

CURRICULUM VITAE

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EDUCATION

- Ph.D. Electrical Engineering / Solid State, Michigan State University, 1986.
Dissertation Title: "Anodic Oxidation of Silicon in a Microwave Plasma Discharge"
M.S. Electrical Engineering, Michigan State University, 1981.
B.S. Electrical Engineering, Michigan State University, 1978.

EMPLOYMENT HISTORY

Associate Professor - Auburn University Department of Electrical Engineering, Sept. 1992 - present.

Summer Faculty Researcher – Air Force Office of Scientific Research, 1992 and 1993.

Assistant Professor - Auburn University Department of Electrical Engineering, Sept. 1986 - Sept. 1992.

Research Assistant - Michigan State University Department of Electrical Engineering, June 1985 - Aug. 1986.

Teaching Assistant - Michigan State University Department of Electrical Engineering, June 1981 - June 1985.

RESEARCH INTERESTS

- Wireless sensor networks, sensor interface circuits, and sensor signal processing.
- Collaborative robotics.
- Software radio.
- Advanced microelectronic sensors including integrated circuit sensors for chemical detection, intelligent sensors, micromachined transducers, thin film transducers, and biomedical telemetry devices.
- Application of neural network concepts to the design of high-reliability, fault-tolerant, distributed sensor arrays.

CURRENT RESEARCH SUMMARY

Current research includes collaborative robotics for hazardous applications, investigation of wireless sensor networks, software-defined radio, biosensors, neural network and fuzzy logic applications for sensor fusion and data integration.

CONTRACTS AND GRANTS

- "Collaborative Robotics for Reconnaissance," Army Research Office, 1/1/07 – 1/31/07, \$49,800
- "Versatile Wireless Data Network for Rocket Propulsion Testing Technologies," NASA / AlphaBeta Technologies, 1/1/2005 – 12/31/2005, \$40,000, with R. Dean.
- "U.S.-Turkey Cooperative Research: A Novel LIDAR System Development and Studies for Remote Sensing," National Science Foundation, 4/15/2004 – 3/31/2006, \$30,000, with H. Kirkici.

- "Breedon Teaching Grant: Core Laboratory Course Enhancements in Electrical and Computer Engineering, " Auburn University Office of the Provost, 6/16/2000 – 6/2001, \$2,000.
- "MEMS-based Chemical Sensing Systems for Monitoring Battlefield and Weapon Storage Sites," with D. Wilson and J. Lumpp, DARPA, 4/97 - 12/99, \$452,467.
- "Chrysler Radio2000 Radio Simulation," Chrysler Huntsville Electronics, 4/97 - 12/97, \$32,000.
- "Chrysler MY97 Radio Simulation," Chrysler Huntsville Electronics, 9/95 - 6/96, \$15,000.
- "Chemical Sensors for Substance Detection," with V. Vodyanoy, Federal Aviation Administration, 9/93 - 9/95, \$200,000.
- "Neural Networks for Sensor Fusion," Air Force Office of Scientific Research, 1/93 - 12/93, \$20,000.
- "Test and Evaluation System for ISFET Biosensors," with L. Myers, Institute for Drug Abatement Research (INDAR), 9/91 - 12/91, \$10,000.
- "Space Power System Reliability Using Intelligent Sensors and Fault-Tolerant Parallel Computing," NASA Center for Commercial Development of Space Power and Advanced Electronics, 6/88 - 12/91, \$640,000.
- "Growth and Characterization of Synthetic Diamond Thin Films," SDIO/IST Center for Advanced Technology, 1/90 - 12/91, \$120,000.
- "Development of a Biomedical Stimulator Using Hybrid Microelectronics," with M.S. Morse, Walker Institute, Pacific Palisades, CA, 1/88 - 12/88, \$50,000.
- "High Temperature Superconductor Opening Switch," with Y. Tzeng, Air Force Office of Scientific Research (AFOSR), 5/88 - 8/88, \$50,000.
- "Growth and Characterization of Silicon Oxide Films Formed on Large Area Silicon Substrates in a Microwave Plasma Disk Reactor," Auburn University Competitive Grant-In-Aid, 1/87 - 6/88, \$2,700.

PARTICIPATION IN INTERDISCIPLINARY PROGRAMS

- Wireless Education and Research Center at Auburn University, 2002 - present
- Alabama Microelectronics Science and Technology Center, 1986 – present.
- Institute for Biological Detection Systems (IBDS), 1988 - present.
- Interactive Space Technologies, 1987 - 89.
- NASA Center for Commercial Development of Space Power, 1988 - 92.

