

## David W. Greve

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### EDUCATION

Ph.D. Electrical Engineering, Lehigh University, 1979  
M.S. Electrical Engineering, Lehigh University, 1976  
M.S. Physics, Rutgers University, 1975  
B.S. Engineering Physics, Lehigh University, 1972

### RECENT POSITIONS

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| 2008-present | Resident Institute Fellow, Institute for Advanced Energy Systems, National Energy Technology Laboratory, Pittsburgh, PA |
| 1999-present | Courtesy faculty member, Department of Physics, Carnegie Mellon University, Pittsburgh, PA                              |
| 1998-present | Courtesy faculty member, Department of Materials Science and Engineering, Carnegie Mellon University, Pittsburgh, PA    |
| 1991-present | Professor of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA                            |
| 1989 (fall)  | Visiting Professor, Department of Materials Science, Helsinki University of Technology, Helsinki, Finland               |
| 1986-1991    | Associate Professor of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA                  |
| 1982-1986    | Assistant Professor of Electrical Engineering, Carnegie Mellon University, Pittsburgh, PA                               |
| 1979-1982    | Device Physicist, Philips Research Laboratories, Sunnyvale, CA  |

### RESEARCH INTERESTS

I am broadly interested in semiconductor fabrication technology and semiconductor device physics. Generally my work has been directed at exploring the relationship between process technology and semiconductor device performance, and most often has concerned devices fabricated with silicon and/or on silicon substrates. This research requires an unusually interdisciplinary approach, bringing together ideas from physics, chemistry, materials science, and a variety of engineering disciplines. My past work has included studies of polysilicon fuses and antifuses; polysilicon emitter bipolar transistors; thin film transistors for flat panel displays; high temperature superconductors on non-lattice-matched substrates; MOCVD growth of AlGaN alloys for ultraviolet detectors; the development of advanced diagnostic and control strategies for semiconductor processes; epitaxial growth by chemical vapor deposition of germanium-silicon and germanium-silicon-carbon alloys; and investigations of fundamental surface processes during growth of wide-gap semiconductors. Other recent research includes studies of fabrication processes for silicon-based quantum cellular automata and the physics of electronic biosensors. Current research is directed at sensing for infrastructure applications, including both MEMS and novel piezoelectric transducers. New research conducted as part of the Institute for Advanced Energy Systems, National Energy Technology Laboratory concerns sensor technology for energy systems. My research has a strong experimental component, and has frequently involved collaborations with other departments or other areas within Electrical and Computer Engineering.

## TEACHING INTERESTS

An engineering education should give students an understanding of “how things work” which is based on fundamental science; the ability to perform engineering analyses; and, most important, the ability to approach real problems which lack unique, closed-form solutions. I have worked to incorporate these elements in my undergraduate teaching. My specific teaching interests at the undergraduate level include semiconductor device physics and introductory analog circuit design. Innovations in these undergraduate courses have included the implementation of an all-design laboratory for analog circuits and the development of a new course on field effect devices and their applications. The latter course is novel in its applications emphasis, the inclusion of new material on imaging and display devices, and the use of Mathcad as an integral part of the course. A textbook specifically written for this course was published by Prentice Hall in 1998. Other related work has included the revision of the laboratory portion of the Semiconductor Devices I course to include basic device and circuit layout concepts. At the graduate level, I have taught a variety of courses on advanced semiconductor devices and semiconductor process technology. Particularly in upper level courses, I have emphasized the connection between process technology and device performance and the strong interdisciplinary nature of these fields.

I am also broadly interested in the continuing evolution and re-invention of the ECE curriculum. Engineering curricula are not static; rather, they continuously change in response to internal and external forces. Any curriculum, no matter how innovative or attractive when designed, must be subject to continuing assessment and improvement.

## FELLOWSHIPS AND AFFILIATIONS

Sherman Fairchild Fellow, Lehigh University (1977-1979).

### Memberships

IEEE Electron Devices Society (Member)

Electrochemical Society

American Vacuum Society

Österreichischer Alpenverein

## PROFESSIONAL ACTIVITIES

Divisional Editor, The Electrochemical Society Journal (Electronics Division, 1986-1990)

Program Committee and Co-chairman of session on Diffusion and Ion Implantation, Sixth International Symposium on Silicon Materials Science and Technology, (Spring 1990 Meeting of the Electrochemical Society, Montreal, Canada)

Program Subcommittee, International Electron Devices Meeting, 1989 and 1990 (Detectors, Sensors, and Displays)

Subcommittee Chair, International Electron Devices Meeting, 1991 (Detectors, Sensors, and Displays)

National Science Foundation, review panels (various)

