

Denise M. Wilson

Department of Electrical Engineering,
University of Washington, Seattle, Washington 98195
(206) 221-5238, denisew@u.washington.edu

EDUCATION

9/92-12/95	Georgia Institute of Technology:	Ph.D. Electrical Engineering
	Thesis Title:	Analog VLSI Architectures for Chemical Sensing Microsystems
	Thesis Advisor:	Dr. Stephen P. DeWeerth
	Areas of Specialty:	Computer Engineering, Electronic Design Microelectronics
	Minor:	Mechanical Engineering
9/88-12/89	Georgia Institute of Technology:	MS Electrical Engineering
9/86-6/88	Stanford University:	BS Mechanical Engineering
9/84-5/86	Massachusetts Institute of Technology:	Mechanical Engineering (transfer to Stanford)

EXPERIENCE

9/01-present **University of Washington (Seattle, WA)**
Associate Professor, Department of Electrical Engineering

1/99-9/01 **University of Washington (Seattle, WA)**
Assistant Professor, Department of Electrical Engineering
Research focus primarily in sensing microsystem design (auditory, chemical, visual, multimodal). Focus of research is in distributed microsystems with targeted applications in image processing, chemical sensing, auditory processing, and sensorimotor tasks. Distributed microsystems employ large arrays of sensors or actuators controlled by localized analog VLSI and digital circuits to perform front-end sensory and motor tasks. Front-end processing is massively parallel and suitable to a wide variety of sensing applications (visual, auditory, general frequency, olfactory, etc...). Research includes full architecture design including distributed communication and back-end processing using artificial neural networks for pattern interpretation and decision making. Responsible for teaching microelectronics (analog and digital)

Collaborators:

- Arizona State University (Karl Booksh, Chemistry)
- Auburn University (Thad Roppel, Electrical Engineering)
- Georgia Institute of Technology (Jiri Janata, Chemistry)
- Georgia Institute of Technology (Paul Hasler, Electrical Engineering)
- University of Kentucky (Craig Grimes, Electrical Engineering)
- University of London (Dave Williams, Chemistry)
- University of Louisville (Kevin Walsh, Electrical Engineering)
- University of Southern Illinois (Petr Vanysek, Chemistry)
- University of Washington (Dave Allstot, Bruce Darling)
- Capture Sensors (Dave Williams, Peter McGeehin)
- Sandia National Laboratories (Richard Cernosek)
- USTLAB (John Cranney)

1/96-12/98 **University of Kentucky (Lexington, KY)**
Assistant Professor, Department of Electrical Engineering
Job description similar to UW (above)
Responsible for teaching computer engineering and electronics classes.
Graduate Students (MS): Mark Carpenter (MS: 2/98)
Ronald Kalim (MS: 5/99)

Shakura Quabili (MS: 5/99)
Harsha Ramachandra (MS: 3/99)

- 9/92-12/95 Georgia Institute of Technology (Atlanta, GA)**
Instructor:
- Solely responsible for instruction of basic electronics and digital design courses
- 11/91-6/92 Applied Materials (Santa Clara, CA)**
Test/Reliability Engineer:
- Responsible for PCBA reliability in \$200 million product line
 - Employee of the Quarter Award, 1992
- 4/90-10/91 Applied Materials (Santa Clara, CA)**
Manufacturing Engineer
- Electromechanical support of subassembly, production and testing of semiconductor etching and CVD equipment
 - Small Team Award, 1991: redesign for cost reduction, reliability, and manufacturability of heat exchanger subsystem in \$1.5 million semiconductor fabrication product.
- 2/92-6/92 Applied Materials (Santa Clara, CA)**
- Prepared and taught company-wide classes on PCBA operation for Etch and CVD semiconductor fabrication equipment
- 12/91-3/92 Society of Manufacturing Engineers (SME)**
- Prepared and taught math and physics review classes for SME certification exams.
- 9/88-12/89 Georgia Institute of Technology (Atlanta, GA)**
Instructor:
- Solely responsible for instruction of basic circuits and electronics courses
- 10/86-9/88 Mountain View High School (Mountain View, CA)**
- Volunteer tutor: tutored high school students in all levels of math, science, and English.
 - Prepared and taught exam reviews, AP Physics exam preparation and *Taking the Pain out of the SAT*, a comprehensive SAT Preparation Workshop package
- 5/87-9/87 Honeywell Avionics Division (Clearwater, FL)**
Summer Intern
- Mechanical design engineering support for Centaur guidance systems

ACADEMIC HONORS:

EE Outstanding Teaching Award (2001)
National Science Foundation CAREER Award (1997-2001)
National Science Foundation Fellowship (1992-1995), Georgia Tech Presidential Fellowship (1992-1995)
Alexander Grossman Scholarship (1984-88, covered 90% of undergraduate expenses),
Outstanding Teaching Assistant Award (1989, 1993, 1994)

PUBLICATIONS (Journal Articles)

- Michael Warren and Denise Wilson, "A Virtual Point Array for Parabolic Voltage Interpolation," submitted to *IEEE Transactions on Circuits and Systems II: Analog and Digital Signal Processing*.
- Rachel Yotter and Denise Wilson, "A Review of Photodetectors for Biosensing Applications," *IEEE Sensors Journal*, in press.
- D.M. Wilson and S.D. Garrod, "Optimization of Gas-Sensitive Polymer Arrays using Combinations of Heterogeneous and Homogeneous Sub-Arrays," *IEEE Sensors Journal*, vol. 2, no. 3, June 2002, pp. 169-178.
- D.M. Wilson, Sean Hoyt, Jiri Janata, Louis Abando, and Karl Booksh, "Chemical Sensors for Portable, Hand-held Field Instruments," *IEEE Sensors Journal*, vol. 1, no. 4, December 2001, pp. 256-276.
- B.P. Tan and D.M. Wilson, "Semi-Parallel Rank Order Filtering in Analog VLSI," *IEEE Trans Circuits and*

Systems II: Analog and Digital Signal Processing, vol. 48, n 2, February 2001, pp. 198-205.