UNDERGRADUATE AND GRADUATE INSTRUCTION

Theses Directed

Adam Ray (M.S. 2005)	" Cooperative Robotics Using Wireless Communication "
Ratha An (M.S. 2005)	"Software Defined Radio for Instructional Applications"
Ramakrishnan Narendran (M.S. 2004)	"Determining the Rotational Orientation of a Spacecraft Using Neural Networks"
Aroldo Couto (M.S. 2003)	"Neural Networks for Industrial Applications: Odor Detection and Neural Factory"
Fraidun Akhi (M.S. 2003)	"Design and Implementation of a Software Radio Testset for Research and Laboratory Instruction"
Kevin Dunman (M.S. 1999)	"Odor Discrimination and Localization Using Neural Network-Based Sensor Array Data Fusion"
Ting-To Lo (Ph.D. 1999)	"Ion Selective Chemical Probes"
Randy Williams (M.S. 1996)	"Silicon Capacitive Micromechanical Accelerometers."
Craig Carlson (M.S. 1996)	"Encapsulation for ISFET Biosensors"
Tom Zoes (M.S. 1994)	"Reference Electrodes for ISFET Biosensors"
Camille Raad (M.S. 1994)	"Neural Network Training Improvement Using Data Clustering"
Utpal Desai (M.S. 1993)	"VLSI Implementations for Artificial Neural Networks."
Tsan-Heui Chein (M.S. 1992)	"Electrical and Optical Characterization of Diamond Thin Film."
Robert Dean (M.S. 1991)	"Integrated Interface Circuitry for Capacitive Sensors."
Sheng-Yau Lee (M.S. 1991)	"Diamond Thin Film Microstructured Accelerometers."

Courses Taught

Undergraduate Courses

Circuits I and II – Basic electrical circuit theory.

Sophomore labs – Instrumentation, transistor electronics, sensors, digital logic circuits, analog-to-digital converters.

Digital Electronics – Solid state materials, diodes, transistors, NMOS, CMOS, and bipolar digital logic circuits.

Analog Electronics I – Analog electronic circuits, transistor amplifiers, op-amps.

Analog Electronics II – Feedback, filters and oscillators.

Advanced Senior/Beginning Graduate Courses

Solid State Sensors – Materials and methods for modern microelectronic sensors.

Solid State Materials and Devices – Physics of electronic devices.

Integrated Circuit Fabrication – Methods and materials for CMOS and bipolar IC fabrication. Includes laboratory work.

Senior Design – Biomedical amplifier design, Telemetry system for a racecar, Rover driven over the internet.

Graduate Courses

Plasma Engineering – Theory of gas discharges, device processing applications, plasma chemistry, fusion energy concepts.

Microelectronic Sensors – Theory and applications of modern IC-based sensors.

UNIVERSITY EXTENSION ACTIVITIES

Teleseminar "Circuit Theory and Analysis" presented for Professional Registered Engineer Continuing Instruction by Satellite Extension (PRECISE) program. Three hour course covering dc, ac, and transient circuits.

UNIVERSITY SERVICE ACTIVITIES

Faculty Advisor to Electrical and Computer Engineering Honor Society, Eta Kappa Nu, Sept. 2001 - present

Electrical and Computer Engineering Department Labs Committee, March 1997- present.

Electrical and Computer Engineering Department Curriculum Committee, Sept. 1993 - present.

College of Engineering Extension Advisory Committee, Jan. 1995 - present.

PROFESSIONAL ACTIVITIES

Chairing and Reviewing

Associate Editor for IEEE Sensors Journal, 2000 - 2003
Textbook reviews for various publishers, 1995 – present.
Technical Chair (Microelectronics) - WNN-AIND 92 Workshop on Neural Networks.
Technical Chair (Microelectronics) - WNN-AIND 91 Workshop on Neural Networks.
Technical Chair (Microelectronics) - WNN-AIND 90 Workshop on Neural Networks.
Reviewer for American Vacuum Society, IEEE Transactions on Education, and others.
Reviewer for IEEE Symposium on Industrial Electronics
Session Chair - IEEE Engineering in Medicine and Biology International Conference, 1988.

Advisory Boards

Member of the Science Advisory Board for *Diamond Thin Films Newsletter* published by Superconductivity News, Inc.

Member of the Scientific Advisory Board for the Neurological Recovery Foundation, sponsored by the Walker Institute, Inc.