Associate Editor, Journal of Vacuum Science and Technology B (2003-2006)

IEEE Ultrasonics Symposium - Group 2 Technical Program Committee (2007- )

## UNIVERSITY SERVICE

Faculty Senate, 1985-1986

Faculty Senate Executive Committee 1986

University Research Council 1986-1987

Academic Freedom Committee 1986- ~1988

Secretary, Faculty Senate 1987

Faculty Affairs Council, 1993-1995  
*ad hoc* Committee member (faculty promotions), 1997  
University Radiation Safety Committee, 1996-1997  
University Laboratory Safety Committee, 1997-present  
Faculty Senate, 1999-2000  
Faculty Review Committee (2000-2004)  
Educational Facilities Committee (2000-2001)

#### DEPARTMENTAL SERVICE

Various (Graduate Admissions Committee, Undergraduate Education Committee, etc.)  
Graduate Seminar Coordinator, ECE Department, 1990-1992  
Graduate Education Committee Chair, 1993-1994  
Graduate Education Committee Member, 1994-1997  
Co-director, Electronic Materials Minor, 1992-present  
Graduate Admissions Committee Chairman (1998-1999)  
Graduate Studies Committee Chairman (1999-2003)  
Undergraduate Advising Committee (2003-2008, 2009-present)

#### CONSULTING

Keithley Instruments  
Panelvision Corporation  
Optical Imaging Systems, Inc.  
Solid State Measurements, Inc.  
Magnascreen, Inc.  
Lehigh University  
Epigress AB, Sweden  
Chestnut Partners, Inc.  
Morrison and Foerster  
Skjervén Morrill  
Finnegan, Henderson, Farabow, Garrett & Dunner

#### STUDENTS SUPERVISED (CMU)

M.J. Saccomango, M.S. (1983)  
R. Prasad, M.S. (1987)  
D.-L. Chen, M.S., Ph.D. (1987)  
P.A. Potyraj, Ph.D. (Physics, 1987)  
M.K. Hatalis, Ph.D. (1987)  
J. Pickering, M.S. (Met. Engrg. and Mat. Sci., 1988)  
B.C. Hseih, Ph.D. (1988)  
P.H.L. Rasky, (co-advised with M.H. Kryder) M.S., Ph.D. (1989)  
M. Racanelli, M.S. (1989), Ph.D. (1991)  
A.K. Stamper (co-advised with T.E. Schlesinger), Ph.D. (1991)  
R. Misra, Ph.D. (1995)  
R. Strong, M.S. (1993), Ph.D. (1996)  
M. Johnson, (co-advised with A.J. Strojwas) Ph.D. (1993)  
T. Knight, M.S. (1994); Ph.D. (1997)

X. Cheng, Ph.D. (co-advised with B.H. Krogh, 1996)  
 S. Vyas, M.S. (Mat. Sci. and Engrg., 1994)  
 R. Desrosiers, M.S. (1996)  
 J. Ganong, M.S. (1997)  
 C. Chan, M.S. (principal advisor, A. Gellman, Chem. Engrg., 1997)  
 A. Mocuta, Ph.D. (1999)  
 M. Shin, Ph.D. (principal advisor, M. Skowronski, Mat. Sci. And Engrg., 1998)  
 S. Min, Ph.D. (Mat. Sci. and Engrg.; Ph.D. MSE 2003)  
 H. Chen, Ph.D. (principal advisor, R. Feenstra, Physics, 2000)  
 V. Ramachandran, Ph.D. (principal advisor, R. Feenstra, Physics, 1999)  
 X. Zhu, Ph.D. (through 1999; principal advisor G. Fedder)  
 T. Kuhr, (Mat. Sci. and Engrg., through 1999, co-advised with M. Skowronski)  
 Q. Zhao, (Ph.D., 2002)  
 A. Jain, (M.S., 2002)  
 J. Lee (Mech. Engrg., one semester, co-advised with I.J. Oppenheim)  
 X. Huang (Ph.D., 2004)  
 D. Nguyen (Ph.D., 2004, Chem. Engrg.)  
 C. Ye, (part-time M.S.)  
 R. Singamilla, (M.S., 2003)  
 F. Cao, (Ph.D. 2008, co-advised with I.J. Oppenheim)  
 N. Tyson (M.S. CEE 2007, I.J. Oppenheim, principal advisor)  
 W. Wu (Ph.D., 2011, co-advised with I.J. Oppenheim)  
 P. Zheng (Ph.D. 2011, Physics, co-advised with I.J. Oppenheim)  
 I. Neill, (M.S. ~2008, CEE, I.J. Oppenheim, principal advisor)  
 A. Wright (Ph.D. ~2009, CEE, I.J. Oppenheim, principal advisor)  
 T.-L. Chin, (Ph.D. in progress, ECE, co-advised with I.J. Oppenheim)  
 V. Malone (M.S. 2011, CEE, co-advised with I.J. Oppenheim)