- K.H. Chong and D.M. Wilson, "Multi-Level Pattern Recognition Architectures for Localization of Mixed Chemical/Auditory Stimuli," *Sensors and Actuators B*, vol. 68, no. 1, 2001, pp. 58-68.
- T.A. Roppel and D.M. Wilson, "Biologically-Inspired Pattern Recognition for Odor Detection," *Pattern Recognition Letters*, vol. 21, 2000, pp. 213-219.
- D.M. Wilson, T.R. Roppel, and R. Kalim, "Aggregation of Sensory Input for Robust Performance in Chemical Sensing Microsystems," *Sensors and Actuators B*, vol. 64, 2000, pp. 107-117.
- Denise M. Wilson, Kevin Dunman, Thaddeus Roppel, and Ronald Kalim, "Rank Extraction in Tin-Oxide Sensor Arrays," *Sensors and Actuators B*, vol. 62, 2000, pp. 199-210.
- D.M. Wilson, E.D. Blom, M.A. Marra, and B.L. Walcott, "Direct Sensorimotor Control for Low-Cost Mobile Tracking Applications," *IEEE Trans in Industrial Electronics*, vol. 47, No. 4, August 2000, pp. 939-950.
- D.M. Wilson, "An Analog VLSI, Scale Invariant Method for Edge Detection," *Analog Integrated Circuits and Signal Processing*, vol. 23, no. 3, June, 2000, p 211-226 .
- D.M. Wilson and S. Quabili, "A Compact Well-Tuned Bandpass Filter," *Electronics Letters*, vol. 35, no. 5, March 1999, pp. 364-365.
- D.M. Wilson and S.P. DeWeerth, "Analog VLSI Circuits for Adaptive Chemical Discrimination," *Sensors and Materials*, vol. 10, no. 3, 1998, pp.169-184.
- D.M. Wilson and S.P. DeWeerth, "Signal Processing for Improving Gas Sensor Response Time," *Sensors and Actuators B*, vol. 41, 1997, pp. 63-70.
- D.M. Wilson, "Compact CMOS Circuit for Outlier Removal," *Electronics Letters*, vol. 32, no. 11, May 23 1996, pp. 991-992.
- D.M. Wilson and S.P. DeWeerth, "Odor discrimination using steady-state and transient characteristics of tin-oxide sensors," *Sensors and Actuators B*, vol. 28, no. 2, 1995, pp. 123 -128.
- S.P. DeWeerth and D.M. Wilson, "Fixed-ratio adaptive thresholding using CMOS circuits," *Electronics Letters*, vol. 31, no. 10, May 11 1995, pp. 788-789.
- D. Bednarczyk and S.P. DeWeerth, "Smart chemical sensing arrays using tin oxide sensors and analog winner-take-all signal processing," *Sensors and Actuators B*, vol. 26-27, 1995, p. 271-274.

PUBLICATIONS (Refereed Full Conference Papers)

- Naureen Banani, Joshua Greeger, and Denise Wilson, "LED Aggregation for Optimizing Excitation Spectra in Optical Sensing Systems," submitted to *IEEE Sensors 2003*: Toronto, Canada.
- Garth Tan and Denise Wilson, "Hidden Markov Models Applied to the Validation of Sensor Transient Responses," submitted to *IEEE Sensors 2003*: Toronto, Canada.
- R.A. Yotter, M. Warren, J. Greeger, and Denise M. Wilson, "Optimized CMOS Photodetector Structures for the Detection of Biological Reporters," *Euroensors 2003*, in press.
- J. R. Greeger, R. A. Yotter, and D. M. Wilson, "Optimized Interface electronics and Transduction Mechanisms for High Sensitivity Photodiode Structures," *Transducers 2003*: Boston, Massachusetts, in press.
- R.A. Yotter, R.R. Baxter, S. Ohno, S.D. Hawley, and D.M. Wilson, "On a Micromachined Fluidic Inclinator," *Transducers 2003*: Boston, Massachusetts, in press.
- Denise M. Wilson, Mike Warren, Karl Booksh, and Louis Obando, "Integrated Optical Computing for Portable, Real-time SPR Analysis of Environmental Pollutants," *Euroensors 2002*: Prague, Czech Republic, September 2002.
- Sam McKennoch and Denise M. Wilson, "Electronic Interface Modules for Solid-State Chemical Sensors," *IEEE Sensors 2002*: Orlando, Florida, June 2002.
- Todd M. Massengill and Denise M. Wilson, "Dual-Use Signal Processing for a Multiple-Sensor System: Sonar and Optical Image Processing for Underwater Obstacle Avoidance," *IEEE Sensors 2002*: Orlando, Florida, June 2002.
- Sean Hoyt, Sam McKennoch, and Denise Wilson, "Transient Response Chemical Discrimination

