Curriculum Vitae — Martin Snelgrove

Professor, Department of Electronics, Carleton University
OCRI/NSERC Industrial Research Chair in High-Speed ICs

B.A.Sc., (Chemical Engineering) Toronto, 1975
M.A.Sc., (Electrical Engineering) Toronto, 1977
Ph.D., (Electrical Engineering) Toronto, 1982

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Teaching and Research Appointments

1992 (July)-present	Professor and holder of the OCRI/NSERC Industrial Research Chair in High-Speed Integrated Circuits, Department of Electronics, Carleton University, Ottawa.
1987 (July)-1992	Associate Professor, Dept. of Electrical Engineering, University of Toronto (since July 1/92: Adjunct)
1991 (Mar-April)	Visiting Professor, Oulu University, Finland
1990 (Jan - June), 1989 (Jan - June)	Resident Visitor, AT&T Bell Labs, Reading, PA.
1982 (Aug)-1987 (June)	Assistant Professor, Dept. of Electrical Engineering, University of Toronto
1982 (Jan-June)	Visiting Investigator, Instituto Nacional de Astrofisica, Optica y Electronica, Tonantzintla, Pue.Mexico.
1981	Lecturer, University of Toronto.
1980	Special Lecturer, University of Toronto.

Research Funding

Principal and others	Source, period	Title	Amount (annual)	current
Snelgrove	IBM	C*RAM	$37k US	*
Snelgrove	Rockwell	Radio	$30k US	*
Snelgrove et al.	Micronet, 93-94	Computing in RAM	33 500	
Snelgrove	OCRI/NSERC Chair 92-97	Industrial Research Chair in High-Speed Integrated Circuits	362 783	*
Snelgrove	NSERC Operating 92-95	High-Speed Integrated Circuit Design	29 400	*
Snelgrove	MOSAID Ltd., Carp. Ont.	Computing in RAM	5 000	
Snelgrove	Bell-Northern Research 92/09 and 93/09	Research in low-voltage and low-power analog/digital circuits and high-speed A/D.	40 000	*
Snelgrove	Bell-Northern Research 92	Research in high-frequency filter design.	15 000	*
Snelgrove	Bell-Northern Research 88-92	CAD for signal processing	15 000	*
Snelgrove	MICRONET Operating 90-93	Adaptive Recursive Filters and Applications	40 000	*
Snelgrove	NSERC Operating 89-92	CAD of Signal Processing Circuits and Systems	18 000	
Snelgrove, Johns, Chow	ITRC 91-93	Algorithms and Hardware for Digital Audio Applications	100 000	
Sedra, Snelgrove, Johns	ITRC 91-92	Computer-aided Design for Filters	60 000	
Sevcik, 9 others	ITRC 91-92	Parallel Applications and their Support on Multi-Processor Systems	90 000	
Snelgrove	NSERC Operating 86-89	CAD for VLSI	16 100	

Principal and others	Source, period	Title	Amount (annual) current
Snelgrove	NSERC Operating 83-86	CAD for VLSI	14 100
Snelgrove	BNR 86-88	Multiprocessor CAD	20 000
Snelgrove	NSERC/ BNR CRD-8438, 84-85	Layout Using Special-Purpose Hardware	15 900
Sedra, Snelgrove, Johns	ITRC 89-90	Automated Filter Design	80 000
Sedra, Snelgrove	ITRC 88-89	Automated Filter Design	67 500
Hamacher, 3 others	ITRC 88-89	Integrating Supercomputers into the Workstation Environment	84 000
Holt, 6 others	NSERC Strategic 86-89	HECTOR: A Large-Scale General-Purpose Multiprocessor	250 970