M. Miguolo (postdoctoral fellow, collaboration with T. E. Schlesinger and D. Stancil, 1988)

T.Y. Ma (postdoctoral fellow, 1989)

A.Y. Polyakov (postdoctoral fellow, collaboration with M. Skowronski, MSE, 1995-1996)

A. Smith (postdoctoral fellow, collaboration with R. Feenstra, Physics 1996-1998)

J. Fan (visiting research engineer, project in association with B.H. Krogh, 1998-1999)

J. Neumann (research engineer, project in association with I.J. Oppenheim, 2004)

J. Nieuwenhuis, (visiting Ph.D. student at Bosch RTC, Spring-Summer 2004)

S. Nie, (Physics, short-term project during Fall 2003-early Spring 2004)

L. Cao (research engineer, partly supported by D. Ricketts, Jan- Dec 2009)

Fei Zhang (postdoctoral fellow, Sept 2011-present)

Qinglong Zheng (postdoctoral fello, May 2011-present)

Undergraduate project students (41)

#### STUDENTS SUPERVISED (OTHER, CURRENT, non-ECE)

S. Nie (Ph.D. Physics, CMU, Ph.D. committee member)

S. Gaan (Ph.D. Physics, CMU, Ph.D. committee member)

N. Srivastava (Ph.D. Physics, CMU, Ph.D. committee member)

## COURSES TAUGHT

Linear Circuits (once, sophomore)  
Introduction to Solid State Electronics (four times, junior)  
Analysis and Design of Analog Circuits (ten times, junior)  
Introduction to Electronic Circuits and Devices (four times, sophomore)  
VLSI Process Technology (five times, graduate)  
Field Effect Devices and Process Technology (once, senior)  
Advanced Solid State Electronics (twice, graduate)  
Silicon Process Technology and Physics (senior, at Helsinki University of Technology)  
Solid State Electronics I (five times, junior)  
Solid State Electronics II (ten times, senior)  
Special Topics in Semiconductor Devices (twice, graduate)  
Digital Integrated Circuit Analysis and Design, (once, junior, team-taught)  
Fundamentals of Electrical Engineering (once, sophomore)  
Special Topics in Applied Physics: Computer-controlled Instrumentation (once, graduate)  
Mathematical Foundations of Electrical Engineering (once, sophomore)  
Computer-aided instrumentation and characterization (once, undergraduate/ graduate)  
Micro and Nano Systems Fabrication (once, undergraduate/graduate)  
Computer-aided instrumentation and characterization (ICES, interdisciplinary undergraduate/graduate)  
Fundamentals of Modern CMOS Devices (twice, graduate)  
Special topics in Applied Physics: Ultrasonic Devices and Applications (once, graduate)  
Introduction to Electrical Engineering (five times)  
Electronic Devices and Analog Circuits (once)

## BOOK CONTRIBUTIONS

1. Contributor to An Atlas of IC Technology, W. Maly, principal author (Benjamin Cummings, 1987).
2. Four articles in The Encyclopedia of Advanced Materials, D. Bloor, M.C. Flemings, R.J. Brook, and S. Mahajan, editors, (Pergamon Press, 1994): “Bipolar Junction Transistors,” pp. 270-274; “Bipolar Transistors, Heterojunction,” pp. 274-280; “Metal- Semiconductor Field Effect Transistors,” pp. 1550-1555; “Thin Film Transistors,” pp. 2847-2852.
3. “Ge<sub>x</sub>Si<sub>1-x</sub> Epitaxial Growth and Application to Integrated Circuits,” invited book chapter in Physics of Thin Films, Volume 23, pp. 1-82, M. Francombe, editor (Academic Press, 1997).
4. "Solid state devices and materials," D.W. Greve, in Our vision: Frontiers in Electrical and Computer Engineering, (R.M. White, editor, pp. 42-47, Department of ECE publication, 1997); also available at <http://www.ece.cmu.edu/~dwg/visiona.html>.
5. “UHV/CVD and related growth techniques for Si and other materials,” D.W. Greve (in Properties of Crystalline Silicon, EMIS Datareviews Series No. 20, R. Hull, editor, INSPEC/IEEE, 1999).
6. “Gas-source molecular beam epitaxy of Si and other materials,” D.W. Greve (in Properties of Crystalline Silicon, EMIS Datareviews Series No. 20, R. Hull, editor,

INSPEC/IEEE, 1999).