- Module,” *IEEE Sensors 2002*: Orlando, Florida, June 2002.
- Todd M. Massengill, Denise M. Wilson, Paul E. Hasler, and David W. Graham, “Empirical Comparison of Analog and Digital Auditory Preprocessing for Automatic Speech Recognition,” *Intl. Symp. Circuits and Systems, ISCAS 2002*: Phoenix, May 2002.
 - Mike Warren and Denise M. Wilson, “A Virtual Point Array for Parabolic Voltage Interpolation,” *Intl. Symp. Circuits and Systems, ISCAS 2002*: Phoenix, Arizona, May 2002.
 - Denise M. Wilson, Sean Hoyt, and Doug St. John, “Diameter Sensing using Radio Frequency Identification for Precision Forestry Applications,” *First International Precision Forestry Symposium*: Seattle, Washington, June 2001.
 - Denise Wilson, “Optimization of composite polymer gas sensor arrays for single-analyte multiple-interferent applications,” *SPIE, Photonics East*: Boston, Massachusetts, November 2001.
 - Sam McKennoch and Denise Wilson, “Autoranging Compensation for Variable Baseline Chemical Sensors,” *SPIE, Photonics East*: Boston, Massachusetts, November 2001.
 - Denise Wilson and Blake Hannaford, “Robust Electronic Design: What’s That?,” *Frontiers in Education 2001*: Reno, Nevada, October 2001.
 - Denise Wilson, “The Ongoing Quest for the Perfect First Course in Electrical Engineering,” *Frontiers in Education 2001*: Reno, Nevada, October 2001.
 - Thaddeus Roppel and Denise Wilson, “Improved Chemical Identification from Sensor Arrays using Intelligent Algorithms,” *SPIE Environmental and Industrial Sensing*: Boston, Massachusetts, November 6-8, 2000.
 - Denise Wilson and Thaddeus Roppel, “Improvements in Concentration-immune Discrimination of Chemicals using a SAW Sensor Array and Multi-stage Pattern Recognition,” *Euroensors 2000*: Copenhagen, Denmark: August 28-30, 2000.
 - Denise Wilson and Kian Haur Chong, “Reduction in False Alarm Rates for metal-oxide chemical sensor arrays,” *Euroensors 2000*: Copenhagen, Denmark: August 28-30, 2000.
 - Denise Wilson and Thaddeus Roppel, “Signal Processing Hierarchies for Portable, Low-Power SAW-based Chemical Sensing Systems,” *2000 Solid State Sensor and Actuator Workshop*: Hilton Head, South Carolina, June 4-8, 2000.
 - Denise Wilson and Howard Chizeck, “Aligning outreach with Cognitive Development: K-12 Initiatives in Electrical Engineering at the University of Washington”, *Frontiers in Education 2000*: St. Louis, Missouri, November 2000.
 - Denise M. Wilson and Thaddeus Roppel, “Hardware Architectures for Chemical Sensing Electronics,” *SPIE Proceedings Photonics East*: Boston, MA, September 20-22, 1999.
 - K.H. Chong and D.M. Wilson, “Multi-level Artificial Neural Networks for Localization of mixed Chemical/Auditory Stimuli,” *Euroensors XIII*: The Hague, Netherlands, September 12-15, 1999.
 - Thaddeus Roppel, Denise Wilson, Kevin Dunman, Vlatko Becanovic, and Mary Lou Padgett, “Design of a Low-Power, Portable Sensor System Using Embedded Neural Networks and Hardware Preprocessing,” *Intl Joint Conf Neural Networks*: Washington D.C., June 1999.
 - Denise Wilson and Ronald Kalim, “Aggregation of Sensory Input for Biologically Inspired Gas Sensing,” *Transducers ‘99*: Sendai Japan, June 1999.
 - Denise Wilson, “The Tenure Process: An individualized approach based on personality type,” *ASEE Annual Conference*: Charlotte, North Carolina, June 1999.
 - R. Kalim and D.M. Wilson, “Semi-parallel Rank-order Filtering in Analog VLSI,” *ISCAS 1999*: Orlando, Florida, May 1999.
 - T. Roppel, M. Padgett, J. Waldemark, D. Wilson, “Feature-Level Signal Processing for Near-Real-Time Odor Identification,” *SPIE-OA*, Orlando, FL: April 13-17, 1998.
 - T. Roppel, K. Dunman, M. Padgett, D. Wilson, and T. Lindblad, “Feature-Level Signal Processing for Odor Sensor Arrays,” *IECON ‘97*, New Orleans, LA: November 2-5, 1997.
 - E.D. Blom, M.W. Carpenter, and D.M. Wilson, “Analog VLSI Circuits for Sensorimotor Control,”

First Intl Workshop on Design of Mixed-Mode Integrated Circuits and Applications, Cancun, Mexico: July 28-30, 1997.

- M.W. Carpenter, and D.M. Wilson, "Pre-Processing of Speech Waveforms Using an Electronic Cochlea," *First Intl Workshop on Design of Mixed-Mode Integrated Circuits and Applications*, Cancun, Mexico: July 28-30, 1997.
- E.J. Brauer, R. Jung, D. Wilson, and J. Abbas, "Sensitivity Analysis of an Analog Circuit Model of Lamprey Unit Pattern Generator," *1997 Intl Conf Neural Networks*.
- E.J. Brauer, R. Jung, D. Wilson, and J. Abbas, "Analog Circuit Model of Lamprey Unit Pattern Generator," *1997 Great Lakes Symposium on VLSI*.
- D.M. Wilson and S.P. DeWeerth, "Rank-Order Filtering in Analog VLSI," *ISCAS96*, Atlanta, Georgia, May 1996.
- D.M. Wilson, T. Hudson, S. Fletcher, B. Harris, C. Knight, T. Morris, G. Patel, and S.P. DeWeerth, "Establishing the Foundations for Engineering Education in K-5," *Frontiers in Education Conference*, Atlanta, Georgia, November 1995.
- D.M. Wilson and S.P. DeWeerth, "Nonlinear preprocessing for Smart Chemical Sensing Systems," *Transducers '95/Euroensors IX*, Stockholm, Sweden, June 1995.
- D.M. Wilson and S.P. DeWeerth, "Winning Isn't Everything," *ISCAS 1995*, Seattle, Washington, May 1995.
- T.G. Morris, D.M. Wilson, and S.P. DeWeerth, "Analog VLSI Circuits for Manufacturing Inspection," *16th Conference on Advanced Research in VLSI*, IEEE Computer Society Press: Los Alamitos, CA, March 1995, pp. 241-255.
- D. Bednarczyk, B. Harris, and S.P. DeWeerth, "Analog VLSI Circuits for Odor Discrimination," *Midwest Symp. on Circuits and Systems*, Lafayette, Louisiana, August 1994.