Publications

Journal Papers

1. Omid Shoaei and Martin Snelgrove, **"Design and Implementation of a Tunable 40MHz-70MHz $G_m - C$ Bandpass Delta-Sigma Modulator,"** IEEE T-CAS-II, to appear july 1997
2. W. Gao, M. Snelgrove and S. Kovacic, **"A 5-GHz SiGe HBT Return-to-Zero Comparator for RF A/D Conversion,"** IEEE-JSSC, v. 31 # 10, pp. 1502-1506, October 1996,
3. N.G. Tarr, R. Soreefan, T.W. MacElwee, W.M. Snelgrove and S. Bazarjani, **"A Simple Back-gated MOSFET Structure for Dynamic Threshold Control in Fully-Depleted SOI CMOS,"** Elec. Lett. v. 32, pp. 1093-1095, 6 June 1996
4. A. Shoval, W.M. Snelgrove and D.A. Johns, **"A 100Mb/s BiCMOS Adaptive Pulse-Shaping Filter,"** IEEE J. Selec. Areas Commun., vol. 13, no. 9, pp. 1692-1702 Dec. 1995
5. Stephen H. Lewis, R. Ramachandran and W. Martin Snelgrove, **"Indirect Testing of Digital-Correction Circuits in Analog-to-Digital Converters with Redundancy,"** T-CAS-II, vol. 42, no. 7 pp. 437-445 July 1995.
6. Ayal Shoval, David A. Johns and W. Martin Snelgrove, **"Comparison of DC Offset Effects in Four LMS Adaptive Algorithms,"** T-CAS-II, vol. 42, no. 3 pp. 176-185 March 1995
7. Frank W. Singor and Martin Snelgrove, **"Switched-Capacitor Bandpass Delta-Sigma A/D Modulation at 10.7MHz,"** IEEE JSSC, v. 30 # 3, pp. 184-192, March 1995.

8. Frank X.Y. Gao and W. Martin Snelgrove **"Adaptive Nonlinear Recursive State-Space Filters,"** IEEE T-CAS Transactions Brief, T-CAS-II vol. 41 # 11 pp. 760-764 November 1994
9. W. Gao and M. Snelgrove, **"Floating-gate MOS Device as an Analog Trimming Element"**, MJ v. 25 #5 pp. 353-361, August 1994.
10. A. Shoval, D.A. Johns and Martin Snelgrove, **"A Wide-Range Tunable BiCMOS Transconductor"**, MJ, v. 24, #5, pp. 555-564, Aug 1993.
11. S.A. Jantzi, M. Snelgrove and P. Ferguson Jr., **"A Fourth-order Bandpass Sigma-Delta Modulator**", IEEE JSSC, v. 28 #3, pp. 282-291, March 1993
12. Frank X.Y. Gao and W. Martin Snelgrove **"An Adaptive Backpropagation Cascade IIR Filter"**, IEEE T-CAS-II, v. 39 #9 pp. 606-610, Sept. 1992
13. Martin Snelgrove and Ayal Shoval **"A Balanced 0.9µm CMOS Transconductance-C Filter Tunable over the VHF Range"**, IEEE JSSC, v.27 #3 pp. 314-323, March 1992
14. Stephen Jantzi, Richard Schreier and Martin Snelgrove, **"Bandpass Sigma-Delta Analog-to-Digital Conversion",** IEEE T-CAS (Express Letter), v.38 #11 pp. 1406-1409, Nov. 1991
15. D.A. Johns, W.M. Snelgrove and A.S. Sedra, **"Continuous-time LMS Adaptive Recursive Filters",** IEEE T-CAS, v.38 #7 pp. 769-778., July 1991
16. D.A. Johns, W.M. Snelgrove and A.S. Sedra, **"Adaptive Recursive State-Space Filters using a Gradient-Based Algorithm",** IEEE T-CAS v. 37 #6 pp. 673-684, June 1990.
17. R. Schreier and M. Snelgrove, **"Bandpass Sigma-Delta Modulation",** Electron. Lett., v. 25, #23, pp. 1560-1561, Nov. 1989.
18. D.A. Johns, W.M. Snelgrove and A.S.Sedra, **"Orthonormal Ladder Filters",** IEEE T-CAS v. 36 #3, pp. 337-343, March 1989.
19. J.S.Rose, W.M.Snelgrove and Z.G.Vranesic, **"Parallel Standard Cell Placement Algorithms with Quality Equivalent to Simulated Annealing",** IEEE T-CAD, v. 7. #3, pp. 387-396, March 1988.
20. W. Song, K.C. Smith and W.M.Snelgrove, **"Partitioning for Pseudo-Exhaustive Testing is NP-Complete"**, Electron. Lett., vol. 23 no 20, pp. 1060-1062, Sept. 1987.
21. G.W. Roberts, W.M. Snelgrove and A.S.Sedra, **"Switched-Capacitor Realization of an Nth Order Transfer Function Using a Single Multiplexed Op-Amp"**, IEEE T-CAS, v. 34 #2, pp.140-148, Feb. 1987.
22. W.M. Snelgrove and A.S. Sedra, **"Synthesis and Analysis of State-Space Active Filters Using Intermediate Transfer Functions"**, IEEE T-CAS, v. 33 #3 pp.287-301, March 1986. (Guillemin-Cauer best paper award, 1986).
23. Wayne M. Loucks, Martin Snelgrove, and Safwat G. Zaky, **"A Vector Processor Based on One-Bit Microprocessors"**, IEEE Micro, v. 2 #1, pp. 53-62, Feb. 1982.
24. W.M. Snelgrove and A.S. Sedra, **"On State-Variable Biquads with Optimum Integrator Sensitivities"**, IEE Proc. v.128 Part G, #4, pp. 173-175, August 1981.

