Richard B. Brown
Curriculum Vitae

University of Utah
College of Engineering
1692 Warnock Engineering Building
72 S. Central Campus Drive
Salt Lake City, Utah 84112

brown@utah.edu
(801) 585-7498
http://www.coe.utah.edu/brown

Personal

Degrees

Ph.D. E.E.	University of Utah Dissertation: Multiple-Sensor Chemical Transducer	June 1985
M.S.E.E.	Brigham Young University Thesis: Logic State and Timing Analyzer	April 1976
B.S.E.E.	Brigham Young University Cum Laude, Highest Honors, University Scholar Designation	April 1976

Positions at the University of Utah

College of Engineering	Salt Lake City, UT
Dean	7/04 –
School of Computing Professor	7/04 –
Electrical & Computer Engineering Professor	7/04 –
Bioengineering Adjunct Professor	4/05 –

Positions at the University of Michigan

Electrical Engineering and Computer Science Department	Ann Arbor, MI
Adjunct Professor	7/04 -
Interim Chair	7/01 - 5/03
Associate Chair	10/97 - 6/01
Professor	9/97 - 6/04
Associate Professor	9/91 - 8/97
Assistant Professor	9/85 - 8/91

Other Positions

IBM Austin Research Labs	Austin, TX
Visiting Scholar, Exploratory VLSI	9/03 - 5/04

Studied low-power circuit techniques in advanced processes while on sabbatical.

Cascade Design Automation	Bellevue, WA
Visiting Scientist, Advanced Technology	9/91 - 7/92

Explored advanced electronic design automation concepts, and CAD for GaAs technologies while on sabbatical.

Cardinal Computer Division, Cardinal Industries	Webb City, MO
Manager Computer Development	1/78 - 9/81

Led team in the development of computers, instrumentation, and printers for process control and electronic weighing applications.

Holman Industries	Oakdale, CA
V.P. Engineering	1/76 - 12/77

Designed microcomputer system and dot matrix printers. Directed new product development and supervised R & D department.

Teaching

New Courses Taught at U of M

Title	Introduced	Taught
EECS317 Solid-State Devices and Digital Electronics	F88	F88, F89 W93, W94, W95

I organized EECS317 to have an integrated-circuit orientation. This course gave all EECS students a good introduction to active devices and large-signal circuits, and prepared them for the VLSI course which followed at the senior level. Large-signal circuit models for diodes and transistors were developed from a physical perspective, and circuit analysis with active devices was introduced using digital circuits. The homework assignments emphasized the complementary use of hand analysis and computer simulation.

EECS427 VLSI Design I	F90	F90, W96, W97

In 1990, I modified EECS427 so that it was organized around the design of a simple 8-bit CISC microprocessor, the baseline architecture of which was given to students as a starting point for their projects. Working in pairs, they chose an application for their processor and made all design decisions to support this application. Lectures covered topics just in time for students to design the cells which were due each week. This project and general approach to 427 were used through 1995. VLSI Design I was a major design experience before ABET had such a requirement.

In 1996, I had a chance to teach EECS427 again, and renewed and updated it in major ways. The project was changed to a simple 16-bit RISC processor and design teams grew to four members. A number of new CAD capabilities were put into place to reduce design time, to introduce students to important industrial CAD capabilities, and to improve design methodology. At the end of the term, each team had designed and verified their microprocessor. The course has been taught in this format since then.

EECS627 VLSI Design II	W86	W86, W87, W88, W89, W90, W91, F92 F93, F94, F95, F96, F97, F98, F99, W01

I developed EECS627, the UM advanced integrated circuit design course, in 1986; it had been taught once before, but was a very different course. Students gain maturity in 627 as they are exposed to advanced VLSI topics in lectures, and have a realistic design experience. In ’86, I introduced CMOS. In ’87, I incorporated a silicon compiler and other commercial CAD tools. In ’92, I introduced design entry with the hardware-description language, Verilog. This course has continued to change to include current topics in VLSI and the latest CAD capabilities. EECS627 has enabled many research projects and has done much to improve the reputation of our Department in the area of VLSI.

Short Courses and Workshops

Course	Location	Date Enrollment
Ideal VLSI Curriculum	University of the Philippines, Manila	Aug. 9-10, 2005 18
Gallium Arsenide VLSI (Instructor)	Centre Applied Microelectron ics Universidad de Las Palmas Gran Canaria, Spain	Nov. 28-29, 1996 35
GaAs IC Primer Course (Organizer)	1995 GaAs IC Symposium San Diego, CA	Oct. 29, 1995 47
VLSI Digital GaAs Circuit Design 'How to Build a 1 GHz Microproces sor' (Instructor)	Helsinki University of Technology Espoo, Finland	July 4, 1995 28
GaAs IC Primer Course (Instructor)	1994 GaAs IC Symposium Philadelphia, PA	Oct. 16, 1994 37
Device Selection and Performance for High Temperatures (Instructor)	1st Intl. High Temp. Elect. Conf. Albuquerque, NM	June 16, 1991 145
High-Temperature Electronics Workshop (Chairman)	Ford, GE and UM Ann Arbor, MI	Sep. 28, 1990 16

Contributions to Teaching

When I arrived at the University of Michigan in 1985, the EECS Department's National Advisory Committee had just published their report which included a recommendation that we strengthen the integrated circuit design area (VLSI). I decided to make this a focus of my teaching effort.

CAD Tools: Early in my career at UM, I realized that one could not teach proper design methodology with the CAD tools we were using at the time. With the support of the Department and College, I chaired an ad-hoc committee to evaluate and procure new CAD tools, with the vision of replacing the fragmentary collection of software packages used in the Department with a consistent set of tools which would satisfy our instructional and research needs. The University of Michigan pioneered the use of commercial electronic CAD tools in academia, as the major vendors accepted my proposals to donate their software to us. Our interaction with these companies helped them to establish university programs which have benefited many other schools. Our undergraduate circuit and computer courses were being reviewed at that time, and were restructured to use the commercial design automation software. These tools have been used throughout the undergraduate and graduate curricula. Many universities have used the University of Michigan as a model for updating curricula to include electronic design automation. The number of electronic CAD tools available to our students has continued to grow.

VLSI Program: My proposal to add VLSI as a new major area of study for M.S. and Ph.D. students led, with the help of others, to establishment of a new kernel for graduate students. From both academic and research points of view, VLSI has grown into one of the department's strong areas.

Curriculum: I developed both the introductory and advanced VLSI courses in their present forms. These courses are widely known in industry and academia for giving students realistic design experiences which prepare them well for careers in integrated circuit design. Many universities have used our introductory course as a model.

VLSI Infrastructure: In addition to the excellent computing resources at the University of Michigan and the commercial CAD tools mentioned above, students involved in VLSI courses and research need some specialized equipment to facilitate their work. I acquired for the Department plotters which can produce large color plots of chip layouts, an IC tester with 360 high-speed channels, and other test equipment, which have been used by many classes and research projects.

