

## 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

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. 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-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., in progress, co-advised with I.J. Oppenheim)  
N. Tyson (M.S. CEE, I.J. Oppenheim, principal advisor)  
W. Wu (Ph.D., in progress, co-advised with I.J. Oppenheim)  
P. Zheng (Ph.D. in progress, Physics, co-advised with I.J. Oppenheim)  
I. Neill, (M.S. in progress, CEE, I.J. Oppenheim, principal advisor)  
A. Wright (Ph.D. in progress, CEE, I.J. Oppenheim, principal advisor)

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)

Undergraduate project students (37)

#### 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)

#### 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)

#### 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<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. 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](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.*