Patents

1. D.G. Elliott and W. M. Snelgrove **"Method and Apparatus for a Single Instruction Operating Multiple Processors on a Memory Chip"**. U.S. Patent 5546343, issued August 13 1996, filed October 1990

Journal Papers in Preparation and Review and Patents Applied for

1. Xiang Yang Gao and Martin Snelgrove **"Adaptive Linearization Schemes for Weakly Nonlinear Systems and Application to a Loudspeaker"**, submitted to T-SP
2. D.G. Elliott and W. M. Snelgrove **"Memory with a fast SIMD processor"**. Application filed October 1990 (continuing in part)

Refereed Conference Papers

1. Weinan Gao and Martin Snelgrove, **"A 950MHz Second-Order Integrated LC Bandpass ΔΣ Modulator,"** VLSI Symposium '97 Digest pp. 111-112, Kyoto, June 12-14 1997
2. Seyfi Bazarjani and Martin Snelgrove, **"A 40MHz IF Fourth-Order Double-Sampled SC Bandpass ΣΔ Modulator,"** Proc. ISCAS-97 v.1 pp. 73-76, Hong Kong, June 10-12 1997
3. Seyfi Bazarjani, Martin Snelgrove, Trevor Monson and Tom MacElwee, **"1 V Mixed-Signal Circuits in a** 0.5 μm **CMOS Technology,"** Proc. ISCAS-97 v. 3, pp. 1860-1863, Hong Kong, June 10-12 1997
4. Weinan Gao and W. Martin Snelgrove, **"A Linear Q-Enhanced Monolithic LC Filter,"** Proc. ISCAS-97 v.1 pp. 97-100, Hong Kong, June 10-12 1997
5. Weinan Gao, Omid Shoaei and W. Martin Snelgrove, **"Excess Loop Delay Effects in Continuous-Time ΣΔ Modulators and the Compensation Solution,"** Proc. ISCAS-97 v. 1 pp. 65-68, Hong Kong, June 10-12 1997
6. T.M. Le, W.M. Snelgrove and S. Panchanathan, **"Computational*RAM Implementation of MPEG-2 for real-time encoding,"** presented at SPIE Multimedia Hardware Architectures 1997, San Jose, Feb 8-14 1997
7. N.G. Tarr, R. Soreefan, T.W. MacElwee, W.M. Snelgrove and S. Bazarjani, **"A Simple Implanted Backgate MOSFET for Dynamic Threshold Control in Full Depleted SOI CMOS,"** Int'l SOI Conf., Fort Myers, Florida, Oct. 1-3 1996
8. Ashok Swaminathan, A., Martin Snelgrove, Steven Jantzi and Seyfi Bazarjani. **"A Monolithic Complex Sigma-Delta Modulator for Digital Radio,"** IEEE-CAS Region 8 Workshop, Pavia, Italy Sept. 13-14, 1996
9. H.K. Yang and Martin Snelgrove, **"Symbol Timing Recovery Using Oversampling Techniques,"** ICC-96, Dallas, June 23-27 1996
10. O. Shoaei and Martin Snelgrove, **"A Wide-Range Tunable 25MHz-110MHz BiCMOS Continuous-Time Filter,"** Proc. ISCAS-96, Atlanta, May 12-15 1996
11. H.K. Yang and Martin Snelgrove, **"High-Speed Polyphase CIC Decimation Filter,"** Proc. ISCAS-96, Atlanta, May 12-15 1996
12. T. Varelas, S. Bazarjani and Martin Snelgrove, **"A Bipolar Sampled-Data Bandpass Delta-Sigma A/D Modulator"**, Proc. CICC-96, San Diego, May 6-8 1996
13. Seyfi Bazarjani, W.M. Snelgrove, and Tom MacElwee **"A 1V Switched-Capacitor ΣΔ Modulator,"** presented at SLPE '95, San Jose, Oct 1995.
14. W. Gao, M. Snelgrove, T. Varelas, S. Kovacic and D. Harame, **"A 5-GHz SiGe HBT Return-to-Zero Comparator,"** Proc. BCTM '95 pp. 166-169, Minneapolis Oct. 2-3 1995
15. S. Bazarjani, T. MacElwee and M. Snelgrove, **"Optimizing the Natural MOSFETs in a** 0.5μm **Process for 1V Mixed-Signal Applications,"** presented at the 25th ESSDERC, The Hague, Sept. 25-27 1995