VLSI Design Contest: I organized a contest, originally founded by Kent Smith at the University of Utah, in which UM students participated for 15 years. It raised interest in VLSI at Michigan and served to improve UM's VLSI reputation with industrial companies and among our peer institutions. Companies with an interest in VLSI donated prizes totaling $15,000-$20,000 each year. Judges from the sponsoring companies evaluated the entries from the participating universities. UM students did very well in the contest. Mentor Graphics ran a Student VLSI Contest for four years which was patterned after ours. Here too, UM students typically took the top prizes. In 2000, we merged our VLSI Design Contest with a contest sponsored by the Design Automation Conference (DAC), one of the largest integrated circuit related conferences. The new competition, called the Student Design Contest, is patterned after our contest, but gives the students national exposure. The winners have their expenses paid to attend DAC and, where they present their designs as posters or in oral sessions, and are honored at awards ceremonies. This contest has two categories, conceptual and operational. In the first year of this contest (2000), there were 31 entries from 22 of the top universities throughout the world. UM students took first prize in operational and both first and second prize in conceptual, as well as best paper. In 2001, UM students took first prize in operational and first, second and third prizes in conceptual, as well as best paper. In 2002, UM students won third place in the operational category, first place in the conceptual category, and overall best paper award. In 2003, UM students were awarded first and second prizes in the conceptual category. For these students, it's like winning the Rose Bowl.

<u>Research</u>

Major Research Accomplishments

I conduct research in two general areas, solid-state sensors and integrated circuits. Both of these areas are multidisciplinary, and have led to collaborative relationships with other researchers at the University and in industry.

<u>Sensors</u>: Our cross-disciplinary chemical sensor group has involved faculty and students primarily from EECS, Chemistry and the Medical School, as well as postdoctoral students, visiting faculty and visiting student researchers. We have advanced chemical sensor technology by developing novel sensors, demonstrating the integration of chemical sensors and circuitry, and extending sensor lifetimes. Our group has developed new membrane matrices which have excellent adhesion to the sensor surface, overcoming the primary lifetime failure mechanism. We have developed low-temperature encapsulation methods, and have improved chemical sensor packaging with the application of conductive-polymer flip- chip assembly. We have designed efficient process flows for silicon-based chemical sensors, including mass fabrication of arrays of sensors on standard CMOS circuits.

We have developed an optically-coupled sensor for ions, which has the advantage of needing no reference electrode, and which is able to detect some important analytes which are difficult to detect electrochemically, such as alcohol. We have developed amperometric sensors for heavy metals such as lead and arsenic. With Prof. Meyerhoff's group in Chemistry, we are developing a new sensor type which will use molecular wires and antibody fab fragments to detect a wide array of antigens, other large molecules, bacteria and viruses. With Prof. Cha's group in Korea, we have developed an on-chip reference electrode, which has shrunk the size of solid-state liquid sensors, and with Advanced Sensor Technologies (AST), a small Michigan company, we have grown neurons on an array of sensors which can detect both electrical signals and neurotransmitter type and concentration. Three companies, i-sens (located in Seoul, Korea), Sensicore (in Ann Arbor), and AST are commercializing our solid-state liquid chemical sensor technology.

CMOS circuits have been designed to operate at higher temperatures in part because of our work in characterizing and modeling high-temperature effects in MOSFETs. A special high-temperature CMOS process was developed in conjunction with GE Central Research and Development which resulted in metal-migration immunity, and in doubling of latchup holding voltage and holding current at 300oC. Chapters based on our work are included in two major books on high temperature electronics.

We pioneered the use of sputtered refractory metal and refractory-metal silicides as micromachined materials for solid-state sensors and actuators. This work characterized the morphology and micromechanical properties of molybdenum and tungsten silicide as functions of processing parameters, and resulted in a fabrication process for producing stress-controlled films for use as diaphragms in sensors.

Integrated Circuits: Our high-speed circuits group developed, with DARPA funding, three gallium arsenide microprocessors in E/D MESFET technology, three in CMOS, and one in complementary heterostructure-insulated-gate FET technology (CGaAs). The four faculty and twenty students in this group were from both the Solid-State and Advanced Computer Architecture Labs (ECE and CSE Divisions of the Department). Our research activities covered many facets of high- performance processor design, including process technology, circuit design, packaging, CAD tools, architecture, and compilers. Close working relationships developed between our group and Vitesse Semiconductor, National Semiconductor, Motorola, MIPS Computer Systems, Cray Computer, Tera Computer, IBM, Green Hills Software, and Cascade Design Automation. The results of our exploration of very large-scale digital circuits in GaAs influenced technology directions taken by Vitesse and Motorola, and paved the way for companies like Tera which built a GaAs supercomputer. A major contribution of our work was the development of design automation tools for high-performance GaAs circuits and multichip modules. For example, we developed circuit design techniques and CAD tools which guarantee process tolerance in the circuits; SRAM compilers which optimize the design for the desired power delay product; a tool that optimally places modules on a datapath; an automatic block placement tool which minimizes routing congestion; and software which guides engineers in nonlinear process scaling through cost-benefit analysis. Many of these approaches have been commercialized.

We developed a number of MESFET circuits which demonstrated novel ideas at the gate level (e.g., our patented current-mirror memory cell); module level (e.g., high-speed modified Ling adder); and microarchitecture level (e.g., decoupled superscalar architecture and partially-decoded instruction cache). We were the first group to implement dynamic circuits in complementary GaAs. We also contributed to advanced packaging technologies for high performance computing (multichip modules, fine-pitch flip- chip gold bonding, array I/O, and current-mode I/O circuits which support an order of magnitude higher data rates than voltage signalling). We optimized the PowerPC microarchitecture for implementation in a small transistor-budget, and demonstrated a radiation-hard CGaAs microprocessor. Our high-speed circuits group has been seen as one of only a few at universities that has the breadth, experience, and facilities to have been able to prototype modern high-performance computers. We have established ourselves as leaders in assessment/development of new technologies, rapid prototyping of integrated circuits, and microarchitectures for high speed digital systems.

My research group has designed mixed-signal microcontrollers which include voltage-, current- and capacitive-inputs, an analog multiplexor, bandgap voltage reference, programmable-gain instrumentation amplifier, analog-to-digital converter, and a complete 8-bit microprocessor, including a 16x16 multiply, 40-bit accumulator MAC for signal processing, and a variety of counters and I/O modules. We have designed several microcontrollers which have influenced commercial products. Our present project in this area, under WIMS ERC funding, is the development of a single, mixed-signal integrated circuit, which will serve as the complete instrument for solid-state sensors. This circuit is being designed to operate at 0.9V, the end-life voltage of a single alkaline battery cell. It will include an on-chip MEMS- based clock generator.

My circuits focus has now moved to silicon-on-insulator (SOI) technology. I have had some involvement in SOI since 1989, when my students developed an SOI process in our Solid-State Electronics Laboratory. That process was designed to be compatible with bulk CMOS, and to provide intrinsic encapsulation for liquid chemical sensors. Now we are working with state-of-the-art SOI processes at IBM, developing digital and analog circuit methods that will overcome the disadvantages of partially-depleted SOI devices, using these non-ideal characteristics to produce even faster, lower- power circuits. With Semiconductor Research Corporation funding, we developed circuit techniques for minimizing power dissipation, optimizing performance, and mitigating the timing uncertainty inherent in SOI circuits. We are now focused on source-drain and gate leakage mechanisms, which are becoming important in current processes. The WIMS microcontroller mentioned above may also be implemented in SOI in order to minimize power dissipation. This project opens SOI for analog circuit applications, developing techniques to take advantage of the inherent isolation between devices and the substrate, freedom from back-gating, and the ability to control device characteristics with the body contact.

