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Professor

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Education: B.S. (1977), M.S. (1979), Ph.D. (1985) Electrical Engineering, University of Virginia

Research Interests: High performance electron devices and circuits, nanoelectronics, tunneling and nanomechanical devices, microwaves, and microelectromechanical systems.

University of Notre Dame (1999-2005): Current group: 11 graduate students, 1 undergraduate, and a post doc. A versatile nanoelectronics testing laboratory has been constructed based around a 110 GHz Agilent 8510XF network analyzer, two Cascade temperature-controlled wafer chucks, and semiconductor parameter and impedance analyzers (see www.nd.edu/~nano). Six courses have been developed in this period, including four graduate courses. Received the Department of Electrical Engineering Outstanding Teacher Award in 2001.

Raytheon/Texas Instruments (1986-1999): Responsible for development of resonant tunneling circuit technology (nanoelectronics) for digital and analog/mixed signal applications (5-100 GHz) and memory. Led group demonstrating first resonant tunneling analog-to-digital converter (4 bits, 3 GSps), demonstrated first integrated bipolar resonant tunneling transistor (RTT) full adder, co-demonstrated first room temperature current gain in tunnel-emitter hot electron transistor, co-demonstrated first bipolar quantum well RTT (BiQuaRTT), demonstrated first 9-state RT SRAM cell. Manager for four completed government programs: AFOSR/DARPA Silicon-Based Quantum MOS Technology Development (1996-1999), AFOSR Resonant Tunneling Transistor Logic (1989-1992), DARPA Quantum Transistors and Circuits (1991-1994), AFOSR/DARPA Oxide/Silicon/Oxide Resonant Tunneling (1995-1998). Principal Investigator: ARPA Resonant Tunneling Devices and Circuits program (1993-1997).

University of Texas at Dallas Visiting Lecturer: EE3301 Electrical Network Analysis (1987), EE6320 Semiconductor Device Theory (1988, 1996), EE3310 Electronic Devices (1989), EE6321 Advanced Semiconductor Device Theory (1997). Received the *Teacher of the Year* award from the student chapter of the *IEEE* 1989-1990.

National Bureau of Standards Electronics Engineer (1979-1986): NBS graduate research fellowship (1981-84). Developed electronic characterization methods and apparatus for GaAs, including resistivity, Hall-effect, deep-level transient spectroscopy, photocapacitance, and photocurrent measurement systems. Revised the ASTM standard method F76 for measuring resistivity and Hall effect.

Ph. D. thesis (1985): Transient photoresistance spectroscopy of deep levels in high resistivity semiconductors.

M.S. thesis (1979): GaAs liquid phase epitaxy for millimeter wave Schottky diodes.

Publications, Patents, Presentations: publications/authored and coauthored, >150; book chapters, 3; patents authored and coauthored: 22 U.S., 10 foreign; invited presentations, 46.

Awards: *TI Achievement Award* for “Demonstration of the world’s first pseudomorphic bipolar quantum resonant tunneling transistor” (1988), *TI Achievement Award* for “Demonstration of the world’s first room temperature resonant tunneling integrated circuit” (1992), *IEEE Computer Society Outstanding Paper Award* (coauthored, 1994), DARPA Sustained Superior Performance award (1997) and DARPA Outstanding Performance by a Project Manager award (1998). Teacher of the Year Award, student chapter of the *IEEE* (1989-1990). Outstanding Teacher Award 2001. **Promotions:** Elected to Texas Instruments’ Senior Member of Technical Staff (1991), Distinguished Member of Technical Staff (1997), and Raytheon Senior Fellow (1999).

Professional Memberships and Committees: *IEEE* Fellow (2003) “for contributions to high speed and nanoelectronic device and circuit technology”, Member APS. *IEEE* EDS Chair of the Nanotechnology Committee (2001-2004), *IEEE* Nanotechnology Council Standards Chairman (2002), *Device Research Conference* technical program committee (1993-1995, 2001-2003), DRC local arrangements chair (2001), DRC technical program chair (2004), DRC general chair (2005), *Silicon Nanoelectronics Workshop* Technical Program Chair (1996), General Chair (1998), program committee (1999-2001), *Advanced Heterostructure Transistor Workshop* (1998), *Int. Electron Dev. Mtg.* technical program committee (1999,2000). Referee for *Electronics Lett.*, *IEEE Electron Dev. Lett.*, *IEEE Trans. Electron Dev.*, *Appl. Phys. Lett.*, and *J. Appl. Phys.* (~1988-present). Guest Editor for the *IEEE Proceedings* special issue on Quantum Devices and Their Applications (1999). Patent Committee: Texas Instruments (1991-1997), Raytheon Systems Company (1997-1999). SRC Si Tunnel Diode and CMOS/HBT Integration Workshop (1999)

University of Notre Dame Courses: EE486 Digital and Analog Integrated Circuits (2005), EE342 Electronics II (2000-2002), EE348 Electromagnetic Fields and Waves (2000), EE556 Fundamentals of Semiconductor Physics (2001,03,04), EE598F Advanced IC Laboratory Techniques (2000), EE598F Advanced Studies in Semiconductor Devices (1999), EE598F Analog CMOS Design (2001,03,04), and EE598 RF Integrated Circuit Design (2002),