16. B. Korst-Fagundes, J. Xie and M. Snelgrove, **"Multipoint Equalization with the Condition Number,"** Proc. MWSCAS '95, Rio de Janeiro August 1995.
17. Seyfi Bazarjani and W.M. Snelgrove, **"A Fourth-Order SC Bandpass ΣΔ Modulator Designed on a Digital CMOS Process,"** Proc. MWSCAS '95, Rio de Janeiro August 1995.
18. James A. Cherry and W. Martin Snelgrove, **"Analog Filter Banks with Low Intermodulation Distortion,"** Proc. ISCAS 95, v. 2 pp. 1195-1198, Seattle, WA April 29-May 3 1995
19. Omid Shoaei and W. Martin Snelgrove, **"A Multi-feedback design for LC bandpass Delta-Sigma modulators,"** Proc. ISCAS-95, v. 1 pp. 171-174, Seattle, WA April 29-May 3 1995
20. S. Bazarjani, W. Snelgrove, **"Low Voltage SC Circuit Design with Low-Vt MOSFETs,"** Proc. ISCAS-95, v. 2 pp. 1021-1024, Seattle, WA April 29-May 3 1995
21. Seyfi S. Bazarjani, W.M. Snelgrove, N.G. Tarr and K. Howlett, **"Low Voltage SC Circuit Design Using Short-Channel MOSFET Switches,"** Proc. ASICON 94, pp. 344-347, Beijing, Oct. 94
22. Thinh M. Le, Sethuraman Panchanathan and Martin Snelgrove, **"Computational RAM Implementation of Vector Quantization for Image Compression,"** IEEE Conf. on Visual Signal Processing and Communications, Rutgers, NJ, pp. 157-162 Sept. 19-20, 1994
23. Frank W. Singor and Martin Snelgrove, **"10.7MHz Bandpass Delta-Sigma A/D Modulators,"** Proc. CICC-94, San Diego, CA, pp. 163-166, May 1-4 1994
24. S.A. Jantzi, K.W. Martin, W.M. Snelgrove and A.S. Sedra, **"A Complex Bandpass ΔΣ Converter for Digital Radio,"** Proc. ISCAS 94, London, Eng., v. 5 pp. 453-456 May 30-June 2 1994
25. O. Shoaei and M. Snelgrove, **"Optimal (Bandpass) Continuous-Time Sigma - Delta Modulator,"** Proc. ISCAS 94, London, Eng., v. 5 pp. 489-492 May 30-June 2 1994
26. A. Shoval, D.A. Johns and M. Snelgrove, **"DC Offset Performance of Four LMS Adaptive Algorithms,"** Proc. ISCAS 94, London, Eng., v. 2 pp. 409-412 May 30-June 2 1994
27. Z. Gu and M. Snelgrove, **"Analysis and Design of Adaptive Self-Trimming Technique for A/D Converters"**, Proc. ISCAS 94, London, Eng., v. 5 pp. 457-460 May 30-June 2 1994
28. Z. Gu and M. Snelgrove, **"Frequency-Domain Analysis of A/D Converter Nonlinearity"**, Proc. ISCAS 94, London, Eng., v. 5 pp. 373-376 May 30-June 2 1994
29. W. Gao and Martin Snelgrove, **"Floating Gate Charge Sharing: a Novel Circuit for Analog Trimming"**, Proc. ISCAS 94, London, Eng., v. 4 pp. 315-318 May 30-June 2 1994
30. A. Shoval, D.A. Johns and Martin Snelgrove, **"A Wide-Range Tunable BiCMOS Transconductor"**, Proc. CCVLSI '92, Halifax, Nova Scotia, pp. 81-88, Oct. 18-20 1992
31. W. Gao and Martin Snelgrove, **"Floating Gate MOS Device as an Element for Analog Trimming"**, CCVLSI '92, Halifax, Nova Scotia, pp. 147-154, Oct. 18-20 1992
32. C. Ouslis, S.C. Good, M. Snelgrove and A. Sedra, **"FiltorX: Computer-Aided Filter Design and Industry"**, CCVLSI '92, Halifax, Nova Scotia, pp. 180-187, Oct. 18-20 1992
33. E.M. Distefano and Martin Snelgrove, **"An Efficient Synchronization Mechanism for A Multi-DSP Application"**, ICSPAT '92, Cambridge MA, Nov. 2-5 1992
34. Zhiqiang Gu and Martin Snelgrove, **"Application of A Novel Self-Calibration Technique For Pipelined Multi-Stage A/D Converters"**, Proc. 35th MWSCAS, Washington DC., pp. 64-67, August 9-12, 1992