7. "Chemical Vapor Deposition of Group IV Alloys on Silicon," D.W. Greve, Encyclopedia of Materials: Science and Technology, K.H.J. Buschow, R.W. Cahn, M.C. Flemings, B. Iilschner, E.J. Kramer, and S. Mahajan, editors, Elsevier (2001).

## BOOKS

Field Effect Devices and Applications: Devices for low-power, portable, and imaging systems, D.W. Greve, undergraduate textbook, (1998, Prentice Hall; see also [http://www.prenhall.com/allbooks/esm\\_0137548540.html](http://www.prenhall.com/allbooks/esm_0137548540.html)).

*This book is intended for use at the junior/senior level. Study of the physics of field effect devices is motivated by their systems applications in portable and low power systems. The book uses Mathcad extensively in problems and examples.*

Semiconductor Devices and Technology  
Circuit Analysis and Applications

*These two volumes were written for the new version of 18-220, Introduction to Electrical Engineering. They are privately published by lulu.com for Carnegie Mellon student. Currently in third revision (2011).*

Fundamentals of Modern CMOS Devices

*Written for 18-610, a graduate-level course and privately published by lulu.com (2011).*

## INVITED REVIEW PAPERS

1. "UHV/CVD Epitaxy of Si and  $\text{Ge}_x\text{Si}_{1-x}$ ," M. Racanelli and D.W. Greve, Journal of Metals, pp. 32- 37, October, 1991.
2. "Growth of Epitaxial Germanium-Silicon Heterostructures by Chemical Vapour Deposition," D.W. Greve, Mater. Sci. Engrg. B18, 22-51 (1993).

## REFEREED PUBLICATIONS

1. "Method for Extending the Range of Low-Frequency Admittance Measurements," D.W. Greve, *Rev. Sci. Instrum.* **47**, 1409 (1976).
2. "Thermal Diffusivity/ Conductivity of Alumina with a Zirconia Dispersed Phase," D. Greve, N.E. Claussen, D.P.H. Hasselman, and G.E. Youngblood, *Bull. Am. Cer. Soc.* **56**, 514 (1977).
3. "Statistics of Trap Photoemission in MIS Tunnel Diodes," W.E. Dahlke and D.W. Greve, *Solid-St. Electron.* **22**, 893 (1979).
4. "Photoionization Cross Section and Density of Interface States in MOS Structures," D.W. Greve and W.E. Dahlke, *Appl. Phys. Lett.* **36**, 1002 (1980).
5. "Profiling of Optically Active Defects," D.W. Greve and W.E. Dahlke, *IEEE Transactions on Electron Devices* ED-27, 2152 (1980).
6. "Programming Mechanism of Polysilicon Resistor Fuses," D.W. Greve, *IEEE Transactions on Electron Devices* ED-29, 719 (1982).
7. "Polysilicon n+pn+ Structures for MOS Redundancy," D.W. Greve and L.V. Tran, *IEEE Transactions on Electron Devices* ED-29, 1313 (1982).
8. "Microstructure of Programmed n<sup>+</sup>pn<sup>+</sup> Polycrystalline Silicon Antifuses," M.E. Lunnion and