PUBLICATIONS (Other)

- D.M. Wilson, "Signal Processing Architectures for Chemical Sensing Microsystems," in *Sensors Update*, submitted, Wiley-VCH, 2002.
- D.M. Wilson, Sarah Garrod, Sean Hoyt, Sam McKennoch, and Karl Booksh, "Array Optimization and Preprocessing Techniques for Chemical Sensing Microsystems," in *Sensors Update*, vol. 10, *Sensors Technology, Applications and Markets*, H. Baltes, G.K. Feder and J.G. Korvink eds, Wiley-VCH, 2002.
- D.M. Wilson, "Analog VLSI Architectures for Chemical Sensing Microsystems," *Ph.D. Dissertation, Georgia Institute of Technology*, November 1995.
- D.M. Bednarczyk, "Microelectronic Chemical Sensing Arrays: A Search for Building Blocks," *Georgia Tech Technical Report*, November 1993.

PRESENTATIONS and SEMINARS (invited)

- "Microsensor Instrumentation for Chemical and Biological Monitoring of Environmental Pollutants," University of Connecticut, April 2003.
- "Effective Integration of Sensor, Signal, and Electronics in Microsystems Design," Marquette University, November 2002.
- "Effective Integration of Microscale Techniques, Control and Devices for Biological Sensing Systems," International Workshop on Advances in Micro and Nano Technologies for Sensing Applications: Melbourne, Australia, December 2002.
- "Information Electronics For Chemical and Biological Sensing Systems," The New Challenges of Chemical and Biological Sensing, National Science Foundation, January 9-10, 2002.
- "Chemical Sensors in Distributed Microsystems," EI du Pont de Nemours, November 2002.
- "Distributed Microsystems at the University of Washington," Draper Labs, November 2002.
- "Smart Microsensing Systems: Architectures, Methodologies and Case Studies," guest lectures (4) for

EE484 University of Washington EE: April 2000.

- "Distributed Microsystems Development: Developing Microsystems that Make Sense," Intermountain Industry/University Partnerships Conference, Salt Lake City, Utah: April 2000.
- "Signal Processing Architectures for Portable SAW-based chemical sensing microsystems," Tin Person's Meeting: DOE NN-20 Program Review, Salt Lake City, Utah: February 2000.
- "Signal Processing Architectures for Portable chemical sensing microsystems," Gordon Conference on Chemical Sensing and Interfacial Design, Ventura, California: January 2000.
- "Modeling of Olfaction in Artificial Chemical Sensing Microsystems," University of Washington EE Sensing and Sensing Systems Seminar: November, 1999.
- "Chemical Sensing Microsystem Architectures," Sandia National Laboratories, Albuquerque, New Mexico: September, 1999.
- "Improvements in Signal to Noise performance of solid-state chemical sensor arrays," *Tin Person's Meeting: DOE NN-20 Program Review*, Salt Lake City, Utah: August 1999.
- "The Use of Microfabrication techniques in fuel cell development", University of Washington EE Energy Seminar: April, 1999.
- "Chemical sensing microsystems development in the Distributed Microsystems Laboratory at the University of Washington," *Tin Person's Meeting: DOE NN-20 Program Review*, Salt Lake City, Utah: February 1999.
- "Development of Smart platforms for metal-oxide gas sensors," Capteur Sensors, England: December 12, 1998.
- "Integrated Solid-state Gas Sensor Array Research in the U.S.," *Gas Analysis and Sensing Group*, London, England: December 10, 1998.
- "Distributed Microsystems for Sensing Applications," University of Maryland, College Park Maryland: March 1998.
- "Distributed Microsystems for Sensing Applications," University of Washington: March 1998.
- "Distributed Microsystems for Sensing Applications," University of Arizona, Tucson, Arizona: April 1998.
- "Distributed Microsystems: Platforms, array optimization, and signal processing architectures," *Arizona State University*: Phoenix, Arizona: May 1998.
- Denise Wilson, "Chemical Sensing Electronics: What does it Really Mean," *Tin Man (Person) Convention: DOE NN-20 Research Consortium*: Salt Lake City: February 7-8, 1999.
- Denise Wilson, "Integrated Solid-state Gas Sensor Array Research in the U.S.," *Gas Analysis and Sensing Group*, London, England: December 10, 1998.
- Denise Wilson, "VLSI Architectures for Chemical Sensor Arrays," *Gordon Conference on Chemical Sensors and Interfacial Design*: Henniker, New Hampshire, July 12-17, 1998.
- Denise Wilson and Thad Roppel, "System Level Design of Chemical Sensing Microsystems," *2nd Southeastern Workshop on Mixed-Signal VLSI and Monolithic Sensors*: Knoxville, TN: April 2-3, 1998.
- Denise Wilson, "Translation of Olfactory Systems to Artificial Chemical Sensing Microsystems," *Fourth NSF Workshop on Neuromorphic Engineering*, Telluride, Colorado: June 23-July 14, 1997.
- Denise Wilson, "Issues in Industrial Applications for Chemical Sensing Microsystems," *Fourth NSF Workshop on Neuromorphic Engineering*, Telluride, Colorado: June 23-July 14, 1997.
- Eric Blom and Denise Wilson, "Analog VLSI Circuits for Sensorimotor Control," *Fourth NSF Workshop on Neuromorphic Engineering*, Telluride, Colorado: June 23-July 14, 1997.
- "On-board Integration of Electronics in Chemical Sensing Microsystems," *First NSF Workshop on Chemical Sensors*, Albany, NY, May 7-10, 1997.
- Denise Wilson, "Distributed Microsystems at the University of Kentucky," *Oak Ridge National Laboratories*, Oak Ridge TN, July 12, 1996.
- Denise Wilson, "Biologically Inspired Architectures for Artificial Sensing Systems," *Auburn University*, Auburn AL, May 16, 1996.

