J.J. Welser, E.C. Jones, F.R. McFeely and E. Cartier, "CMOS and Memories: From 100 nm to 10 nm!" *Invited paper*, Special Issue of Microelectronic Engineering, **46** 3-6 (1999)
- S. Tiwari and R. Nair, "Defect Tolerance in Computer Architecture: Towards Use of Massive Integration," Commentary in Physics World Oct. (1998)
- S. Tiwari, J.J. Welser, A. Kumar and S. Cohen, "Straddle Gate Transistor: A MOSFET in the Limit of Useful Field-Effect," *Invited paper*, Proceedings of Workshop on Future Electronics (1999)
- S. Tiwari, A. Kumar and J.J. Welser, "Straddle-Gate Transistor: A MOSFET in the Limit of Useful Field-Effect," *Invited Paper*, International Journal of High Speed Electronics and Systems, **10**, 231-245 (2000)
- S. Tiwari, J.A. Wahl, H. Silva, F. Rana and J.J. Welser, "Small Silicon Memories: Confinement, Single-Electron, and Interface State Considerations," *Invited Paper*, Applied Physics A **71**, 403-414, Oct. (2000)
- A. Kumar and S. Tiwari, "Scaling of Flash NVRAMs to 10's of nm by Decoupling of Storage from Read/Sense using Back-Floating Gates," IEEE Transactions on Nanotechnology, V1, No. 4, 247(2002)
- C. C. Liu, J. Zhang, A. K. Datta, and S. Tiwari, "Heating Effects of Clock Drivers on Bulk, SOI, and 3D CMOS," IEEE Electron Device Letters, V23, No.12, 716(2002)
- L. Xue, C. C. Liu, H.-S. Kim, S (K) Kim, and S. Tiwari, "Three-Dimensional Integration: Technology, Use, and Issues for Mixed-Signal Applications," IEEE Transactions on Electron Devices, **50**, No. 3, 601-609(2003)
- C. C. Liu and S. Tiwari, "Performance Advantages of 3-D Digital Integrated Circuits in a Mixed SOI and Bulk CMOS Design Space," IEEE Transactions on Circuits and Systems II
- J. A. Wahl, J. VanDelden and S. Tiwari, "Tapered Fabry-Perot Filters," IEEE Photonics Technology Letters, 16, No. 8, 1873-1875(2004)
- U. Avci and S. Tiwari, "Nano-Scale Thin Single-Crystal Silicon and its Application to Electronics," Applied Physics Letters, **84**, 13, 2406-2408 (2004)
- U. Avci and S. Tiwari, "Back-Gated MOSFETs with Controlled Silicon Thickness MOSFETs for Adaptive Threshold Voltage Control," Electronics Letters, **40**, No. 1, 74-75 (2004)
- H. Liu and S. Tiwari, "Speed and Capacitance Penalty in Optimization of MOSFET Short Channel Effects: A Comparison of Bulk and Back-Gated SOI MOSFETs," submitted to IEEE Electronic Device Letters
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*August, 2008*