35. Zhiqiang Gu and Martin Snelgrove, **"A Novel Self-Calibrating Scheme for Video-rate Two-step A/D Converters"**, Proc. ISCAS-92, San Diego, CA, pp. 601-604, May 10-13 1992
36. C. Ouslis, M. Snelgrove and A. S. Sedra, **"Multirate Switched-capacitor Filter Design: filtorX in Action"**, Proc. ISCAS-92, San Diego, CA, 1183-1186, May 10-13 1992
37. Ayal Shoval, David A. Johns and W. Martin Snelgrove, **"Median-based Offset Cancellation Technique"**, Proc. ISCAS-92, San Diego, CA, 2033-2036, May 10-13 1992
38. S.A. Jantzi, M. Snelgrove and P. Ferguson Jr., **"A Fourth-order Bandpass Sigma-Delta Modulator,"** Proc. CICC'92, Boston, pp. 16.5.1-4, May 3-6 1992
39. D.G. Elliott, W.M. Snelgrove and M. Stumm, **"Computational RAM: A Memory-SIMD Hybrid and its Application to DSP"**, Proc. CICC'92, Boston, pp. 30.6.1-4, May 3-6 1992
40. Stephen Jantzi, Richard Schreier and Martin Snelgrove, **"A Bandpass SD Convertor for a Digital AM Receiver"**, Intl Conf. on A/D and D/A conversion, Swansea, pp. 75-80, Sept. 1991.
41. Chris Ouslis, Martin Snelgrove and Adel S. Sedra, **"A filter designer's filter design aid: filtorX"**, ISCAS'91, Singapore, pp. 376-379, June 11-14, 1991,
42. Richard Schreier and Martin Snelgrove, **"Stability in Sigma-Delta Modulators"**, ICIAM'91, Washington, D.C., July 8-12 1991
43. X.Y. Gao and Martin Snelgrove, **"An Efficient Adaptive Cascade IIR Filter"**, ISCAS'91, Singapore, pp. 444-447, June 11-14 1991.
44. Richard Schreier and Martin Snelgrove **"ΣΔ Modulation is a Mapping"**, ISCAS'91, Singapore, pp. 2415-2418, June 11-14, 1991.
45. Richard Schreier and Martin Snelgrove, **"Stability in a General ΣΔ Modulator"**, ICASSP'91, Toronto, pp. 1769-1772, May 14-17, 1991.
46. X.Y. Gao and W.M. Snelgrove, **"Adaptive Linearization of a Loudspeaker"**, ICASSP'91, Toronto, pp. 3589-3592, May 14-17, 1991.
47. Martin Snelgrove and Ayal Shoval, **"A CMOS Biquad at VHF"**, CICC '91, San Diego, pp. 9.2.1-9.2.6, May 13, 1991.
48. Duncan G. Elliott and W. Martin Snelgrove, **"C-RAM: Memory with a Fast SIMD Processor"**, CCVLSI '90, Ottawa, pp. 3.3.1-3.3.6, Oct. 21-23, 1990.
49. C. Ouslis, M. Snelgrove and A.S. Sedra, **"FiltorX: An Interactive Design Language for Filters"**, Advances in Electrical Engineering Software, First Int'l. Conf. on Electrical Engineering Analysis and Design, Lowell, Massachusetts, Springer Verlag, pp. 227-240, Aug. 1990.
50. X.Y. Gao and W.M. Snelgrove, **"Adaptive Linearization Schemes for Weakly Nonlinear Systems Using Adaptive Linear and Nonlinear FIR Filters"**, 33rd MWSCAS, pp. 3122-3125, Aug. 1990.
51. D.A. Johns, W.M. Snelgrove and A.S. Sedra, **"Performance Improvements for Fine-Tuned Adaptive Recursive Filters"**, ISCAS'90, New Orleans, pp. 1951-1954, May 1990.
52. R. Schreier and W.M. Snelgrove, **"Decimation for Bandpass Sigma-Delta Analog-to-Digital Conversion"**, ISCAS'90, New Orleans pp.1801-1804, May 1990.
53. X.Y. Gao and W.M. Snelgrove, **"Adaptive Nonlinear State-Space Filters"**, ISCAS'90, New Orleans, pp. 3122-3125, May 1990.