Grants and Contracts

Dates	Title/Participants	Sponsor	Total Funds
1/86 - 7/87 7/87 - 7/91	High-Temp. Solid-State Sensor Technology (grant) (P.I. & Proj. Dir.; Co-P.I., F. L. Terry, EECS)	Ford SRL Ford Fund	$131,994 $370,000
9/86 - 4/87	Fabrication Feasibility of Multielectrode Arrays (SBIR consultant to Integrated Microsystems)	NIH	$50,000
10/86 - 10/91	High-Frequency Microelectronics (Participant; Proj. Dir., George Haddad, EECS)	ARO	$18,000,000
3/87	Digital Oscilloscope and Plotter (Equipment Grant)	HP	$27,358
4/87 - 12/92	Integrated Sensors for Water Quality Control (P.I.)	Fleck Controls, Inc.	$289,084
6/87 - 5/88	Micromachined Pressure Sensor (P.I.)	VP Res. UM	$15,119

5/89 - 4/90	High-Temperature Electronics (P.I.)	G.E.	$20,000
9/89 - 7/93	Microbiosensor Arrays (P.I. & Proj. Dir.; Co-P.I.s, M.E. Meyerhoff, Chemistry, and A.R. Midgley, Medicine)	NSF	$574,696
8/90 - 8/94	GaAs Microcomputer (P.I. and Proj. Dir.; Co-P.I.s, T.N. Mudge, R.J. Lomax, K. Sakallah and W. P. Birmingham)	DARPA	$2,776,270
7/91 - 11/91	High-Speed Digital Tester (P.I.)	ARO	$149,202
12/92 - 11/95	Rapid Prototyping and Evaluation of High-Performance Computers (Co-PI with Mudge (Director), Davidson, Hayes, Abraham, Birmingham, Sakallah, and Patt.)	NSF	$804,076
7/92 - 6/97	High-Frequency Microelectronics (Participant; Proj. Dir., George Haddad, EECS) (One student support for 1 yr.)	ARO	$5,840,400
1/93 - 12/93	Solid State Chemical Sensors (P.I.)	Motorola	$50,000
2/93	Electrostatic Plotter (P.I. - transferred to gift account)	HP	$49,900
4/94 - 4/95	Evaluation of Polymer Membrane Based ISMOS-FETS and Characterization of Same with Respect to Manufacturability (P.I.)	Motorola	$166,667
5/94 - 4/95	High Speed Design Tools (Co-P.I. with Pavlidis (Director), Sakallah, and Katehi)	ARPA	$566,279
7/94 - 7/95	Planar Sensor Fabrication Feasibility Assessment (Co-P.I. with M. E. Meyerhoff, Chemistry)	Mallinckrodt	$190,487
7/94	Solid-State Sensors (P.I., Unrestricted Gift)	DuPont	$10,000

9/94 - 8/98	Design Optimization of a GaAs RISC Microprocessor with Area-Interconnect MCM Packaging (P.I. and Proj. Dir.; Co-P.I.s, T. N. Mudge, R. J. Lomax, and K. Sakallah)	ARPA	$5,002,705
5/95	Solid-State Sensors (P.I., Unrestricted Gift)	DuPont	$10,000
7/95 - 6/00	GaAs System Implementation (P.I.)	ARPA	$243,424
7/95 - 6/96	Solid-State Planar Sensor Technology (Co-P.I. with M. E. Meyerhoff, Chemistry)	Mallinckrodt	$219,739
7/97 - 7/99	Microprocessor Design Verification (Co-P.I. with Hayes (Director), and Mudge	DARPA	$660,390
7/96 - 6/97	Silicon-Based Sensor Array for Whole Blood Analysis (P.I.)	Inst. Labs. (IL)	$200,281
7/97 - 6/00	Instruction Stream Compression (Co-P.I. with Mudge (Director), and Bird)	DARPA	$1,183,596
1998	Mixed-Signal Microprocessor	National	$100,000
1/98 - 12/98	Multi-site Potentio-Amperometric Neural Sen sor Array (SBIR with Dr. Hal Cantor of Advanced Sensor Technologies, Inc.)	NIH	$100,000
1998	Analog Circuit Design	Texas Instruments	$50,000
1998	Silicon on Insulator Circuits	AMD	$10,000
6/99 - 5/00	Low Voltage Analog Front End	National Semi.	$100,000
1/99 -12/99	Low Voltage Analog Design	Texas Instruments	$100,000
10/99 - 9/00	SOI Circuits	AMD	$20,000
12/1/99 - 11/30/02	Mass Producible Chemical Sensors and Their Measuring Systems	Kwangwoon Univ., Korea	$24,000

2/1/00 - 1/31/03	SOI Circuits for Analog, Digital, and Mixed Signal Applications	SRC	$300,000
8/00 - 7/01	SOI Circuits	AMD	$25,000
8/00 - 7/01	Mixed-Signal Microprocessor	National Semiconductor	$50,000
9/00 - 8/05	An ERC in Wireless Integrated Microsystems Kensall D. Wise, Director Richard B. Brown, Thrust Leader	NSF	$29,447,010 my share $500,000/yr.
10/00 - 9/01	Undergraduate Mentoring Program	SRC	$18,000
1/01 - 12/04	Electron-Relay Enabled Immunosensor (Co-P.I. with M.E. Meyerhoff, Chemistry)	State of MI - Life Sciences Proposal	$769,589
2/01 - 1/02	An Optimal Microbial Control System to Enable Environmental Improvement of Aqueous Fluidic Systems Steven Skerlos, Richard Brown, Katsuo Kura bayashi, Kim Hayes, Alexa Rihana	IESET	$50,000
9/01 - 8/02	Undergraduate Mentoring Program	SRC	$12,000
	IBM Faculty Partnership Award:	IBM	
9/01 - 12/01	YR 1: An SOI, DTMOS Resonant-clocked Floating-point Unit		$25,000
1/02 - 12/02	YR 2: Low-Power SOI Datapath Circuits		$40,000
1/03 - 12/03	YR 3: Mitigation of CMOS Gate Leakage		$40,000
1/04 - 12/04	YR 4: Robust Low-Leakage Circuits		$40,000
1/05 - 12/05	YR 5: Embedded Microcontroller to Improve Power		$40,000
3/01	9 Workstations with Monitors	Sun Microsystems	$142,038
9/01 - 9/03	Complex Signal Processing ASIC Designs (P.I.; Co-P.I., Dennis Sylvester)	DARPA - BAE Systems	$786,496
9/03 - 8/04	Sensors for Monitoring and Diagnostics of Bridges (P.I. Andrzej Nowak, Civil and Envi ronmental Engineering)	ISI: Infrastruc ture Systems Initiative	$85,000
2003	Focused Ion Beam Workstation	MRI	

	John F. Mansfield (P.I., Materials Science and Engineering, EMAL), R. Brown and others		
9/03 - 12/04	VLSI Design Curriculum (Richard B. Brown (P.I.), David Blaauw, Michael Flynn, Dennis Sylvester)	Intel Foundation	$202,173
9/05 - 8/08	SST Integrated Particle Counting and Potenti ometric Sensor Array for Water Quality Analysis (P.I.; Co-P.I., Henry White, UofU Chemistry)	NSF	$299,994
7/05 - 6/06 7/06 – 7/07 6/07 – 7/08	Feasibility of Measuring Autoantibody Interfer ence of Physiologically Active Muscle Cells Using a Biological Nanosensor (Co-P.I. with Harry Hill, ARUP Labs)	ARUP Lab and Dept. of Pathology-UofU	$15,000 $25,000 $30,256
9/05 - 8/08	Neural Probes for Electrical and Chemical Sensing (sub-contract with UMI) (Co-P.I., Richard Brown; P.I., Daryl Kipke)	NIH	$129,371
9/05 - 8/06 9/06 - 8/07 9/07 - 8/08	An Engineering Research Center in Wireless Integrated Microsystems (sub-contract with UMI)	NSF	$99,881 $90,000 $90,000

<u>Publications</u> ***(My graduate students' names are underlined; * indicates that the person was my postdoctoral student when the published work was done)***