- D.W. Greve, J. Appl. Phys. 54, 3278 (1983).
9. "Absence of Oxidation in Polysilicon Fuse Links," D.W. Greve, J. Electrochem. Soc. 130, 1616 (1983).
  10. "Influence of Hydrogen Implantation on the Resistivity of Polycrystalline Silicon," D.-L. Chen, D.W. Greve, and A.M. Guzman, Appl. Phys. Lett. 57, 1408 (1985).
  11. "Feasibility of Silicon-on-Garnet Technology," P.H.L. Rasky, D.W. Greve, M.H. Kryder, and S. Dutta," J. Appl. Phys. 57, 4077 (1985).
  12. "Field Enhanced Emission and Capture in Polysilicon pn Junctions," D.W. Greve, P.A. Potyraj, and A.M. Guzman, Solid-State Electronics 28, 1255 (1985).
  13. "Effect of Hydrogen Implantation on Polysilicon pn Junctions," D.-L. Chen, A.M. Guzman, and D.W. Greve, IEEE Transactions on Electron Devices ED-33, 270 (1986).
  14. "Characterization of Aluminum/ LPCVD Polysilicon Schottky Barrier Diodes," D.-L. Chen, D.W. Greve, and A.M. Guzman, Solid- State Electronics 30, 339 (1987).
  15. "Solid Phase Epitaxy of LPCVD Amorphous Silicon Films," M.K. Hatalis and D.W. Greve, J. Electrochem. Soc. 134, 2536 (1987).
  16. "Interpretation of Capacitance-Voltage Characteristics of Polysilicon Thin Film Transistors," D.W. Greve and V.R. Hay, J. Appl. Phys. 61, 1176 (1987).
  17. "Large Grain Polycrystalline Silicon by Low-Temperature Annealing of Low-Pressure Chemical Vapor Deposited Amorphous Silicon Films," M.K. Hatalis and D.W. Greve, J. Appl. Phys. 63, 2260 (1988).
  18. "High-Performance Thin-Film Transistors in Low-Temperature Crystallized LPCVD Amorphous Silicon Films," M.K. Hatalis and D.W. Greve, IEEE Trans. Electron Devices EDL-8, 361 (1987).
  19. "Minority Carrier Hole Diffusion Length Measurement in Heavily-Doped Polysilicon-Emitter Structures," D.-L. Chen, D.W. Greve, and A.M. Guzman, IEEE Trans. Electron Devices ED-35, 1045 (1988).
  20. "Low Temperature Polycrystalline Silicon Thin-Film Transistors for Displays," B.-C. Hseih, M.K. Hatalis, and D.W. Greve, IEEE Trans. Electron Dev. 35, 1842 (1988).
  21. "Interfacial Oxide, Grain Size, and Hydrogen Passivation Effects on Polysilicon Emitter Transistors," P.A. Potyraj, D.-L. Chen, M.K. Hatalis, and D.W. Greve, IEEE Trans. Electron Devices 35, 1334 (1988).
  22. "Sputter Deposition of  $\text{YBa}_2\text{Cu}_3\text{O}_{6+x}$  on Alumina and the Influence of  $\text{ZrO}_2$  Buffer Layers," A. Stamper, D.W. Greve, D. Wong, and T.E. Schlesinger, Appl. Phys. Lett. 52, 1746 (1988).
  23. "Characterization of Ytria-Stabilized Zirconium Oxide Buffer Layers for High- Temperature Superconductor Thin Films," J.-W. Lee, T.E. Schlesinger, A.K. Stamper, M. Migliuolo, D.W. Greve, and D.E. Laughlin, J. Appl. Phys. 64, 6502 (1988).
  24. "Influence of  $\text{Y}_2\text{O}_3\text{-ZrO}_2$  Buffer Layers on Sputtered Films of  $\text{YBa}_2\text{Cu}_3\text{O}_{6+x}$ ," D.W. Greve, A.K. Stamper, T.E. Schlesinger, and M. Migliuolo, Materials Science and Engineering A109, 325 (1989).
  25. "Single Target Sputtering of Superconducting  $\text{Y}_1\text{Ba}_2\text{Cu}_3\text{O}_{7-\delta}$  Thin Films on Si (100)," M. Migliuolo, A.K. Stamper, D.W. Greve, and T.E. Schlesinger, Appl. Phys. Lett. 54, 859 (1989).