54. S. Zhou, T. McInerny, M. Snelgrove, M. Stumm, D. Wortman, **"Shared Virtual Memory: A Simple Model for Implementing Distributed Applications",** CCECE, Montreal, pp. 716-719, Sept. 1989.
55. D.A. Johns, W.M.Snelgrove, A.S. Sedra, **"DC Offsets in Analogue Adaptive IIR Filters"**, ECCTD'89, Brighton, pp. 137-141, Sept. 1989.
56. D.A.Johns, W.M. Snelgrove A.S.Sedra, **"Nonideal Effects in Analog Adaptive IIR Filters",** MWSCAS, Champaign-Urbana IL, Aug. 1989.
57. E.M DiStefano and W.M. Snelgrove, **"A Multi-DSP Board for a Parallel Computer using a Packet-Switched Pipelined Bus",** IEEE Pacific Rim Conf. on Communication, Computers and Signal Processing, Victoria, B.C., pp. 156-160, June 1989.
58. D.A. Johns, W.M. Snelgrove and A.S. Sedra, **"Continuous-Time Analog Adaptive Recursive Filters"**, ISCAS'89, Portland, May 1989.
59. X.Y. Gao, W.M. Snelgrove and D.A. Johns, **"Nonlinear IIR Adaptive Filtering Using a Bilinear Structure"**, ISCAS'89 Portland, May 1989
60. D.A. Johns, W.M. Snelgrove and A.S. Sedra, **"State-Space Adaptive Recursive Filters",** ISCAS'88, Helsinki, pp. 2153-2156, June 1988.
61. E.P. Nowicki, W.M. Snelgrove and A.S. Sedra, **"Circuit and Layout of a State Multiplexed Switched-Capacitor Filter"**, CCVLSI, Winnipeg, pp. 43-48, Oct. 25-27 1987.
62. John Kitamura, David Blythe and Martin Snelgrove, **"DSPs for Music at Toronto"**, 83rd Convention of the AES, New York, Oct. 1987.
63. D.R. Galloway, D.R. Blythe and M. Snelgrove, **"Graphical CAD of Digital Filters"**, Prod. IEEE Pacific Rim Conf, Victoria, B.C., pp. 303-305, June 1987.
64. G.V. Eaton, D.G. Nairn, W.M. Snelgrove and A.S. Sedra, **"SICOMP: A Silicon Compiler for Switched-Capacitor Filters"**, ISCAS'87, Philadelphia, pp. 321-324, May 1987.
65. G.W. Roberts, W.M. Snelgrove, and A.S. Sedra, **"SC Circuit Simulations of State-Space Formulations Derived from LC Ladder Network Prototypes"**, ISCAS'87, Philadelphia, pp. 722-725, May 1987.
66. J.S. Rose, D.R.Blythe, W.M.Snelgrove, Z.G. Vranesic, **"Fast, High Quality VLSI Placement on an MIMD Multiprocessor"**, ICCAD, Santa Clara, Nov 10-13 1986.
67. J.J. Culbert and W.M.Snelgrove, **"A Continuous-Time 5 MHz Biquad Filter in BNR CMOS-1B"**, CCVLSI, Montreal, pp. 247-252., Oct 27-28 1986
68. D. Rosati and W.M. Snelgrove, **"A Knowledge Base for a VLSI Design Environment"**, CCVLSI, Montreal, pp. 295-300, Oct 27-28 1986.
69. G.V. Eaton, D.G. Nairn, W.M. Snelgrove and A.S. Sedra, **"SICOMP: A Silicon Compiler for Switched-Capacitor Filters"**, CCVLSI, Montreal, pp. 349-352, Oct 27-28 1986.
70. D.R. Blythe, J. Kitamura, D.R. Galloway and W.M. Snelgrove, **"Virtual Patchcords for the Katosizer"**, ICMC, Amsterdam, Oct. 20-22 1986, pp. 359-363.
71. T.H. Yeap, T.H. Szymanski,W.M Snelgrove and S.G. Zaky, **"An Automated Diagnostician for Hardware Faults in Digital Systems"**, IASTED Intl Conf. Applied Simulation and Modelling, Vancouver, B.C., pp.510-514,June 4-6, 1986.
72. Qingli Liu, W.M. Snelgrove and A.S.Sedra,**"Switched-Capacitor Implementation of Complex Filters"**, ISCAS'86, San Jose, pp. 1121-1124, May 5-7 1986.
73. G.W. Roberts, W.M. Snelgrove and A.S.Sedra, **"Switched-Capacitor State-Space Filters Using Intermediate-Function Synthesis"**, ISCAS'86, San Jose, pp. 614-617, May 5-7 1986.

