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

2016-present	Emeritus Professor of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA
2015-present	Participant in the Department of Energy (DOE) Faculty Research Participation Program at the National Energy Technology Laboratory
2008-2014	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 device physics. Generally my work has been directed at exploring the relationship between process technology and device performance, and 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 ultrasonic 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 wireless surface acoustic wave sensor technology for energy systems and microwave Doppler sensing of particulate flows. 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. A textbook specifically written for this course was published by Prentice Hall in 1998 and a revised and expanded version has been used in a graduate course at CMU in 2011-14. 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).
Member, IEEE Ultrasonics, Ferroelectrics and Frequency Control Society

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 Subcommitee, 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-)

Guest Editor, special issue on Piezoelectric Sensors and Actuators, Sensors, (2014)

IEEE Ultrasonics Symposium - Group 2 Technical Program Committee co-chair (2013-2015)

Rayleigh Award Committee, IEEE Ultrasonics Society (2015)

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, 1997-2000
Faculty Senate, 1999-2000
Faculty Review Committee (2000-2004)
Educational Facilities Committee (2000-2001)
Review committee member, Graduate Research Funding Grants (GuSH) (2012- 2-16)

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, 2009-2015)
Dilks Library Committee (2013-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
Skjerven Morrill
Finnegan, Henderson, Farrabow, Garrett & Dunner
Advantec, Inc.

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)
E. Dauson (CEE, co-advised with I.J. Oppenheim)
P. Gong (CEE, co-advised with I.J. Oppenheim)
H. Cheng (ECE, M.S. project student)

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 2011-2012)
Qinglong Zheng (postdoctoral fellow, May 2011-2011)

Undergraduate project students (>41)

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 (three times, graduate)
Special topics in Applied Physics: Ultrasonic Devices and Applications (once, graduate)
Introduction to Electrical Engineering (five times)
Electronic Devices and Analog Circuits (once)
Special Topics in Applied Physics: Waves and Applications (twice)
RF Circuits and Antennas for Wireless Systems (twice)
Fundamentals of Semiconductor Devices (twice)

BOOK CONTRIBUTIONS

1. Contributor to An Atlas of IC Technology, W. Maly, principal author (Benajmin 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_xSi_{1-x} 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. Ilschner, 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).

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, revised 2013,).

INVITED REVIEW PAPERS

1. "UHV/CVD Epitaxy of Si and Ge_xSi_{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 Trans- actions 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^+pn^+ Polycrystalline Silicon Antifuses," M.E. Lunnon 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 $YBa_2Cu_3O_{6+x}$ on Alumina and the Influence of ZrO2 Buffer Layers," A. Stamper, D.W. Greve, D. Wong, and T.E. Schlesinger, Appl. Phys. Lett. 52, 1746 (1988).

23. "Characterization of Yttria-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 Y_2O_3-ZrO_2 Buffer Layers on Sputtered Films of $YBa_2Cu_3O_{6+x}$," 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 $Y_1Ba_2Cu_3O_{7-\delta}$ 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 $YBa_2Cu_3O_{7-\delta}$ 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. Hseih, 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. Hseih and D.W. Greve, J. Appl. Phys. 67, 2494 (1990).

29. "Temperature Dependence of Growth of Ge_xSi_{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 Ge_xSi_{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 SiH_4 and GeH_4," M. Racanelli and D.W. Greve, Appl. Phys. Lett. 58, 2096 (1991).

33. "*in situ* Doping of Si and $Si_{1-x}Ge_x$ 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 $YBa_2Cu_3O_{7-\delta}$ 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 Ÿzendoorn, 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 Ge_xSi_{1-x} Epitaxial Layers" D.W. Greve, R. Misra, T.E. Schlesinger, and G. McLaughlin, Thin Solid Films 222, 46 (1992).

39. "Uniformity of Ge_xSi_{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 Ge_xSi_{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 Ge_xSi_{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. B14, 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_xSi_{1-x} 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_xSi_{1-x} 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. B46, 84 (1997).

53. "Decomposition of B_2H_6 on Ni(100), R.M. Desrosiers, D.W. Greve, and A.J. Gellman, J. Vac. Sci. Technol. A15, 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 AlGaN 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 $Al_{0.12}Ga_{0.88}N$", A.Y. Polyakov, M. Shin, M.