Full Articles in Refereed Journals

- Harmander Singh, <u>Robert M. Senger</u>, <u>Rahul Rao</u>, Dennis Sylvester, Richard B. Brown, Kevin Nowka, "A Dual VDD Boosted Pulsed Bus Technique for Low Power and Low Leakage Operation", *IEEE Journal of Solid-State Circuits*, "accepted".
- Kanak Agarwal, <u>Rahul Rao</u>, Dennis Sylvester, Richard Brown, "Parametric Yield Analsis and Optimization in Leakage Dominated Technologies," *IEEE Transactions on Very Large Sclae Integration (VLSI) Systems*, vol. 15, no. 6, June 2007.
- Jun Ho Shim, Juneho Kim, Geun Sig Cha, Hakhyun Nam, Ryan J. White, Henry S. White, Richard B. Brown, "Glass Nanopore-Based Ion-Selective Electrodes", *Analytical Chemistry,* 79(10), pp. 3568-3574, 2007. DOI:10.1021/ac061984z.
- <u>Michael S. McCorquodale</u>, Justin D. Day, Scott M. Pernia, Gordon A. Carichner, Sundus Kubba,

Richard B. Brown, “A Monolithic and Self-Referenced RF LC Clock Generator Compliant with USB 2.0,” *IEEE Journal of Solid-State Circuits*, vol. 42, issue 2, pp. 385-399, Feb. 2007.

- Steven M. Martin, Fadi H. Gebara, Brian J. Larivee, Richard B. Brown, “A CMOS-Integrated Microinstrument for Trace Detection of Heavy Metals,” *IEEE Journal of Solid-State Circuits*, vol. 40, issue, 12, pp. 2777-2786, Dec. 2005.
- Jeonghan Ha, Steven M. Martin, Youngho Jeon, In Jun Yoon, Richard B. Brown, Hakhyun Nam, Geun Sig Cha, “A Polymeric Junction Membrane for Solid-State Reference Electrodes”, *Analytica Chimica Acta.,* vol. 549, issues 1-2, pp. 59-66, Sept. 6, 2005. (Online at http://dx.doi.org: doi:10.1016/j.aca.2005.06.011)
- Rajiv A. Ravindran, Robert M. Senger, Eric D. Marsman, Ganesh S. Dasika, Matthew R. Guthaus, Scott A. Mahlke, Richard B. Brown, “Partitioning Variables Across Multiple Register Windows to Reduce Spill Code In A Low-Power Processor”, *IEEE Transactions on Computers*, vol. 54, issue 8, pp. 998-1012, Aug. 2005.
- M.S. McCorquodale, R.B. Brown, “Academic and Professional Resources for Student-led Technology Ventures,” IEEE Antennas and Propagation Magazine, vol. 46, issue 4, pp. 125-131, Aug. 2004.
- A.J. Drake, K.J. Nowka, T.Y. Nguyen, J.L. Burns, R.B. Brown, “Resonant Clocking Using Distributed Parasitic Capacitance,” IEEE Journal of Solid-State Circuits, vol. 39, issue 9, pp. 1520-1528, Sept. 2004.
- Hakhyun Nam, Geun-Sig Cha, Timothy D. Strong, Jeongha Ha, Jun Ho Sim, Robert W. Hower, Steven M. Martin, Richard B. Brown, “Micro-Potentiometric Sensors,” *Proceedings of the IEEE,* vol. 91, issue 6, pp. 870-880, June 2003.
- Keith L. Kraver, Matthew R. Guthaus, Timothy D. Strong, Peter L. Bird, Geun Sig Cha, Wolfgang Hoeld, Richard B. Brown, “A Mixed-Signal Sensor Interface Microinstrument,” *Sensors & Actuators: A Physical*, 91, pp. 266-277, 2001.
- Timothy D. Strong, Hal C. Cantor, Richard B. Brown, “A Microelectrode Array for Real-Time Neurochemical and Neuroelectrical Recording in Vitro,” *Sensors & Actuators: A Physical*, 91, 357-362, 2001.
- Richard B. Brown, Ronald J. Lomax, Gordon Carichner, Alan J. Drake, “A Microprocessor Design Project in an Introductory VLSI Course,” *IEEE Transactions on Education*, vol. 43, issue 3, pp. 353-361, August 2000.
- Hyo Jung Yoon, Jae Ho Shin, Sung Dong Lee, Hakhyun Nam, Geun Sig Cha, Timothy D. Strong, Richard B. Brown, “Solid-State Ion Sensors with a Liquid Junction-Free Polymer Membrane- Based Reference Electrode for Blood Analysis,” *Sensors and Actuators: B Chemical*, 64, 8-14, 2000.
- Oliver Lutze, Ravi K. Meruva, Aaron Frielich, Narayanan Ramamurthy, Richard B. Brown, Robert Hower, Mark E. Meyerhoff, “Stabilized Potentiometric Solid-State Polyion Sensors Using Silver-Calixarene Complexes as Additives Within Ion-Exchanger-Based Polymeric Films,” *Fresenius' Journal of Analytical Chemistry*, 364 (1/2):41-47, May, 1999.
- Jun Yoon, Dong Kwon Lee, Hakhyun Nam, Geun Sig Cha, Timothy D. Strong, Richard B. Brown, “Ion sensors using one-component room temperature vulcanizing-type silicone rubber matrices,” *Journal of Electroanalytical Chemistry*, Vol. 464, pp. 135-142, 1999.

- D. Van Campenhout, H. Al-Asaad, J. P. Hayes, T. Mudge, R. Brown, “High-Level Design Verification of Microprocessors via Error Modeling,” *ACM Trans. on Design Automation of Electronic Systems*, 3(4), pp. 581-599, October 1998.
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- O. A. Olukotun, T. N. Mudge, R. B. Brown, “Multilevel Optimization of Pipelined Caches,” *IEEE Transactions on Computers*, vol. 46, issue 10, pp. 1093-1102, October 1997.
- M. E. Poplawski, R. B. Brown, K. L Rho, S. Y. Yun, H. J. Lee, G. S. Cha, K.-J. Paeng, “One-Component Room Temperature Vulcanizing-Type Silicone Rubber-Based Sodium-Selective Membrane Electrodes,” *Analytica Chimica Acta*, 355, pp. 249-257, 1997.
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- R. W. Hower, J. H. Sin, G. S. Cha, R. K. Meruva, M. E. Meyerhoff, R. B. Brown, “New Solvent System for the Improved Electrochemical Performance of Screen-Printed Polyurethane Membrane-Based Solid-State Sensors,” *Sensors and Actuators: B Chemical*, vol. SNB033/1-3, pp. 168- 172, 1996.
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- T. Shimei, R. B. Brown, H. Wang, "Coupling a Multiple Micro-Biosensor with a Process Monitor for On-Line Process Monitoring," Recent Advances in Biotechnology Symposium, June 16-17, 1987.
- R. B. Brown, "Integrated Microsensors," Recent Advances in Biotechnology Symposium, July 10-11, 1986.
- R. B. Brown, "An Integrated Chemical Transducer Array," *WESCON '85 Professional Papers*, 27:5, San Francisco, CA, pp. 1-8, Nov. 19-22, 1985.