74. J.S.Rose,W.M.Snelgrove and Z.G.Vranesic, **"ALTOR: An automatic Standard-Cell Layout Program"**, CCVLSI, Toronto, pp 169-173, Nov. 1985.(joint winner, Best Paper Award).
75. T.H. Szymanski and W.M. Snelgrove, **"A Semantic Data Model for VLSI"**, CCVLSI, Toronto, pp.113-116, Nov 1985.
76. L.J. McNaughton, V.C. Hamacher and W.M.Snelgrove, **"A Multiprocessor Fault Simulator for VLSI Circuits"**, CCVLSI, Toronto, pp. 93-96, Nov. 1985.
77. T.H. Yeap, W.M. Loucks, W.M. Snelgrove and S.G. Zaky, **"Implementing the VASTOR Architecture using a VLSI Array of 1-bit Processors"**, ICCD, Port Chester, pp. 494-499, Oct. 1985.
78. J. Kitamura, W. Buxton and W.M. Snelgrove, **"Music Synthesis by Simulation using a General-Purpose Signal Processing System"**, ICMC, Burnaby, pp. 155-158, Aug. 1985.
79. G.W. Roberts, W.M. Snelgrove and A.S. Sedra, **"Switched-Capacitor Realization of an N-th Order Transfer Function Using a Multiplexed Op-Amp"**, MWSCAS, pp. 621-624, Aug. 1985.
80. Adel S. Sedra, W.M. Snelgrove and R. Allen, **"Complex Analog Bandpass Filters Designed by Linearly Shifting Real Low-Pass Prototypes"**, ISCAS'85, Tokyo 1985.
81. T.H. Yeap, W.H. Lo, W.M. Snelgrove, W.M. Loucks and S.G. Zaky, **"A VLSI Implementation of a 1-bit Processing Element for the VASTOR Array Processor"**, CCVLSI, Waterloo, pp. 18-21, Oct. 1983.
82. W.M. Snelgrove and A.S. Sedra, **"A Novel Approach to Transfer-Function Error Modelling with Application to Filter Approximation"**, ISCAS'82, Rome, May 1982, pp. 1127-1131.
83. W.M. Snelgrove and A.S. Sedra, **"State-Space Synthesis of Complex Analog Filters",** ECCTD'81, Den Haag, pp. 420-424, Aug. 1981.
84. W.M. Loucks, W.M. Snelgrove and S.G. Zaky, **"VASTOR: A Microprocessor Based Associative Vector Processor for Small Scale Applications"**, ICPP, August 1980,.pp. 37-46.
85. W.M. Snelgrove and A. Sedra, **"A Novel Synthesis Method for State-Space Active Networks"**, MWSCAS, Toledo OH, pp. 196-200, Aug. 1980.
86. W.M. Snelgrove and A. Sedra, **"Optimization of Dynamic Range in Cascade Active Filters"**, ISCAS'78, New York, pp. 151-155, May 1978.