- Denise Wilson and Stephen DeWeerth, "Signal Processing for Integrated Chemical Microsystems," *Georgia Tech Graduate Symposium*, Atlanta GA, February 1995.
- Denise Wilson and Stephen DeWeerth, "Analog VLSI Circuits for Image Thresholding," *Georgia Tech Analog Consortium Review*, Atlanta GA, October 1994.
- Denise Wilson and Stephen DeWeerth, "Monolithic Integration of Chemical Sensors and CMOS Circuitry," *Georgia Tech Industry Symposium*, Atlanta GA, May 1994.
- Denise Wilson and Stephen DeWeerth, "Integration of Chemical Sensors and CMOS Circuitry," *Georgia Tech Analog Consortium Review*, Atlanta GA, May 1994.
- Denise Wilson and Stephen DeWeerth, "Analog Circuits for Smart Odor Discrimination," *Georgia Tech Analog Consortium Review*, Atlanta GA, October 1993.

FUNDED RESEARCH ACTIVITY

Highly Streamlined Computing Platforms for Sensory Plane Processing in Portical Chemical Sensing Analysis Systems

National Science Foundation

Principal Investigator: Denise Wilson

Amount: \$330,000

Period of award: 4/03-3/06

Signal Processing Architectures for Biologically Inspired Chemiresistor Array Microsystems

Subcontract to California Institute of Technology (Nathan Lewis, Dept of Chemistry, PI)

for ARO DAAG55-98-1-0266

Principal Investigator: Denise Wilson

Amount: \$80,000

Period of Award: 9/02-12/03

Center for Genomic Excellence (Life on a Chip)

National Institute of Health

Principal Investigator: Deedee Meldrum, Mary Lidstrom

Amount: \$323,735 (Year 1 of 5), 273,000 (Year 2 of 5), 251,000 (Year 3 of 5)

Period of Award: 8/01-7/06

Preventative Techniques for Sensor Validation in Chemical Sensing Applications

Center for Process Analytical Chemistry (CPAC)

Principal Investigator: Denise Wilson

Amount: \$49,000

Period of Award: 1/1/00 - 12/30/02 (ongoing)

Micro-AUV (Autonomous Underwater Vehicle) Project

USTLAB (Subcontract for DARPA AUV Project)

Principal Investigator: Denise Wilson

Amount: \$13,000 (Year 1) + \$63,000 (Year 2)

Period of Award: 12/15/00-8/03

Radio Frequency Identification and Sensing for Precision Forestry Applications

University of Washington Royalty Research Fund

Principal Investigator: Denise Wilson

Amount: \$30,000

Period of Award: 8/01-9/02

Mixed Optical and Electronic Computing Platforms for Surface Plasmon Resonance Sensors

Arizona State University (Subcontract for National Science Foundation, Environmental Technologies)

Principal Investigator: Denise Wilson

Amount: \$60,562

Period of Award: 11/1/00-6/02

Integration of Auditory and Chemical Processing into Compact, Distributed Sensing Nodes

National Science Foundation, Electrical and Communication Systems

Principal Investigator: Denise Wilson

Amount: \$400,000

Period of Award: 10/15/00-9/30/03

Anomaly Detection and Fault Diagnosis in the Space Shuttle Main Engine

Boeing Corporation

Principal Investigator: Les Atlas

Amount: \$93,029

Period of Award: 9/99-7/00

Integration of Biological and Engineering Inspiration into the Classroom Experience and the Design of Chemical Sensing Microsystems

National Science Foundation, Research Experiences for Undergraduates Supplement

Principal Investigator: Denise Wilson

Amount: \$10,000

Period of Award: 1/1/00-12/31/00

Evaluation of Low-Cost, Low-Power Mixed Signal Auditory Processing Systems

National Science Foundation, Small Grant for Exploratory Research

Principal Investigator: Denise Wilson

Amount: \$50,000

Period of Award: 5/99-10/00

An Adaptive technique for A/D conversion on the focal plane

Center for the Design of Analog and Digital Integrated Circuits

Principal Investigator: Denise Wilson

Amount: \$53,000

Period of Award: 9/98-8/99

Integration of Biological and Engineering Inspiration into the Classroom Experience and the Design of Chemical Sensing Microsystems

National Science Foundation, Research Experiences for Undergraduates Supplement

Principal Investigator: Denise Wilson

Amount: \$10,000

Period of Award: 11/1/98-10/31/99

Integration of Biological and Engineering Inspiration into the Classroom Experience and the Design of Chemical Sensing Microsystems

NSF, Solid State and Microstructures, CAREER Program

Principal Investigator: Denise Wilson
Amount: \$210,000
Period of Award: 5/1/97-4/30/01

MEMS-Based Distributed Chemical Sensing Systems for Monitoring Battlefield and Weapon Storage Sites

DARPA, Electronics Technology Office
Principal Investigator: Denise Wilson
Co-Principal Investigator: Janet Lumpf (UK), Thad Roppel (Auburn University)
Amount: \$372,000
Period of Award: 1/1/97 - 2/28/99

Development of Design Infrastructure for Multi-Modal Distributed Sensing

National Science Foundation, Small Grant for Exploratory Research
Principal Investigator: Denise Wilson
Amount: \$49,945
Period of Award: 7/1/96-6/30/97

Development of Design Infrastructure for Multi-Modal Distributed Sensing

National Science Foundation, Research Experiences for Undergraduates Supplement
Principal Investigator: Denise Wilson
Amount: \$10,000
Period of Award: 7/1/96-6/30/97

CURRENT GRADUATE STUDENTS

- Greeger, Josh -- MS Electrical Engineering
- Leung, Carina -- MS Electrical Engineering
- Moe, Andrew -- MS Electrical Engineering
- Strumpf, Michael -- MS Electrical Engineering
- Tan, Garth -- MS Electrical Engineering
- Yotter, Rachel -- MS/PhD Electrical Engineering

PREVIOUS GRADUATE STUDENTS (MS Thesis)