Service

Committee Assignments at U of U

Committee	Position	Date
Tech. Transfer Office Director Search Com mittee	Co-Chair	8/04 - 5/05
CoE Industrial Advisory Board	Ex Officio Member	7/04 -
CoE Engineering National Advisory Com.	Ex Officio Member	7/04 -
CoE Executive Committee	Chair	7/04 -
Utah Science Technology and Research (USTAR) Oversight Committee	Member	7/04 - 9/05
University Academic Senate	Senator-Deans' Rep	8/05 – 5/07
Academic Senate Executive Committee	Member	8/06 – 5/07
Presidential Mission Statement Task Force	Member	9/05 - 3/06
University Commercialization Advisory Board	Member	10/05 -
Cyber Infrastructure Advisory Committee	Member	10/05 - 3/06
Advancement Policy Council	Member	12/05 -
Effort Reporting for Sponsored Research - Steering Committee	Member	1/06 -
Neuroscience and Biomedical Tech Building - Steering Committee	Member	5/06 -
Disaster Resistant University Advisory Com mittee	Member	8/06 -

Internal International Advisory Board	Member	10/06 –
Institutional Conflice of Interest Policy Drafting Committee	Member	1/07 -
Asia Center Advisory Board	Member	8/07 -
Communication, Leadership, Ethics and Research (CLEAR) Advisory Board	Member	9/07 -

Committee Assignments at U of M

Committee	Position	Date
EECS Ad hoc Circuits Review Com.	Member	10/85 - 1/87
SSEL Operations Com.	Member	1/86 - 9/00
EECS Ad hoc Com. on CAD Tools	Chair	3/86 - 12/87
Solid-State Lab Mgr. Search Com.	Member	9/86 - 10/86
EECS Computer Policy Com.	Member	9/86 - 8/91
IEEE Student Chapter Advisor	Advisor	1/87 - 8/90
SSEL Ad hoc Com. on Document Prep.	Chair	2/87 - 4/87
EECS Ad hoc Computing Needs Com.	Member	3/87 - 5/87
EECS Elec. Sci. Eng. Division Executive Com.	Member	9/88 - 8/89
College Honors and Awards Com.	Member	9/88 - 9/90
EECS Elec. Sci. Eng. Division Graduate Com.	Member	9/92 - 8/94
EECS Circuits Advisor	Advisor	9/92 - 8/94
CAEN Executive Committee	Member	10/90 - 8/95
EECS Dept. Executive Committee	Member	9/93 - 8/95 9/97 - 5/03
Solid-State Faculty Search Committee	Member Chair	9/96 - 9/99 9/98 -9/99

EECS Department Chair Search Committee	Member	11/96 - 9/97
CoE National Advisory Committee	Participant	11/98
DCO Executive Committee	Member	9/97 - 9/98
Circuits Faculty Search Committee	Chair Member	9/97 - 8/98 9/98 - 9/99
Tauber Manufacturing Institute	Board of Directors	9/97 - 9/99
TMI Industrial Co-Director Search Committee	Member	9/98 - 6/99
UM Conflict of Interest Committee	Member	9/95 - 4/01
EECS Administrative Committee	Member	10/97 - 6/01
EECS Honors and Awards Committee	Member	9/97 - 5/03
EECS National Advisory Committee	Participant	3/99
ESE/SSE Curriculum Committee	Member	9/98 - 6/01
CoE Task Force on Reshaping Graduate Engineering Education	Member	9/98 - 6/99
EECS Ad Hoc Committee on Undergraduate Programs	Member	9/99 - 3/00
EECS Futures Committee	Member	3/00 - 11/00
EECS National Advisory Committee	Participant	9/00
CE Undergrad Degree Committee	Member	10/00 - 7/01
EE/Systems Organization Committee	Member	4/01 - 8/01
EECS Administrative Committee	Chair	7/01 - 5/03
ECE Executive Committee	Chair	7/01 - 5/03
CSE Executive Committee	Member	7/01 - 5/03
CoE Chair Advisory Committee	Member	7/01 - 5/03

EECS National Advisory Committee	Organizer	3/02
CoE National Advisory Committee	Participant	4/02
CoE Committee on Interdisciplinary Research	Member	9/02 - 5/03
Medical School Conflict of Interest Board	Member	9/02 - 2/02
CoE International Programs Committee	Member	9/02-
Arthur F. Thurnau Professorships	Reviewer	2002 - 03
Michigan Society of Fellows	Reviewer	2002
OVPR Review Committee of Conflict of Interest & Commitment Policies	Member	2003
Infrastructure Systems Initiative (ISI) Steering Committee	Member	2003

(see key below)

CoE	College of Engineering
EECS	Electrical Engineering and Computer Science Department
ECE	Electrical and Computer Engineering Division of EECS
CSE	Computer Science and Engineering Division of EECS
ESE	*former* Electrical Science and Engineering Division of EECS
SSE	*former* System Science and Engineering Division of EECS
SSEL	Solid-State Electronics Laboratory
CAEN	College of Engineering Computer-Aided Engineering Network
DCO	EECS Departmental Computing Organization
UM	University of Michigan

Administrative Duties at U of U

Organization	Duty	Date
CoE	Dean	7/04 -

Administrative Duties at U of M

Organization	Duty	Date

EECS/CAEN Electronic CAD Application Sector	Director	6/88 - 6/04
EECS Department	Assoc. Chair	10/97 - 6/01
EECS Department	Interim Chair	7/01 - 6/03

Service to Government and Professional Organizations

Type/Organization	Position	Date
Proposal Reviewer		
NIH	Reviewer	
UM Undergraduate Initiatives Grants	Reviewer	
State of Michigan Research Fund Proposals	Reviewer	
UM Office V.P. for Research Grants	Reviewer	
NSF	Reviewer	
Department of Energy	Reviewer	
NIH Site Visit Special Study Section Panel	Member	98

Journal Reviewer/Editor/Advisory Board

IEEE Transactions on Electron Devices	Reviewer	
Solid-State Electronics	Reviewer	
Analytical Chemistry	Reviewer	
Sensors and Actuators	Reviewer	
IEEE Circuits and Devices	Reviewer	
IEEE Journal of Solid State Circuits	Reviewer	
IEEE Journal of Solid State Circuits	Guest Editor	95
IEEE Transactions on Reliability	Reviewer	
Transactions on Very Large Scale Integrated (VLSI) Circuits	Assoc. Editor	99-02
Sensors	Advisory Board	4/01-
Proceedings of the IEEE	Guest Editor	01-02
American Society of Engineering Education	Reviewer	02

Advisory Committees and Activities

NSF Workshop on Microelect. Sys. Edu. in the 1990s	Panel Mem.	90
ASME Emerging Technologies Com.	Member	90
NSF Workshop on Rapid Prototyping of ICs	Panel Mem.	93
ARPA/ONR Thermal Management Round Table	Member	93
MOSIS Advanced Technology Advisory Committee	Member	93-
NSF Workshop on Integration of Edu. & Res. in Microelec. Edu.	Panel Mem.	96
NSF MOSIS Advisory Council on Education	Chair	97-
Engineering Program Review for BYU		99
National Advisory Committee for BYU	Member	00-

SRC Undergraduate Engineering Programs Advisory Board	Member	01-04
Hope College Engineering Advisory Board	Member	02-04
MOBIUS Microsystems Technical Advisory Board	Member	02-
Utah Technology Council	Member	04-

Program Committees

VLSI Education Conference	89
Advanced Research in VLSI	92
27th Hawaii International Conference on System Sciences	93
GaAs IC Symposium	93-97
Advanced Research in VLSI	95
Advanced Research in VLSI Program Chair	99
Ninth Great Lakes Symposium on VLSI	99
Conference on Microelectronic Systems Education	99
Conf. on Advanced Research in VLSI	99
DAC 2000 (Chair of Student Design Contest)	00
SPIE'S Int'l Symp. on Microtechnologies for the New Millennium	03
Microelectronic Systems Education Conference (MSE) 2003	03
2004 IEEE Int. SOI Conference	04
MSE 2005 Program Committee	05
2005 SOI Conference	05