HONORS AND AWARDS

Eta Kappa Nu Electrical Engineering Honor Society Member.
Outstanding Teacher in Electrical and Computer Engineering Department , 2001-2002.
Outstanding Faculty Member, College of Engineering, 2001-2002.
Fred H. Pumphrey Teaching Award, 2002.

PUBLICATIONS

Refereed Journal Articles

- R. Dean, G. Flowers, R. Horvath, N. Sanders, A.S. Hodel, J. Hung, and T. Roppel, "Characterization and Experimental Verification of the Nonlinear Distortion in a Technique for Measuring Relative Velocity between Micromachined Structures in Normal Translational Motion," *IEEE Sensors Journal*, Vol. 7, No. 4, April 2007, pp. 496-501.
- D. M. Wilson, T. Roppel, "Signal Processing Architectures for Chemical Sensing Microsystems," *Sensors Update*, v. 11, No. 1, pp. 65 – 100, Oct. 30, 2002.
- D. M. Wilson, T. Roppel, and R. Kalim, "Aggregation of Sensory Input for Robust Performance in Chemical Sensing Microsystems," *Sensors and Actuators B*, **64**(1–3), 107-117, June 2000.
- T. Roppel, J. Y. Hung, S. W. Wentworth, and A. S. Hodel, " An Interdisciplinary Laboratory Sequence in Electrical and Computer Engineering: Curriculum Design and Assessment Results," *IEEE Transactions on Education*, **43**(2), 143–152, May 2000.
- T. Roppel and D. M. Wilson, "Biologically-Inspired Pattern Recognition for Odor Detection," *Pattern Recognition Letters*, **21**(3), 213–219, March 2000.
- D. M. Wilson, K. Dunman, T. Roppel, and R. Kalim, "Rank Extraction in Tin-Oxide Sensor Arrays," *Sensors and Actuators B*, **62**(3), 199-210, April 2000.
- Padgett, Mary Lou and T. A. Roppel, "Neural Networks and Simulation: Modeling for Applications," *Simulation*, **18**(5), 295-305, May 1992.

- T. Roppel, R. Ramesham, C. Ellis, and S.Y. Lee, "Thin Film Diamond Microstructures," *Thin Solid Films*, **212**, 56-62, 1992.
- R. Ramesham, T. Roppel, C. Ellis, and B.H. Loo, "Electrical Characterization of Undoped and Boron-Doped Polycrystalline Diamond Thin Films," *Journal of the Electrochemical Society*, **138**(10), 2981-2984, Oct.1991.
- T. Roppel, M.E. Baginski, D. Jaworske, and R. Ramesham, "Sensor Applications for Synthetic Polycrystalline Thin Film Diamond," *Sensors and Materials*, **2**(6), 329-346, 1991.
- R. Ramesham, T. Roppel, C. Ellis, D. A. Jaworske, and W. Baugh, "Selective and Low Temperature Synthesis of Polycrystalline Diamond," *Journal of Materials Research*. **6**(6), 1278-1286, June 1991.
- R. Ramesham, T. Roppel, C. Ellis, and M.F. Rose, "Fabrication of Microchannels in Synthetic Polycrystalline Diamond Films for Heat Sinking Applications," *Journal of the Electrochemical Society*, **138**(6), 1706-1709, June 1991.
- R. Ramesham, T. Roppel, C. Ellis, and B.F. Hajek, "Characterization of Synthetic Diamond Thin Films," *Journal of the Electrochemical Society*, **137**(10), 3203-3205, Oct. 1990.
- C. Wu, Y. Tzeng, R. P. Hunt, M. A. Belser, and T. Roppel, "High Temperature Superconductor Thick Films on Alumina Substrates," *Journal of the Electrochemical Society*, **136**(5), 1570-1571, May 1989.
- C. Wu, Y. Tzeng, J. Nelson, C. Mosling, T. Roppel, S. McCooey, K. Struve, and M. Fernandez, "Microwave-Controlled High-T_C Superconductor Opening Switch," *Journal of Physics D: Applied Physics*, **22**, 994-996, 1989.
- Y. Tzeng, C. Cutshaw, T. Roppel, C. Wu, C.W. Tanger, M. Belser, R. Williams, L. Czekala, M. Fernandez, and R. Askew, "High Temperature Superconductor Opening Switch," *Applied Physics Letters*, **54**(10), 949-950, March 1989.
- T. Roppel, D.K. Reinhard, and J. Asmussen, "Low Temperature Oxidation of Silicon Using a Microwave Plasma Disk Source," *Journal of Vacuum Science and Technology*, **B4**(1), 295-298, Jan./Feb. 1986.