26. "Microstructure of Superconducting  $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$  Thin Films on Si and Alumina Substrates with Buffer Layers," J.-W. Lee, M. Migliuolo, A.K. Stamper, D.W. Greve, D.E. Laughlin, and T.E. Schlesinger, *J. Appl. Phys.* 66, 4886 (1989).
27. "Short Time Electron Cyclotron Resonance Hydrogenation of Poly-Si Thin Film Transistor Structures," R. Ditizio, G. Liu, S.J. Fonash, B.-C. Hsieh, and D.W. Greve, *Appl. Phys. Lett.* 56, 1140 (1990).
28. "The Structure and Electrical Characteristics of Oxidized Semi-Insulating Polycrystalline Silicon (SIPOS)," B.-C. Hsieh and D.W. Greve, *J. Appl. Phys.* 67, 2494 (1990).
29. "Temperature Dependence of Growth of  $\text{Ge}_x\text{Si}_{1-x}$  by UHV/ CVD Epitaxy," M. Racanelli and D.W. Greve, *Appl. Phys. Lett.* 56, 2524 (1990).
30. "Construction and Operation of a UHV/ CVD Epitaxial Reactor for Growth of  $\text{Ge}_x\text{Si}_{1-x}$ ," D.W. Greve and M. Racanelli, *J. Vac. Sci. Tech.* B8, 511 (1990).
31. "Growth Rate of Doped and Undoped Silicon by UHV/ CVD," D.W. Greve and M. Racanelli, *J. Electrochem. Soc.* 138, 1744 (1991).
32. "Low Temperature Selective Epitaxy by Ultra-High-Vacuum Chemical-Vapor-Deposition from  $\text{SiH}_4$  and  $\text{GeH}_4$ ," M. Racanelli and D.W. Greve, *Appl. Phys. Lett.* 58, 2096 (1991).
33. "*in situ* Doping of Si and  $\text{Si}_{1-x}\text{Ge}_x$  in Ultra-High Vacuum Chemical Vapor Deposition," M. Racanelli and D.W. Greve, *J. Vac. Sci. Technol.* B9, 2017 (1991).
34. "Oxidation-induced Defects in Trench-etched Silicon Single Crystals," J.C. Pickering, S. Mahajan, and D.W. Greve, *Mater. Sci. and Engrg.* B8, 273 (1991).
35. "On-axis Sputter Deposition of Superconducting  $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$  on Si (100)," A.K. Stamper, D.W. Greve, and T.E. Schlesinger, *J. Vac. Sci. Technol.* A9, 2158 (1991).
36. "Alternate Surface Preparation Approaches for UHV/CVD Epitaxy," M. Racanelli, D.W. Greve, M.K. Hatalis, and L.J. van Yzendoorn, *J. Electrochem. Soc.* 138, 3783 (1992).
37. "Incorporation of Boron into UHV/CVD-Grown Germanium-Silicon Epitaxial Layers," D.W. Greve and M. Racanelli, *J. Electron. Mater.* 21, 593 (1992).
38. "Photoluminescence and X-Ray Diffraction Study of Highly Uniform Si and  $\text{Ge}_x\text{Si}_{1-x}$  Epitaxial Layers" D.W. Greve, R. Misra, T.E. Schlesinger, and G. McLaughlin, *Thin Solid Films* 222, 46 (1992).
39. "Uniformity of  $\text{Ge}_x\text{Si}_{1-x}$  Epitaxial Layers Grown by Ultra-High Vacuum Chemical-Vapor Deposition," D.W. Greve, G. McLaughlin, M.A. Capano, and M. Racanelli, *Appl. Phys. Lett.* 62, 726 (1993).
40. "Photoluminescence Characterization of UHV/CVD Grown Multiquantum Wells," R. Misra, D.W. Greve, and T.E. Schlesinger, *J. Electron. Mater.* 22, 399 (1993).
41. "Characterization of Undoped Multiple Quantum Well Structures," R. Misra, R. Strong, D.W. Greve, and T.E. Schlesinger, *J. Vac. Sci. Technol.* B11, 1106 (1993).
42. "Thermal Chemical Vapor Deposition of Semiconductors for Thin Film Transistor Applications," D.W. Greve, *Microelectronic Engineering* 25, 337 (1994).
43. "UHV/CVD Epitaxy of Silicon and Germanium-Silicon Heterostructures," D.W. Greve, R. Misra, R. Strong, and T.E. Schlesinger, *J. Vac. Sci. Technol.* A12, 979 (1994).