- Hoyt, Sean -- MS Electrical Engineering
- Carpenter, Mark -- MS Electrical Engineering, University of Kentucky (Winter 1998)
Thesis Title: "Analog VLSI Cochlea Models for Phoneme Analysis"
- Kalim, Ronald -- MS Electrical Engineering, University of Kentucky (Spring 1999)
Thesis Title: "Modelling of primitive olfactory circuits in Analog VLSI"
- Massengill, Todd -- MS Electrical Engineering
- McKennoch, Sam -- MS Electrical Engineering
- Quabili, Shakura -- MS Electrical Engineering, University of Kentucky (May 1999)
Thesis Title: "Robust Analog VLSI Circuits for auditory preprocessing in hybrid systems"
- Warren, Michael -- MS Electrical Engineering

PREVIOUS GRADUATE STUDENTS (MS Research Assistants)

- Ramachandra, Harsha -- MS Electrical Engineering, University of Kentucky (Fall 1998)
- Perkins, Alex -- MS Electrical Engineering, University of Washington (Summer 1999)

GRADUATE STUDENT COMMITTEES

- Telikerpalli, Anil -- MS Electrical Engineering, 1996
- Kwan, Kam -- MS Electrical Engineering, 1997
- Vakil, Leena -- MS Electrical Engineering, 1998

UNDERGRADUATE RESEARCH PROJECTS ADVISED (Non-Funded, for Credit)

- Allred, Ryan -- BSEE, December 1999
 - Automated Principal Component Analysis Software for Chemical Classification Problems
- Blom, Eric -- BSEE, May 1997
 - Fall, 1996: Design and Construction of Mobile Vehicle Testbed for Sensing Systems
 - Spring, 1997: Design and Fabrication of Sensorimotor VLSI Circuits for Tracking Applications
- Chan, Elizabeth -- BSEE, June 2003
 - Fall, 2002 and Winter, 2003: LED Characterization for Fluorescent Reporter Analysis
- Chong, Kian Haur -- BSEE, December 1998
 - Summer 1998: Multimodal data acquisition of simple stimuli using auditory and chemical sensors
- Chung, Chie Wen -- BSEE, December 1998
 - Spring 1998: Evaluation of noise reduction in homogeneous arrays of tin-oxide sensors
- Eaton, Joe -- BSEE, May 1997
 - Fall, 1996: Artificial Neural Networks for Chemical Discrimination
 - Summer 1996: Artificial Neural Networks for Financial Sector Analysis
- Erickson, Rick--BSEE, June 2003
 - Spring, 2002: Feasibility Study for non-destructive evaluation of moisture in trees in-situ
- Jenkinsen, Matt--BSEE, June 2003
 - Spring, 2002: Feasibility Study for non-destructive evaluation of moisture in trees in-situ
- Lewis, Brandon -- BSEE, May 1998
 - Fall, 1996: Analog VLSI Models of Intrasegmental Neuron Systems in the Lamprey
- Ooi, Lynn Li -- BSEE, December 1998
 - Fall 1998: Development of Decoder Macro using hardware description language
- Parakkat, Treasa -- BSEE, May 1998
 - Fall 1996: Focal Plane Processing for Orientation Estimation
 - Spring 1997: Focal Plane Processing for Color Sensing and Contrast Enhancement
- Patton, Laura -- BSEE, May 1997
 - Summer 1996: Design and Construction of Chemical Localization Testbed
 - Fall 1996: Analysis and Preprocessing of Chemical Sensor Data for Odor Localization
 - Spring 1997: Design and Construction of Computer Architecture and Natural/Artificial Vision Demonstrations for Elementary and Middle School Students
- Paup, Rick -- BSEE, June 2000
 - Summer, 1999: Design and Construction of Infrared Transmitter/Receiver Circuits for MITE
- Roberts, John -- BSEE, August 1997
 - Fall 1996: Analysis and Preprocessing of Chemical Sensor Data for Odor Discrimination
- Spaulding, Stephen -- BSEE, June 2000
 - Winter 2000: Development of "How a Traffic controller works" for middle school outreach
- Tan, Boon Poh -- BSEE, December 1998
 - Spring, 1998: Design and construction of a low frequency, wireless transmitter/receiver circuit
- Tran, Danny -- BS CSE, June 2000
 - Spring, 1999: Collection and Analysis of Data for Homogeneous Arrays of Chemical Sensors
- Yeh, Cindy -- BSEE, June 2000
 - Summer, 1999: Design and construction of CO sensor test circuits

UNDERGRADUATE RESEARCH PROJECTS ADVISED (Funded)