Patents

- T. Roppel, J. Asmussen, and D.K. Reinhard, "Dual Plasma Microwave Apparatus and Method for Treating a Surface," U.S. Patent 4,691,662. Issued Sept.8, 1987.

Invited Lectures

- T. Roppel, "Growth, Characterization, and Applications of Microwave Plasma Deposited Diamond Thin Films," presented at Michigan State University, Sept. 13, 1990.
- T. Roppel, "Growth and Characterization of Microwave Plasma Deposited Diamond Thin Films," presented at IBM Thomas J. Watson Research Center, June 26, 1990.

Conference Papers and Proceedings

- C. Wilson and T. Roppel, "Low-Cost Vision-Based Indoor Robot Localization," accepted abstract for IEEE SoutheastCon 2007.
- Ratha An and Thaddeus Roppel, "Laboratory Technology for Educating Engineers in the Wireless Information Age," ASEE-SE Conference, Auburn, AL, April 2004.
- Fraidun Akhi and Thaddeus Roppel, "Software Radio: A Platform for Graduate Research in the Wireless Age," ASEE-SE Conference, Auburn, AL, April 2004.

- Thaddeus Roppel and Victor Nelson, "Web-Enhanced Instruction and Assessment for a First Laboratory Course in Electrical and Computer Engineering," ASEE 2001 – Annual Meeting of the American Society for Engineering Education, Albuquerque, NM, June 24-27.
- T. Roppel, D. M. Wilson, K. Dunman, V. Becanovic, and M. L. Padgett, "Design of a Low-Power, Portable Sensor System Using Embedded Neural Networks and Hardware Preprocessing," International Joint Conference on Neural Networks IJCNN'99, Washington, D.C., July 10-16, 1999.
- D. M. Wilson, T. Roppel, and R. Kalim, "Aggregation of Sensory Input for Biologically Inspired Gas Sensing," *Transducers'99*, Sendai, Japan, June 7-10, 1999.
- T. Roppel and A. S. Hodel, "Assessment Results for a Recently Introduced Interdisciplinary Laboratory Sequence in Electrical Engineering," *ASEE'99*, Charlotte, NC, June 20-24, 1999.
- M. L. Padgett, T. A. Roppel, V. Becanovic, G. Szekely, and J. T. A. Waldemark, "Feature Selection for PCNN Exemplars as Applied to Electronic Nose Analysis and ATR," Proceedings of the SPIE, Automatic Target Recognition IX, pp 542 - 548, Orlando, FL, April 7-9, 1999.
- T. Roppel, R. Kalim, and D. Wilson, "Sensory Plane Analog-VLSI for Interfacing Sensor Arrays to Neural Networks," *Virtual Intelligence and Dynamic Neural Networks VI-DYNN '98*, Stockholm, Sweden, June 22-26, 1998.
- J. Waldemark, T. Roppel, D. Wilson, K. Dunman, M. Padgett, "Neural Networks and Principal Components Analysis for Determining Region of Interest in Sensory Data Preprocessing," *Virtual Intelligence and Dynamic Neural Networks VI-DYNN '98*, Stockholm, Sweden, June 22 – 26, 1998.
- M. Padgett and T. Roppel, "Pulse Coupled Neural Networks (PCNN), Wavelets and Radial Basis Functions: Olfactory Sensor Applications," *International Conference on Neural Networks ICNN '98/WCCI*, Anchorage, Alaska, May 1998.
- T. Roppel, M. L. Padgett, and J. Waldemark, "Feature-Level Signal Processing for Near-Real-Time Odor Identification," *SPIE Aerosense 98*, Orlando, FL, April 13-17, 1998.
- M. Padgett, T. Roppel, John L. Johnson, "Pulse-Coupled Neural Networks (PCNN) and New Approaches to Biosensor Applications," *SPIE Aerosense 98*, Orlando, FL, April 13 – 17, 1998.
- D. Wilson, T. Roppel, and M. Padgett, "System Level Design of Chemical Sensing Microsystems," 2nd *Southeastern Workshop on Mixed-Signal VLSI and Monolithic Sensors*, Oak Ridge, TN, April 2, 1998.
- T. Roppel, K. Dunman, M. Padgett, C. Adam Rixey, D. Wilson, and T. Lindblad, "Feature-Level Signal Processing for Odor Sensor Arrays," *Proceedings of the Industrial Electronics Conference IECON '97*, 218-221, New Orleans, Nov. 9-14, 1997.
- T. Roppel and D. Wilson, "Feature-Level Signal Processing for Chemical Sensor Arrays," *Southeastern Workshop on Mixed-Signal VLSI and Monolithic Sensors*, Oak Ridge, TN, April 3-4, 1997.
- D. Wilson and T. Roppel, "MEMS-Based Distributed Chemical Sensing Microsystems," *Southeastern Workshop on Mixed-Signal VLSI and Monolithic Sensors*, Oak Ridge, TN, April 3-4, 1997.
- T. Roppel, "Neural Networks Applied to Chemical Sensor Arrays," (Invited) *American Physical Society*, San Jose, CA, March 20-24, 1995.
- M. L. Padgett, T. Roppel, C. C. Raad, M. Townsley, and T. Graf von Haslingen, "Neural Networks for Signal Processing and Analysis: A Clustering Approach," *Proceedings of the Fifth Workshop on Neural Networks WNN93/FNN93*, 387-392, San Francisco, CA, November 7-10, 1993.