44. "Characterization of Cobalt Annealed on Silicon-Germanium Epilayers," F. Lin, G. Sarcona, M.K. Hatalis, A.F. Cserhati, E. Austin, and D.W. Greve, *Thin Solid Films* 250, 20 (1994).
45. "Growth of Epitaxial  $\text{Ge}_x\text{Si}_{1-x}$  for Infrared Detectors by UHV/CVD," S. Vyas, D.W. Greve, T.J. Knight, R.M. Strong, and S. Mahajan, *Vacuum* 46, 1065 (1995).
46. "Infrared Absorption in  $\text{Ge}_x\text{Si}_{1-x}$  Quantum Wells, R. Misra, D.W. Greve, and T.E. Schlesinger, *Appl. Phys. Lett.* 67, 2548 (1995).
47. "Process Control based on Quadrupole Mass Spectrometry," D.W. Greve, T.J. Knight, X. Cheng, B.H. Krogh, M.A. Gibson, and J. LaBrosse, *J. Vac. Sci. Technol. B* 14, 489 (1996).
48. "Real-time multivariable control of PECVD silicon nitride film properties," T.J. Knight, D.W. Greve, X. Cheng, and B.H. Krogh, *IEEE Transactions on Semiconductor Manufacturing* 10, 137 (1997).
49. "GeSi infrared detectors," R. Strong, D.W. Greve, R. Misra, M. Weeks, and P. Pellegrini, *Thin Solid Films* 294, 343 (1997).
50. "Ge<sub>x</sub>Si<sub>1-x</sub> infrared detectors I: Absorption in multiple quantum well and heterojunction internal photoemission structures," R. Strong, R. Misra, D.W. Greve, and P.C. Zalm, *Journal of Applied Physics* 82, 5191 (1997).
51. "Ge<sub>x</sub>Si<sub>1-x</sub> infrared detectors II: Carrier escape probability and detector performance," R. Strong D.W. Greve, P. Pellegrini, and M. Weeks, *Journal of Applied Physics* 82, 5199 (1997).
52. "Nucleation of boron nitride on Ni(100) surfaces," R.M. Desrosiers, D.W. Greve, and A.J. Gellman, *Mater. Sci. Engrg. B* 46, 84 (1997).
53. "Decomposition of  $\text{B}_2\text{H}_6$  on Ni(100), R.M. Desrosiers, D.W. Greve, and A.J. Gellman, *J. Vac. Sci. Technol. A* 15, 2181 (1997).
54. "Nucleation of boron nitride thin films on Ni(100)," R.M. Desrosiers, D.W. Greve, and A.J. Gellman, *Surface Science* 382, 35 (1997).
55. "Growth of GaBN ternary solutions by organometallic vapor phase epitaxy", A.Y. Polyakov, M. Shin, M. Skowronski, D.W. Greve, R.G. Wilson, A.V. Govorkov, and R.M. Desrosiers, *J. Electron. Mater.* 26, 237 (1997).
56. "On the origin of electrically active defects in AlGa<sub>x</sub>N alloys grown by organometallic vapor phase epitaxy", A.Y. Polyakov, M. Shin, J.A. Freitas, M. Skowronski, D.W. Greve, and R.G. Wilson, *J. Appl. Phys.* 80, 6349 (1996).
57. "Ion implantation of Si, Mg, and C into  $\text{Al}_{0.12}\text{Ga}_{0.88}\text{N}$ ", A.Y. Polyakov, M. Shin, M. Skowronski, R.G. Wilson, D.W. Greve, S.J. Pearton, *Solid-State Electron.* 41, 703 (1997).
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121. Zheng, P., Greve, D. W., and Oppenheim, I. J., "Ultrasonic Flaw Detection in a Monorail Box Beam" *SPIE Smart Structures/NDE Joint Conference*, San Diego, March 2009.
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123. S. Bhargava, D.W. Greve, and I.J. Oppenheim, "Novel ultrasonic motor using torsional/longitudinal vibration," to appear in Proc. IEEE Ultrasonics Symposium, 2009.
124. D.W. Greve and I.J. Oppenheim, "Modes and tip motions in ultrasonic motors using torsional/longitudinal vibration," to appear in Proc. IEEE Ultrasonics Symposium, 2009.
125. "A thick-film wireless metal oxide oxygen sensor for oxy-fuel powerplants," W. Wu, D.W. Greve, and I.J. Oppenheim, (to appear in Proceedings of the Twenty-sixth Annual International Pittsburgh Coal Conference).
126. "Multiphysics Simulation of the Effect of Sensing and Spacer Layers on SAW Velocity," P. Zheng, D.W. Greve, and I.J. Oppenheim, Proceedings of 2009 Comsol conference, (<http://www.ece.cmu.edu/~dwg/research/UFFC%202007%20trailing%20pulse12.pdf>).
127. Chin, T.-L., Zheng, P., Greve, D. W., and Oppenheim, I. J., "Surface acoustic wave devices for wireless strain sensing," *SPIE Smart Structures/NDE Joint Conference*, San Diego, March 2010.
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136. D.W. Greve, P. Zheng, T.L. Chin, I.J. Oppenheim, and V. Malone, "Wireless Harsh-environment oxygen sensors," Proc. IEEE Sensors, pp. not available yet.
137. I.J. Oppenheim, N.S. Carey, T.-L. Chin, P. Zheng, and D.W. Greve, "Temperature and Stiffness Correction of SAW Devices for Wireless Strain Sensing," Proc. SPIE 7981, 79811F (2011).
138. T.-L. Chin, D.W. Greve, and I.J. Oppenheim, "Compact antennas for wireless langasite SAW sensors," Proc. IEEE Ultrasonics Symposium 2011, pp. not available yet.

## INVITED CONFERENCE PRESENTATIONS

(Items marked \* also appear under CONFERENCE PROCEEDINGS; contributed conference presentations are not included below)