Executive/Organizing Committees

Symposium on Cellular Bioengineering	Org. Com. Mem.	87
Instrument Soc. of America, Symp. on Innov. in Meas. Sci.	Session Org.	88
IEEE/NSF Multichip Module Workshop	Org. Com. Mem.	91
IEEE Mid-America Symposium on Circ. and Sys.	Org. Com. Mem.	93
1995 GaAs IC Symposium	Treasurer	95
1996 GaAs IC Symposium	Publicity Chair	96
1997 GaAs IC Symposium	Publicity Chair	97
1997 Conference on Advanced Research in VLSI (at UM)	General Chair	97
Ninth Great Lakes Symposium on VLSI	Executive Com.	99
Microelectronic Systems Education Conference 2001	Chair	01

Consulting and Industry Board Memberships

Consulting has played a key role in keeping me current on VLSI and CAD topics, bringing industrial and government funding to my research group, forming critical relationships to aid in my research, and enriching the courses I teach (e.g., the 16-bit RISC processor which is used as the baseline design in EECS427 is a proprietary National Semiconductor architecture, used with permission). In addition, I have had the exhilarating experience of helping define the next generation of microprocessors and VLSI CAD tools, and seeing some of our research work in several areas have an impact in commercial products.

Cardinal Industries, Webb City, MO	9/81 - 5/93
Integrated Microsystems, Inc., Ann Arbor, MI	9/86 - 12/86
General Electric Corporate R&D, Schenectady, NY	7/87
Seattle Silicon, Inc., Seattle, WA	10/87 - 8/91
Fleck Controls, Inc., Brookfield, WI	7/90 - 3/94
Cascade Design Automation, Seattle, WA	9/91 - 1/98
DuPont Medical, Newark, DE	3/93 - 5/95
Motorola Semicond. Prod. Sector, Phoenix, AZ	7/93 - 3/95
Leeds & Northrup, North Wales, PA	8/94
Burns, Doane, Swecker, Mathis, Washington, D.C.	2/95 - 6/95
Idiot Savants, Ann Arbor, MI	5/96 - 4/97
National Semiconductor, Santa Clara, CA	5/97 – 01
Intel Corporation, Santa Clara, CA	7/96
Advanced Micro Devices, Austin, TX	3/97
Giner, Inc., Waltham, MA	1/97 - 7/97
Advanced Sensor Technologies, Inc., Farmington Hills, MI	10/98 - 1/00
Collaboration by Design, Dallas, TX	2/99 - 1/00
Ardesta, LLC	12/00 - 6/04
Sensicore, Inc. Technical Advisory Board Board of Directors	10/98 – 1/00 – 1/00 - 9/03
Maryland HIgher Education Commission	8/00 - 5/02

i-sens - Scientific Advisory Board Member	3/00 –
Mobius - Board of Directors	7/02 -
V-Spring Capital	12/05 –

Honors and Awards

Honors and Awards	**Date**
University of Utah, Electrical & Computer Engineering Department Distinguished Young Alumnus Award	4/03
Arthur F. Thurnau Professor Recognizes faculty for outstanding contributions to undergraduate education.	7/01 - 6/04
Austin Center for Advanced Studies Fellow, IBM	7/01 - 12/04
Distinguished Faculty Award from MAGB (Michigan Association of Governing Boards of Universities and Colleges)	3/00
EECS Department Research Excellence Award	3/95
State of Michigan Teaching Excellence Award (one of 18 in Michigan)	6/90
IEEE Student Chapter 1988 Faculty Award	12/88
College of Engineering Teaching Excellence Award	12/87
Member of Eta Kappa Nu, Tau Beta Pi, and Phi Kappa Phi	

Patents Issued

Richard B. Brown and Noland E. Vogt, "Printer Unit", U.S. Design Patent D 270 732, Sept. 27, 1983.

Richard B. Brown, "Integrated circuit for a chemical-selective sensor with voltage output", U.S. Patent 4,743,954, May 10, 1988.

Richard B. Brown and Geun-sig Cha, "Solid state ion sensor with silicone membrane", U.S. Patent 5,102,526, April 7, 1992.

Richard B. Brown and Geun-Sig Cha, "Solid state ion sensor with polyimide membrane", U.S. Patent 5,417,835, May 23, 1995.

Ajay Chandna and Richard B. Brown, "A high speed current mirror memory cell architecture", U.S. Patent 5,490,105, Feb. 6, 1996.

Richard B. Brown, Geun-Sig Cha and Howard D. Goldberg, "Batch deposition of polymeric ion sensor membranes", U.S. Patent 5,607,566, March 4, 1997.

Hal C. Cantor, Richard B. Brown, Timothy D. Strong, “Microscopic combination amperometric and potentiometric sensor”, U.S. Provisional Patent Serial No.:60/163,471, July 2000.

Timothy D. Strong, Richard B. Brown, Hal C. Cantor, “Batch fabrication of electrodes”, U.S. Provisional Patent, Serial No.:60/163,654, July 2000.

R.B. Brown and S.M. Martin, “Laminated devices and methods of making the same”, U.S. Patent 6,786,708, Sept. 7, 2004.

Robert W. Hower and Richard B. Brown, “Micromachined device for receiving and retaining at least one liquid droplet, method of making the device and method of using the device”, US Patent 6,764,652, July 20, 2004.

Richard B. Brown, Ching-Te K. Chuang, Peter Cook, Koushik K. Das, and Rajiv V. Joshi, “Method of reducing leakage current in sub one volt SOI circuits”, U.S. Patent 6,952,113, October 4, 2005.

Koushik Das and Richard B. Brown, “Low-leakage integrated circuits and dynamic logic circuits”, U.S. Patent 6,933,744, Aug. 23, 2005.

Michael McCorquodale and Richard B. Brown, “MEMS-based, computer systems, clock generation and oscillator circuits and LC-tank apparatus for use therein”, U.S. Patent 6,972,635, December 6, 2005.

Richard B. Brown, Gary D. Carpenter, Fadi H. Gebara, “Ulta high frequency ring oscillator with voltage controlled frequency capabilities”, U.S. Patent 7,113,048, September 26, 2006.

Michael S. McCorquodale, Richard B. Brown, Mei Kim Ding, “Linearizing apparatus and method”, U.S. Patent 7,132,874, November 7, 2006.

Michael McCorquodale and Richard B. Brown, “MEMS-based, computer systems, clock generation and oscillator circuits and LC-tank apparatus for use therein”, U.S. Patent 7,157,984, January 2, 2007.

Patents in Progress

Henry S. White, Ryan J. White, Richard B. Brown, “Ion Selective Electrochemical Sensors Based on Nanopore Electrodes,” U of U file U-4103, disclosed August 17, 2006.

Software Developed

Our work on GaAs CAD tools resulted in a commercial package that was available from Cascade Design Automation. It included a number of programs which were derived from our work, including a program for optimizing placement of datapath modules, a phase-checking program for circuits which use two-phase clocking, and GaAs DCFL cell generators, delay macromodels, and power estimators.

Professional Memberships

Registered Professional Engineer.

Member of ASEE, IEEE and ACM, as well as the following IEEE Technical Societies: Solid-State Circuits; Electron Devices; Education; Computer; and Circuits and Systems.