- M. L. Padgett, T. Roppel, C. C. Raad, M. Townsley, and T. Graf von Haslingen, "Intelligent Sensor Fusion, A Clustering Approach," *Southeastern Simulation Conference*, Huntsville, AL, Oct. 17-21, 1993.
- Padgett, Wayne T., Mary Lou Padgett, and T. Roppel, "Simulation and the Design of Training Sets for Supervised Learning in Neural Networks," *Proceedings of the 1993 Summer Computer Simulation Conference*, 1054-1059, Boston, MA, July 19-21, 1993.
- U. Desai, T. Roppel, M. L. Padgett, "The Role of Simulation in the Design of a Neural Network Chip," *SimTech 92*, Clear Lake, Texas, Nov. 4-6, 1992.
- Padgett, Mary Lou and T. A. Roppel, "Design of a Neural Networks Module for Integration into a Simulation," *Proceedings of the 1992 Summer Computer Simulation Conference*, 390-395, Reno, NV, July 1992.
- Padgett, Mary Lou, T. A. Roppel, U. Desai. 1992. "Neural Networks for Defense: A Control System Application," *Proceedings of the 1992 Summer Computer Simulation Conference*, 396-402, Reno, NV, July 1992.
- Padgett, Mary Lou, Utpal Desai, T. A. Roppel and Charles R. White, "Neural Network Applications," *Proceedings of the Third Workshop on Neural Networks WNN92*, 5-9, Auburn, AL, Feb. 10-12, 1992.
- T. Roppel, M. L. Padgett, and E.W. Knightly, "Neural Networks for Sensor Signal Conditioning," *1991 Simulation Technology International*, Orlando, FL, Oct. 21-23, 1991.
- T. Roppel, C. Ellis, R. Ramesham, D. Jaworske, M.E. Baginski, and S.Y. Lee, "Thin Film Diamond Microstructure Applications," *Proceedings of the First International Conference on Applications of Diamond Films and Related Materials*, 311-318, Auburn, AL, Aug. 17-22, 1991.
- R. Ramesham, C. Ellis, and T. Roppel, "Selective Growth, Characterization, and Microstructure Fabrication of Undoped and Doped Polycrystalline Diamond Thin Films," *Proceedings of the First International Conference on Applications of Diamond Films and Related Materials*, 411-416, Auburn, AL, Aug. 17-22, 1991.
- M. L. Padgett and T. Roppel, "Neural Networks and Knowledge Capture," *Proceedings of the Workshop on Neural Networks*, 47-106, Auburn, AL, Feb. 11-13, 1991.
- T. Roppel and M. L. Padgett, S. Shaibani, and M. Kindell, "Robustness of a Neural Network Trained for Sensor Fault Detection," *Proceedings of the Workshop on Neural Networks*, 107-115, Auburn, AL, Feb. 11-13, 1991.
- R. Ramesham, T. Roppel, J.C. Alsup, C. Ellis, and B.H. Loo, "Selective Growth of Boron-Doped Polycrystalline Diamond Thin Films," *Second International Conference on New Diamond Science and Technology ICNDST-2*, Washington, D.C., Sept. 23-27, 1990.
- R. Ramesham, C. Ellis, D. A. Jaworske, S.Y. Lee, and T. Roppel, "Growth, Characterization, and Applications of Polycrystalline Synthetic Diamond Thin Films," *Workshop on the Science and Technology of Diamond Thin Films*, Concord, OH, May 20-24, 1990.
- R. Ramesham, C. Ellis, and T. Roppel, "Low Temperature Selective Deposition of Diamond Thin Films," *3rd International Conference on Amorphous and Crystalline Silicon Carbide and Other Group IV-IV Materials*, Howard University, April 1990.
- R. Ramesham, C. Ellis, T. Roppel, D. A. Jaworske, and W. Baugh, "Low Temperature Synthesis of Polycrystalline Diamond by Microwave Plasma-Enhanced Chemical Vapor Deposition," *Spring Meeting of the Materials Research Society*, April 1990.
- C.D. Ellis, D. A. Jaworske, R. Ramesham, and T. Roppel, "Polycrystalline Diamond Film Flow Sensor," *IEEE Solid State Sensor and Actuator Workshop*, Hilton Head, SC, June 4-7, 1990