1. "Optical Studies of MOS Interface States," D.W. Greve and W.E. Dahlke, Gordon Conference on MOS Systems, Tilton School, Tilton, NH (July, 1980).
2. "Polysilicon Junctions for VLSI," D.W. Greve, D.-L. Chen, P.A. Potyraj, and A.M. Guzman, 22nd Annual Technical Meeting, Society of Engineering Science, University Park, PA (1985).\*
3. "Integration of Semiconductor and Magnetic Bubble Devices: SOI on Garnet," D.W. Greve, M.H. Kryder, and P.H.L. Rasky, Materials Research Society Fall Meeting, Boston, MA (1985).\*
4. "*In situ* Doping of Si and SiGe in UHV/CVD," D.W. Greve and M. Racanelli, 37th National Symposium of the American Vacuum Society, Toronto, Canada, (October 8, 1990).\*
5. "Photoluminescence and X-Ray Diffraction Study of Highly Uniform Si and Ge<sub>x</sub>Si<sub>1-x</sub> Epitaxial Layers" D.W. Greve, R. Misra, T.E. Schlesinger, and G. McLaughlin, European Materials Research Society Meeting, Symposium on SiGe Based Technologies (May, 1992, Strasbourg, France).\*
6. "Thermal Chemical Vapor Deposition of Semiconductors for Thin Film Transistor Applications," D.W. Greve, Integrated Processing Symposium, European Materials Research Society Meeting, (May, 1993, Strasbourg, France).\*
7. "UHV/CVD Epitaxy of Silicon and Germanium-Silicon Heterostructures," D.W. Greve, R. Misra, R. Strong, and T.E. Schlesinger, Electronic Materials: Session on Chemical Routes to Group IV Epitaxy, 40th Symposium of the American Vacuum Society, (Orlando, FL, November, 1993).
8. "Growth and optimization of Ge<sub>x</sub>Si<sub>1-x</sub> Heterostructures for Long-wave Infrared Detectors," presented at the Workshop on Growth and Device Applications of Si-Ge-C Alloys, University of Texas (April 24-25, 1997, Austin, TX).
9. "Mass spectrometer sensing and control of plasma-enhanced silicon nitride deposition," T. Knight, D.W. Greve, X. Cheng, and B.H. Krogh, Fourth International Symposium on Silicon Nitride and Silicon Dioxide Thin Insulating Films, Electrochemical Society Spring Meeting, May, 1997, Montréal, Canada).\*

10. "Nanoelectronics," Symposium on Nanoscale and Mesoscale Enabling Materials and Phenomena, University of Pittsburgh, Pittsburgh, PA, October 12, 2000.
11. "Si-Ge-C Growth and Devices," 2001 Lawrence Symposium on Critical Issues in Epitaxy, Scottsdale, AZ, January 3-6 (2001).
12. "Silicon-Germanium-Carbon Growth and Devices," NSF-ECS/ EPSCoR National Grantees Conference on Electronics, Photonics, and Device Technologies (EPDT), University of Arkansas, Fayetteville, AK (August 16, 2001).
13. D.W. Greve, X. Huang, M. Domach, and D. Nguyen, "Development of an Active-Matrix Biosensor Array,": Electrochemical Society Fall Meeting abstracts (Los Angeles, CA, 2005).

#### SEMINARS (recent)

"Staying Honest: An experimentalist looks at fraud and self-deception," Department of Electrical and Computer Engineering Seminar, October 2, 2008.

"Sensors: systems and diagnostics," IAES/ NETL Fellow's meeting, NETL Pittsburgh (teleconference to NETL Morgantown, WV and Albany, OR), May 19, 2008.

"Structural Health Monitoring with Lamb Waves: Recent Simulations and Experiments," Wright Patterson Air Force Base, February 2, 2007.

"Ultrasonics for infrastructure sensing," Krautkramer (GE Ultrasonics), Lewistown, PA, (February 15, 2005). (also presented January 14, AIS Meeting, CMU; March 11, CMU visitors; December 20, Physical Acoustics Corporation, Princeton, NJ).

"Making (ultrasonic) waves," CMU Physics Department Undergraduate Seminar, (February 15, 2005).

"Simulation of ultrasonic Lamb waves," COMSOL Workshop on Femlab, Pittsburgh, PA (March 23, 2005).

"Staying Honest: an experimentalist and engineer looks at fraud and self-deception," presentation for ECE Sophomore Seminar, Carnegie Mellon University (October 28, 2009).

Greve, D.W., Indiana University of Pennsylvania, "Waves, surface waves, and surface wave sensors." (December 3, 2010).

"High-temperature oxygen sensing in combustor exhaust streams," NETL merit review, Morgantown, WV, May 5, 2009.

Greve, D.W., National Energy Technology Laboratory Morgantown, "Gas, pressure, and temperature sensing in harsh environments." (December 1, 2010).

Greve, D.W., "Staying Honest an experimentalist looks at fraud and self-deception," 18-200 seminar, Oct 11, 2011.

D.W. Greve, "Scattering in microwave solid flow measurements," for NETL Chemical Looping Working Group, Feb. 6, 2012.

CONTRIBUTED CONFERENCE PRESENTATIONS  
*(not included in the interests of brevity)*

(revised February, 2012)