Students

Postdoctoral Fellows

Name	Ph.D Received	Project Topic	Postdoc
Geun Sig Cha	4/1989		1/1989 - 1/1991
Segyeong Joo	2/2006		10/2006 -

Ph.D. Committees Chaired

Name	Project Topic	Graduation/ Status	(Co-)Chair
Koucheng Wu	High-Temperature CMOS	1990	Chair
Jeffrey A. Dykstra	VLSI GaAs DCFL Circuits	1990	Chair
Howard D. Goldberg	Integrated Solid-State Ion Sensors	1993	Chair
Hal Cantor	Amperometric Sensors for Monitoring Endocrine Events	1994	Co-Chair (BioEng.)
Muh-Ling Ger	Refractory Metal-Silicide Micromachining	1994	Chair
Ajay Chandna	GaAs DCFL SRAM for Embedded Applications	1994	Chair
Thomas R. Huff	Architecture and Circuits for a GaAs DCFL Floating-Point Unit	1995	Chair
Michael Upton	Architectural Tradeoffs in Latency-Tolerant GaAs DCFL CPU	1997	Co-Chair
P. Sean Stetson	Low Phase Jitter Clock Generation	1998	Chair
Phiroze Parakh	Design Methodology for Addressing Crosstalk in IC Design	1999	Chair
Todd D. Basso	Microarchitecture for Resource-Limited Superscalar Microprocessors	1999	Chair
Spencer M. Gold	Quantitative Nonlinear Process Scaling	1999	Chair
Claude Gauthier	Current-Mode I/O	1999	Chair
Koushik Das	Low-Power Circuit Design in	2003	Chair

	SOI-CMOS Technology		
Keith Kraver	Low-Voltage Analog Front End	2004	Chair
Michael McCorquodale	On-Chip MEMS Clock Generation	2004	Chair
Timothy D. Strong	Solid-State Neural Sensors	2004	Chair
Robert W. Hower	Optical Solid-State Chemical Sensors	2005	Chair
Alan Drake	LC Clock Generation and SOI DTMOS	2005	Chair
Steven Martin	Mixed-Mode Electronics and Integrated Heavy Metal Sensors	2005	Chair
Rahul Rao	SOI Circuits to Minimize Gate Leakage	2005	Chair
Jay Sivagnaname	Unipolar Logic in SOI	2005	Chair
Fadi Gebara	Analog SOI Design	2005	Chair
Matthew Guthaus	Gain-Based Sizing CAD Tools	2006	Chair
Eric Marsman	Low-Power Embedded Processor with DSP	2007 exp.	Chair
Robert Senger	Low-Power Microprocessor Optimization in SOI	2007	Chair
Robert Franklin	Electrochemical Brain Probes	2008 exp.	Chair
Amlan Ghosh	Analog Front End for a Neural Prosthesis	2009 exp.	Chair
K. Jeff Campbell	Solid-State Chemical Sensors	2010 exp.	Chair
Nathanial Gaskin	Integrated Clocks for Systems on Chips	2010 exp.	Chair
Spencer Kellis	Monitor Processors	2010 exp.	Chair
F. Bennion Redd		2012 exp.	Chair

M.S. Committees Chaired

Name	Project Area	Graduation	(Co-)Chair
Terry C. Huang	Solid-State Ion Sensor	S 89	Chair
Tri Nguyen	Molybdenum Micromachining	F 89	Co-Chair
Richard S. Raimi	High-Temperature CMOS	S 90	Chair
Shailendra A. Save	GaAs Circuit Compiler	F 90	Chair
David Johnson	Verilog to Layout CAD Tools	S 91	Co-Chair
Phillip J. Barker	GaAs Bus Interface	S 93	Chair
Robert G. McVay	GaAs Microprocessor Testing	S 93	Chair
Thomas A. Hoy	GaAs Cell Generation	W 94	Chair
C. David Kibler	GaAs SRAM Compiler	W 94	Chair
David Putti	GaAs Load/Store Unit	S 94	Chair
Mark E. Roberts	GaAs Processor Architecture	F 94	Chair

Vince Mazzotta	High Perf. Systems	F 96	Chair
Michael J. Kelley	Dynamic CGaAs Multiply/Acc. Unit	W 97	Chair
John Wei	Low-Noise Mixed Signal Circuits	W 99	Chair
Himanshu Sharma	Low-Power Microcontroller	S 99	Chair
John Hall	Known-Good Die Testing	S 99	Chair
Michael E. Poplawski	Whole Blood Sensor Array	99	Chair
Jay Cameron	Low-Voltage Analog Design	W 00	Chair
Edward Kohler	Instruction Compression for ARM	W 00	Chair
Brian Larivee	Low-Voltage Analog Circuits	F02	Chair
Scott Pernia	Low-Voltage ADC	W03	Chair
Yunbum Jung	Cell Library Generation	W03	Chair
Daniel Burke	Electron-Relay Enabled Immunosensor	F03	Chair

Ph.D. Committees (since 1990)

Name	Project Area	Graduation Status
	EECS Electrical and Computer Engineering Division	
Jin Ji	Multichannel Intracortical Recording Array	90
Wei-Tsun Shiau	MOSFET Gate Insulator Reliability at High Temperatures	90
Steven Cho	Ultra-Sensitive Silicon Pressure-Based Microflow Sensor	91
Yibing Dong	Instrument for Engine Misfire Detection	91
Nader Najafi	Smart Sensor with Multi-Element Gas Analyzer	92
Arnold Hoogerwerf	Three-Dimensional Neural Recording Array	92
Mark Nardin	Microstimulator with Bi-Directional Telemetry	96
James Russel Webster	Integrated Capillary Electrophoresis Systems	99
Uk-Song Kang	Capacitive Humidity Sensor	99
Andrew Mason	Portable Wireless Multi-Sensor Microsystems for Environmental Monitoring	00
Pang-Cheng Hsu	Silicon Micromachined Sensors and Actuators	00
Jeong-Yeop Nahm	a-Si:H TFTs Active-Matrix for Liquid Crystal Display	00
Joohan Kim	Active Matrix Liquid Crystal Display Technology	00
Suhwan Kim	True Single-Phase Adiabatic Circuitry for High-Performance, Low-Energy VLSI	01
Piu Francis Man	Microfluidics for DNA Lab on a Chip	01
ChuanChe Wang	Contamination-Insensitive Differential Capacitive Pressure Sensors	01
Yongtaek Hong	Active-Matrix Organic Polymer Light-Emitting Display:	03
Maysam Ghovanloo	Wireless Microsystem for Neural Stimulating Microprobes	04
Pedram Mohseni	Bi-directional Wireless Multichannel Microsystems for	05

	Biomedical Recording Applications	
Gary O’Brien	Angular Rate and Angular Acceleration Sensors	04
Roy H. Olsson III	1024-Site Multiplexed Recording Array	
Mohamed Abdelmoneum	Micromechanical Wine-Glass Resonators with Semi-Automatic Post Fabrication Trimming	05

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<u>EECS Computer Science and Engineering Division</u>