Skowronski, R.G. Wilson, D.W. Greve, S.J. Pearton, Solid-State Electron. 41, 703 (1997).

58. "Growth of AlBN solid solutions by organometallic vapor phase epitaxy", A.Y. Polyakov, M. Shin, W. Qian, M. Skowronski, D.W. Greve, R.G. Wilson, J. Appl. Phys. 81, 1715 (1997).

59. "High resistivity $Al_xGa_{1-x}N$ layers grown by MOCVD", A.Y. Polyakov, M. Shin, D.W. Greve, M. Skowronski, and R.G. Wilson, MRS Internet Journal (Nitride Semiconductor Research), [http://nsr.mij.mrs.org/1/36/] (1996).

60. "Reconstructions of the GaN $(000\bar{1})$ surface," A.R. Smith, R.M. Feenstra, D.W. Greve, J. Neugebauer, and J.E. Northrup, Phys. Rev. Lett. 79, 3934 (1997).

61. "Wurtzite GaN Surface Structures studied by Scanning Tunneling Microscopy and Reflection High Energy Electron Diffraction," A.R. Smith, V. Ramachandran, R.M. Feenstra, D.W. Greve, M.-S. Shin, M. Skowronski, J. Neugebauer, and J.E. Northrup, J. Vac. Sci. Technol. A16, 1641 (1998).

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160. J. B. Harley, C. Liu, I. J. Oppenheim, D. W. Greve, and J. M. F. Moura, "Coherent, data-driven Lamb wave localization under environmental variations," *QNDE*, vol. 1650, pp. 202-210, 2015.
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162. E. Dauson, K. B. Gregory, I. J. Oppenheim, G. Healy, and D. W. Greve, "Particle separation using bulk acoustic waves in a tilted angle microfluidic channel," in *Ultrasonics Symposium (IUS), 2015 IEEE International*, pp. 1–4, 2015.
163. P. Gong, T. R. Hay, D. W. Greve, and I. J. Oppenheim, "Volumetric loss quantification using ultrasonic inductively coupled transducers," in *SPIE Smart Structures and Materials+ Nondestructive Evaluation and Health Monitoring*, pp. 943514–943514, 2015.

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_xSi_{1-x} 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_xSi_{1-x} 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 Mesocale 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).
14. Greve, D. W., F. G., Oppenheim, I. J., NETL/ CLWG, "Solids flow measurement at high temperature for chemical looping combustion," Webex presentation. (2013).
15. Greve, D. W., Oppenheim, I. J., Charley, J., Chorpening, B. T., 2013 Workshop on Multiphase Flow Science, "Development of a Microwave Sensor for Measurement of Solids Mass Flow in Chemical Looping," Morgantown WV. (August 7, 2013).
16. "Surface acoustic wave devices for harsh environment wireless sensing," keynote talk at the SAW Sensors Symposium, Vienna, (October, 2014).

SEMINARS (recent)

Greve, D.W., "Surface acoustic wave devices for wireless harsh environment sensing," University of Helsinki, (October, 2014).

Greve, D.W., "Ultrasonic simulations with COMSOL," COMSOL user meeting, Columbus, OH (July 22, 2015).

Greve, D. W., Sophomore seminar Department of Electrical and Computer Engineering Carnegie Mellon U., "Staying Honest an experimentalist looks at fraud and self-deception," ECE Sophomore seminar, (October, 2013 and also 2012, 2011 and 2009).

Greve, D. W., Oppenheim, I. J., NETL Morgantown, "Solids flow measurement at high temperature

for chemical looping combustion," Morgantown WV. (July 5, 2013).

Greve, D. W., Chin, T.-L., Oppenheim, I. J., NETL Morgantown, "Harsh environment SAW sensingresults and prospects," Morgantown WV. (February 11, 2013).

Greve, D. W., F. G., Oppenheim, I. J., NETL/ CLWG, "Solids flow measurement at high temperature for chemical looping combustion," Webex presentation. (2013).

Greve, D.W., "Waves in solids, surface waves, and surface wave sensors," CMU Physics Department Undergraduate Seminar, (March, 2013).

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

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

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.

“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).

CONTRIBUTED CONFERENCE PRESENTATIONS

(not included in the interests of brevity)

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