- R. Ramesham, T. Roppel, B.F. Hajek, and C. Ellis, "Characterization of Synthetic Diamond Films," *177th Meeting of the Electrochemical Society*, Montreal, Quebec, Canada, May 1990.
- T. Roppel, "Microelectronic Implementation of Neural Networks: A Tutorial," *First Workshop on Neural Networks, Academic/Industrial/NASA/Defense WNN-AIND '90*, Auburn, AL, Feb. 4-7, 1990.
- J.L. Davidson and T. Roppel, "Dielectric Properties of Carbon Films from Plasma Enhanced Chemical Vapor Deposition," *Electrochemical Society Proceedings*, **89**(12), 306-316, Nov. 1989.
- T. Roppel, M. L. Padgett, and C. Wu, "Knowledge Capture for Real-Time Trend Analysis," *Proceedings of the Pacific Division AAAS*, Chico, CA, Sept. 1989.
- T. Roppel, R.W. Johnson, M.S. Morse, and J. Walker, "A Multichannel Digital Biosignal Acquisition System Using Hybrid Microelectronics," *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, vol. 10, part 3, 1110-1111, Nov. 1988.
- K.M. Reeves, M.S. Morse, T. Roppel, and J. Walker, "Local Area Network (LAN) Protocol to Download Biosignals for Multiple Amplifier Sites Over a Single Medium," *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, vol. 10, part 3, 1112-1113, Nov. 1988.
- M.S. Morse, T. Roppel, A. Cilia, S.M. Wixon, and J. Walker, "Multichannel Computer Controlled Stimulation System to Assist the Spinally Injured," *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, vol. 10, part 4, 1525-1526, Nov. 1988.
- Y. Tzeng, C. Wu, R.W. Johnson, T. Roppel, R. Williams, R. Thomas, and R. Salter, "Painting and Printing of High Temperature Oxide Superconductor Films," *34th American Vacuum Society Meeting*, Anaheim, CA, Nov. 1987.
- Y. Tzeng, T.H. Lin, M. Belser, and T. Roppel, "Fast Stripping of Photoresist in Air and Oxygen Plasmas Generated by a Modified Microwave Oven," *National Science Foundation Workshop on Plasma, Ion, and Laser Assisted Processing of Electronic Materials*, San Diego, CA, Feb. 1987.
- T. Roppel, D.K. Reinhard, G.T. Salbert, and J. Asmussen, "Properties of Silicon Oxide Films Grown in a Microwave Oxygen Plasma," *Technical Digest of the 1986 International Electron Devices Meeting*, pp. 205-208, Dec. 1986.
- T. Roppel, "Low Temperature Native Oxidation of Silicon Using a Microwave Plasma Disk Source," *29th International Symposium on Electron, Ion, and Photon Beams*, Portland, OR, May 1985.

Book Contributions

- T. Roppel, "Signal Pickup and Interface Circuitry," in *The Industrial Electronics Handbook*, Edited by J. David Irwin, pp. 146 – 151, CRC Press, 1997.

CONSULTING EXPERIENCE

Walker Institute - Pacific Palisades, CA, 1988 - 89. Biomedical instrumentation.

EPOS Corp. - Auburn, AL, 1986 - 87. General electronics design, including high-voltage, high speed production PC-board test equipment.

SECS, Inc. - Williamston, MI, 1984. Design and development of multichannel A/D and D/A subsystems for closed-loop energy usage control in industrial/commercial buildings.

RH+, Inc. -, Okemos, MI, 1981. Development of electronic medical instrumentation for electrostimulation and biofeedback.

Expert Testimony - Legal cases involving electronic component failure and electrical shock, 1992 - present.