Robert Masiasz	Exact Layout Minimization of Static CMOS Cells	91
Yi-Chieh Chang	Load Sharing in Distributed Real-Time Systems	91
Ayman Kayssi	Timing Macromodels for Digital Circuits	92
James Dolter	Multi-Mode Router for Real-Time Systems	93
Khushro Shahookar	Genetic Algorithm for VLSI CAD	94
Kunle Olukatun	Technology-Organization Tradeoffs in Computer Architecture	94
Rich Uhlig	Trap-Driven Memory Simulation	94
Dan Kaiser	Loop Optimization for Multi-Issue Architectures	94
Joao Paulo Silva	Algorithms for Satisfiability Problems in Comb. Circuits	95
Mickael Batek	Test-Driven Transformations in Logic Design	95
Krishnendu Chakrabarty	Test Response Compaction for Built-In Self Test	95
Michael Golden	Branch and Load Hazards in Pipelined Microprocessors	95
Stuart Daniel	Router Architecture for Point-to-Point Networks	96
Jennifer Rexford	Tailoring Routing Architectures to Performance Requirements	96
I-Cheng Chen	Branch Prediction via Data Compression	97
Chih-Chieh Lee	Cache/Branch Prediction Tradeoffs	97
Bruce Jacob	Operating System Issues in a High Performance Processor	97
James Dundas	Data Prefetch & Branch Prediction	98
V. Chandramouli	Timing Models with State Dependency	98
Hussain Al-Asaad	Verification via Testing-Simulation	98
Michael Riepe	Leaf Cell Generation	98
Hakan Yalcin	Timing Analysis	98
Edward Tom	Improving Cache Performance via Active Management	99
David Van Campenhout	Design Verification of Microprocessors	99
Hyungwon Kim	Testing and Synthesis of Systems-On-A-Chip	99
Jared Stark	Out of order Fetch, Decode, and Issue	00
Charles Lefurgy	Architecture/Software Interactions in Microprocessors	00
Brian Davis	Memory Systems Design and DRAM Interfaces	00
Lea Hwang Lee	Pseudo-Vector Machine For Embedded Applications	00
Marius Evers	Improving Branch Prediction by Understanding Branch Behavior	00
Sung-Whan Moon	Hardware Support for Quality-of-Service Guarantees in	

	Packet Switched Networks	01
Gijoon Nam	A Boolean-Based Layout Approach and Its Application to FPGA Routing	01
Avinoam Nomik Eden	Branch Prediction - Stretching the Limits	01
Victor Kravets	Constructive Multi-Level Synthesis by Way of Functional Properties	01
Hsieu-Hsin Lee	Study of Data Cache Accesses	01
Matthew A. Postiff	Compiler Optimizations for Register File Use	01
Hsien-Hsin Sean Lee	Improving Energy and Performance of Data Cache Architectures by Exploiting Memory Reference Characteristics	01
Joonhwan Yi	High-Level Function and Delay Testing for Digital Circuits	02
Alejandro Gonzalez	Resonant-tunneling diodes in high-performance digital circuit applications	02
Fadi Ahmed Aloul	Scalable Algorithms for Boolean Satisfiability enabled by Problem Structure	03
Paul Racunas	Reducing Load Latency	03
Robert Chappell	Simultaneous Subordinate Microthreading	04
Rajeev Krishna	Application-specific Processors	04
Rajiv Ravindran	Hardware/Software Techniques for Memory Power Optimizations in Embedded Processors	07

Bioengineering

Steve Freeman	Digital Signal Processing for Ultrasound Images	98

Chemistry Department

Hyoung-Sik Yim	Potentiometric Gas Sensor	93
Dong Liu	Solid-State Ion/Biosensor Arrays	94
Ravi Meruva	Gas and Ion Sensing Systems for Biomedical Applications	97
Bong Oh	Electrochemical Nitric Oxide (NO) Sensor	03
Hairong Zhang	Redox Enabled Immunosensor	07
Mark Mendenhall (UofU)	Glass Nanopore Ion-selective Electrodes	

Physics Department

Nathan Eddy	Analysis of the Top Quark Mass	98
Eugene Guillian	Top Quark Decay Kinematics	99

Professional Sketch

I have certainly enjoyed my years as a professor in the Department of Electrical Engineering and Computer Science at the University of Michigan. The foresight and efforts of those who were here before me provided a world-class solid-state laboratory and computing environment which have enabled me to be productive in research and effective in teaching. The Department had the perfect environment for me, and it also had needs which I was able to fill – there was a good impedance match. At Michigan I have found excellent role models, a stimulating intellectual atmosphere, a spirit of cooperation, and able and willing collaborators. Working in VLSI, I have one foot in electrical engineering and the other in computer science.

My industrial sabbaticals, and years working in industry before the Ph.D. give me a perspective which I believe brings relevance to my teaching. I have been pleased to hear from many former students that the courses they had with me prepared them well for their careers. My goal in teaching has been to continue to raise both the quality of my teaching (in class and with my graduate students) and the stature of our VLSI program. Seeing the VLSI graduate kernel grow from conception to fruition has been gratifying. I am happy to see our students have access to professional CAD tools in their design experience projects, and to see the core circuits and VLSI courses preparing students well to work in the world of integrated circuits. My passion for the past few years has been to simplify and provide flexibility to our undergraduate curriculum; I am pleased with the changes that have been implemented.

I have been able to continue my own Ph.D. research, explore new topics, and manage large projects; all of these have been satisfying. My solid-state liquid chemical sensors are being commercialized, and we have made important developments in neurosensors and immunosensors. My high-speed circuit work grew out of an ARO University Research Initiative project directed by Prof. George Haddad. When we received our first independent funding for high-performance microprocessor development, U of M had no history of doing such projects, and almost no other DARPA funding. This effort grew until we were considered one of only a few university groups able to conduct modern microprocessor design research. My group has contributed to technology, circuits, architecture and CAD. I have been delighted to see the demand for my graduate students and their impact on the microelectronics community. Working closely with my MEMS colleagues as one of the thrust leaders in our WIMS ERC has recently provided an exciting opportunity to leverage my activities in both sensors and SOI circuits to work on technologies which will benefit both the environment and human health.

Through service on conference executive committees, I have been able to contribute to VLSI technology and education. In the role of chairman of the MOSIS Advisory Council on Education, I led an effort to raise funds from industry to support the fabrication of integrated circuits designed in university courses throughout the U.S. The availability of fabrication has a major impact on the number of VLSI courses offered and on the quality of education received by students in those courses. Within the University, I learned a great deal serving for six years as a member of the original University of Michigan Conflict of Interest Committee. I have helped a number of College of Engineering faculty members resolve conflict of interest issues, and have made certain that precedent-setting decisions by the committee are conducive to good faculty-industry interactions. My attitude on the committee was to trust the faculty, to educate them about the issues, and to find ways to manage conflicts so that students, faculty, and the institution are both benefited and protected.

A focus of my Associate Chair and Interim Chair service has been building faculty unity. When I became Associate Chair, there was little cohesion in the Electrical Science and Engineering Division. We began to have faculty meetings, to have annual retreats, to interact on search committees and in other ways that have helped faculty to become better acquainted, and to understand the issues across the Solid- State, Optics and Radiation Labs.

I was centrally involved in defining the new EE and CE curricula, which have the advantage of much more flexibility for our students. The process of defining these undergraduate degrees served to bring EE, Systems and CSE faculty together in a positive way. I wrote a basic set of rules for department governance, which were adopted unanimously. These included provisions for faculty to have joint affiliations with the two divisions, and to belong to multiple labs; 25% of our faculty now have joint affiliations between CSE and ECE Divisions. Recruiting (students as well as faculty) has been a large part of my administrative activity. I am pleased with the new faculty who have been hired, and with the fact that we have been able to retain our faculty who have been recruited by other institutions.

I have focused on improving the reputation of EECS through interactions at the ECE Department Head's Association Annual Meetings, through sponsoring social events for UM alumni and friends at major conferences in which our faculty participate, and through publishing a Department newsletter. I have given faculty feedback on their accomplishments and performance, and have made an effort to bring a personal touch to the chair's office by writing notes of appreciation to virtually all of our faculty and contacting them personally about a variety of issues. Our social events, from the annual Faculty Recognition Dinner to retirement parties have improved significantly, creating more positive venues for social interaction. We also significantly increased EECS participation in College of Engineering functions. Faculty meetings have become department-wide forums for discussion of topics that are important to us, and they are well attended.