- Allred, Ryan -- BSEE, December 1999
 - Classification of Anomalies in Aircraft Engine Performance
- Banani, Naureen -- BSEE, December 2003
 - Fall 2002-Spring 2003: LED Characterization and Analysis for Fluorescence Reporter Systems
- Black, Hal -- BSEE, May 1997
 - Spring, 1997: Development of Encoding and Analysis Circuits in VLSI for Chemical Sensing
- Chong, Kian Haur -- BSEE, December 1998
 - Fall 1998: Multimodal recognition of simple stimuli using auditory and chemical sensors
- Chung, Chie Wen -- BSEE, May 1998
 - Summer, 1997: Design, Fabrication and Testing of Circuits and Chemical Sensors for Homogeneous Array Processing
- Eaton, Joe -- BSEE, May 1997
 - Spring, 1997: Sensory Plane Analysis of Infrared/Visual Data for Multimodal Sensing in a Residential Security System
- Farmer, Rachel -- BSEE, December 1998
 - Fall, 1997: Integration of Biological Sciences into the Elementary School Classroom
 - Spring, Summer, Fall 1998: Integration of Biological Sciences into the Elementary Classroom
- Jenkinson, Matt -- BSEE, June 2003
 - Summer, Fall 2002: Camera Module design for Autonomous Underwater Vehicles
- Hoyt, Sean -- BSEE, December 2000
 - Summer, Fall, 2000: Integration of passive RFID into trees for precision forestry applications
- Ip, Louisa -- BSEE, Spring 2002
 - Fall, 2000: Baseline compensation and auto-ranging circuits for solid-state chemiresistors
 - Winter 2001-Spring 2002: Data collection and analysis for hear/smell sensing nodes
- Kim, Sue -- BSEE, Spring 2002
 - Summer, 2000: "From Ears to Microphones" improvements in K-6 outreach program
- Lim, Sheac Yee -- BSEE, December 1998
 - Fall, 1997: Olfactory Modeling in Analog VLSI
 - Spring, 1998: Testing of Lamprey spinal cord segments implemented in analog VLSI
- Maggard, Kristi -- BSEE, May 1998
 - Summer, 1997: Evaluation and Extraction of features for Heterogeneous Array Processing in Chemical Sensing Systems
- Nienaber, Mark -- BSEE, December 1998
 - Summer, Fall 1997, Spring 1998: Infrastructure Development for Fabrication of Chemical Microsensors and Related Signal Processing
- Parakkat, Treasa -- BSEE, December 1997
 - Fall 1997: Analog Photodevice Characterization for Grayscale and Color Sensing
- Ramos, Naomi -- BS CSE, June 2000
 - Spring, 1999 - June 2000: PCB Design and Construction for K-6 Outreach Programs
- Rueckert, Cindy-- BSEE, August 2002
 - Fall 2000-Summer 2001: Support for K-12 Outreach Programs
 - Fall 2001-Spring 2002: Research support for life on a chip research center

PROFESSIONAL SOCIETIES

IEEE Member (1988-present), ASEE Member (1995-present)

PROFESSIONAL ACTIVITIES (OTHER)

- Executive Program Committee, Eurosensors (2002)

- Technical Program Committee, IEEE Sensors (2002)
- Reviewer, IEEE Sensors Journal (2001-present)
- Reviewer, Sensors and Actuators B (1999-present)
- Reviewer, IEEE Journal of Solid State Circuits (1998-present)
- Reviewer, IEEE Transactions on Neural Networks (1999-present)
- NSF ERC (Engineering Research Center) Review Panel: March 1999.
- NSF CAREER Review Panel (Electrical and Communication Systems, Physical Foundations of Enabling Technologies): November 1998.
- NSF Research Equipment Grant Panel Review (Electrical and Communication Systems, Solid State Microstructures): March 1996.

SERVICE ACTIVITIES (completed)

- **NSF Career Workshop, panelist, University of Washington, May 16, 2000.**
- **PAWS, Animal Shelter, Volunteer (2/99 - 2/00): Lynnwood, WA**
- **Johns Hopkins University Institute for the Academic Advancement of Youth (November 1999)**
Speaker, 1999 College Colloquium (University of Puget Sound)
- **Electrical Engineering Search Committee (August 1997-1998)**
University of Kentucky, Assistant Professor Position in VLSI/Microelectronics
- **Women in Engineering Welcome Retreat (August 25, 1997)**
Industry/Faculty Work Group
- **International Science and Engineering Fair 1997, Louisville, Kentucky (May 1997)**
Environmental Sciences, Co-Chairman
- **University of Kentucky, College of Engineering, Continuous Quality Improvement Team/Pre-engineering curriculum development (1996-1998)**
This team is addressing the issue of integrated pre-engineering education at the University of Kentucky using previously successful programs (e.g. Drexel E4) as a model. Unique needs for the program at UK include accommodating a large transfer population, improving retention, and planarizing a highly varied level of preparation in incoming freshman. A pilot program is planned for the 1998-99 academic year followed by a full-fledged program for all freshman engineering students in 99-00.
- **University of Kentucky, Engineering Day (February 1997)**
Lab tours and research demonstrations for all age groups interested in engineering as a career.
- **University of Kentucky, WIE High School Career Day (October 1996)**
Lab Tours for Groups of female high school students (across the state of Kentucky) with demonstrated interest in engineering.
- **Lexington Area Schools, Interactive Electricity Demonstrations**
 - Julia R. Ewing Elementary School: April 1997 (Science Fun Day)
 - Lexington Children's Museum: February 1997 (Science Day)
 - Maurice Bowling Middle School (Owenton, KY): November 1996 (Science Day)
 - Julia R. Ewing Elementary School (Lexington, KY): May 1996 (Science Fun Day)
 - Deep Springs Elementary School (Lexington, KY): April 1996 (Science Day)
- **University of Kentucky, Summer PREP program (July, 1996)**
Demonstration, Design, and Construction of computer hardware displays for Kentucky middle school students.
- **Women in Science and Engineering (WISE): mentor (1994-1995)**
Paired with a local elementary school teacher to bring science and engineering into the classroom as part of a gender equity study sponsored by the federal government.
- **American Red Cross: volunteer and CPR instructor (1993-1995)**

ONGOING SERVICE PROJECTS

- Snohomish County Foster Parent (5/00- present)
- IEEE Faculty Sponsor (Spring 1999-present)
- Course development with Blake Hannaford in linking EE400C and EE498 into a two course, engineering and robust design methodologies sequence.
- Course Lab development for EE215, Introductory Circuit Analysis
- Course development for EE539d, Making Sensors in Silicon

K-12 program coordinator (1/99-present):

This role has typically involved 15 hours a week of activity. Activities include:

- Volunteer recruiting, coordination, and organization of appreciation activities (e.g. lunches and T-shirts).
- Pursuing program funding including visits to and discussions with NSF Elementary and informal science education programs, college of engineering SCORE program, other COE programs, Microsoft corporation, Seattle Robotics society, and other programs.
- Pursuing collaborations and in-kind contributions from mechanical engineering, college of engineering, and the University of Washington Bioengineered Materials (UWEB) program,
- K-5 learning activity development and construction at the Lynnwood garage extension of the UWEE K-12 program (e.g. my home).
- 3-4 hours of in-classroom (K-6) activity per month.
- Coordinator for first and second annual EE Career Day: 2000 and 2001; 25 students from grades 10-12 representing 15+ local high schools shadowed undergraduate students in UW COE for the day.
- Coordinator for UWEE participation in 2000 Open House.
- Establishing collaborations with other departments in linking K-12 activities technically to "complete the circle" of engineering.
- Background research in problem solving, attention building, and cognitive development for K-12 students required to build learning activities synchronized with student needs and abilities at K-12 levels.
- Coordinator for UWEE participation in 1999 Mite program (through MESA in COE): development of "Building an RF Transceiver, Transmitter, Receiver, and Tester Activity".
- Coordinator of development of 6-8 activity in "How Things Work" series for EE: How a traffic light controller works: introduction to the finite state machine."
- Johns Hopkins University Institute for the Academic Advancement of Youth (November 1999): Invited speaker, 1999 College Colloquium (University of Puget Sound).
- Freshman Interest Group, Panel speaker: Fall 1999.
- Women in Engineering Welcome Retreat (August 25, 1997); invited participant in Industry/Faculty Work Group.
- International Science and Engineering Fair 1997, Louisville, Kentucky (May 1997): Environmental Sciences, Co-Chairman.
- University of Kentucky, Engineering Day (February 1997): Coordinated lab tours and research demonstrations for all age groups interested in engineering as a career.

The K-12 program in the EE department involves a threefold set of activities and focus areas:

- K-5: (ES)² to develop ability to grasp concepts in physical science and engineering (see description below).
- 6-8: "How Things Work" series of demonstrations to middle school students to encourage insight into application of otherwise abstract (and perceived "useless") mathematical and scientific principles.
- 9-12: Career Day focuses on providing students with a glimpse into the life of college students

and engineers in industry to encourage students to remain within the local area for their college careers (and to attend the University of Washington).

- **Elementary Science for Elementary Students (ES)²: founder, coordinator, and participant**
(2/94-present)

(ES)² is an outreach program to elementary students and teachers in the Atlanta and Seattle metropolitan areas that has performed, free of charge, over 250 hands-on demonstrations in the physical sciences ranging from electricity made easy to the simple machines. Responsible for administration, scheduling, and volunteer and teacher training. Proposed and procured funding from Sams Club, the Kroger Company, and various Georgia Tech organizations. (ES)² (Atlanta) continues to operate out of Georgia Tech. (ES)² is partially funded by the NSF CAREER grant and includes interactive demonstrations/projects in electricity, computer hardware, and artificial/natural sensing systems (vision, audition, and smell) with the same focus and intent as (ES)² (Atlanta). ES² continues in its current capacity as an outreach program in Washington State. The primary focus of this program is to develop capability for pursuing a career in engineering at the earliest school-age years (K-5) by encouraging the development of abstract thinking skills through an intuitive link between biological and physical science concepts.

- **MITE '99, '00, and '01 coordinator, Electrical Engineering component, in conjunction with MESA,**

(June 1999, June 2000, June 2001):

Workshop for high school students on the topic of “The making of an electronic design: from bread-board to printed circuit board” in the context of designing and constructing an RF transceiver circuit for remote control applications in the home and the construction of operational circuits from potatoes and limes (battery concepts).

COURSES TAUGHT (University of Washington)

- EE215, Fundamentals of Electrical Engineering (Summer 2000)
Circuit Analysis, Development of home laboratories, development of broad-based Topics in EE lectures to introduce fundamentals of electrical engineering
- EE331, Devices and Circuits I (Fall 2000)
Diodes and MOSFET circuits; large signal analysis; frequency response, digital integrated circuits
- EE332, Devices and Circuits II (Winter 1999)
Small and Large Signal Analysis of Diodes and BJTs; single, multistage, and differential amplifier design, frequency response analysis, stability
- EE400C/498, Engineering Design and Robust Design (Fall 1999, Winter 2001) -- NEW COURSE
Techniques for engineering design and robust design.
- EE476, Digital Electronic Circuits (Spring 1999)
Analysis and design of nMOS, CMOS, BiCMOS digital integrated circuits.
- EE539d, Making Sensors in Silicon (Spring 2001) -- NEW COURSE
Survey/Review of common microsensors (pressure, chemical, radiation, etc).

COURSES TAUGHT (University of Kentucky)

- EE461, Introduction to Electronics (Spring 1996; Spring 1997): University of Kentucky
Small and Large Signal Analysis of Diodes, BJTs, MOSFET, BiCMOS; Evaluation of integrated vs. discrete devices; Digital vs. Analog Operation of Transistors
- EE564, Digital Electronic Circuits (Spring 1998): University of Kentucky
Analysis and design of nMOS, CMOS, BiCMOS Digital Integrated Circuits.
- EE581, Advanced Logical Design (Fall 1996; Fall 1997): University of Kentucky
Hardware Level Design Simulation; Pipelining; Special Purpose Computer Architectures; Low and Medium Level Digital Components; Memory/Cache Organization and Mapping

- EE688, Neural Networks (Fall 1996): University of Kentucky
Basic Learning and Application algorithms for artificial neural networks; Evaluation and Design of Sensory Plane Pre-processing for neural network applications

COURSES TAUGHT (Georgia Institute of Technology)

- CmpE2500 (Fall 1995)
Fundamental of Computer Engineering and Digital Design for Electrical Engineers
- CmpE1700 (Fall, 1994, Winter and Spring 1995)
Fundamentals of Computer Engineering and Digital Design for Computer Science Majors
- EE3710 (Fall 1992; WSF 1993; Winter, Spring, 1994)
Introduction to Electronics for Non-Electrical Engineering Majors
- EE3702 (Fall 1989)
Introduction to Solid State Electronics for Non-Electrical Engineering Majors
- EE3701 (Fall 1988, Winter, Spring, Summer 1989)
Introduction to Circuits for Non-Electrical Engineering Majors