Submitted to refereed conferences

Workshop Presentations

1. Robert N. McKenzie, W. Martin Snelgrove and Duncan G. Elliott, **"A 1024 Processing-Element Computational RAM,"** ITRC/TRIO Workshop, Kingston, May 1997
2. Duncan Elliott, Martin Snelgrove, Christian Cojocaru and Michael Stumm, **"A PetaOp/s is Currently Feasible by Computing in RAM,"** presented at the PetaFLOPS Frontier Workshop, IEEE Frontiers Symp., McLean VA, Feb. 6 1995
3. Martin Snelgrove, **"A/D Architectures for Wireless,"** IEEE Solid State Circuits & Technology Committee Workshop on Design Challenges for Wireless ICs, Toronto, Aug. 25 1994
4. S. Bazarjani and M. Snelgrove, **"Single-battery mixed Analog/Digital Signal Processing with Natural Transistors,"** Int'l Workshop on Low-Power Design, Napa Valley, CA, April 24-27 1994

5. Ayal Shoval, W.M. Snelgrove and D.A. Johns, **"A 4.5 Octave Tunable BiCMOS Biquad at VHF to Demonstrate an Adaptive Analog Pulse-Shaping Filter"**, Technical Exposition of the 1993 CMC Workshop, Queen's University, May 1993. (Honourable Mention in the CSDA competition)
6. W.M. Snelgrove, **"Silicon Compilation of Switched-C Filters"**, presented in the Presymposium Workshop on Expert System Tools for Analog Signal Processing Applications, ISCAS 1988, Helsinki, June 1988.

Invited Conference Papers

1. Duncan Elliott, Martin Snelgrove and Christian Cojocaru, **"Computing RAMs for Media Processing,"** SPIE Multimedia Hardware Architectures 1997, San Jose, Feb 8-14 1997
2. Martin Snelgrove and Duncan Elliott, **"(Do Some) Computing in RAM,"** presented at the 1995 International Symposium on Future Information-Processing Technologies, Haikko, Finland Sept. 1995
3. Martin Snelgrove, **"Does Engineering Belong in the Modern University?,"** 46th annual Carleton University Spring Conference, May 1995.
4. Frank X.Y. Gao and W. Martin Snelgrove **"Adaptive Linearization of a Loudspeaker"**, presented at the 93rd AES Convention, San Francisco, Oct 1-4, 1992
5. Martin Snelgrove, **"Digital Signal Processing in Audio"**, presented (in Spanish) at the 5º Simposium de Ingeniería Electrónica, Guadalajara, Mexico, May 20-23 1992
6. W.M. Snelgrove, **"Zen and the Art of Analog Design Automation",** panel position paper, Proc. IFIP 11th World Computer Congress, San Francisco, Aug.1989, p. 914.
7. Martin Snelgrove, **"Digital Signal Processing in Audio",** AES 7th Int'l Conf. on Audio in Digital Times, Toronto, paper 6A, May 1989.

Chapters in Books

1. S. Jantzi, R. Schreier and M. Snelgrove, **"The Design of Bandpass Delta-Sigma ADCs,"** chapter in *Delta-Sigma Data Converters*, IEEE Press, editors. S.R. Norsworthy, R. Schreier and G.C. Temes.
2. Martin Snelgrove, **"Push-Pull Amplifiers"**, article in *McGraw-Hill Encyclopaedia of Science and Technology*, 8th Ed., to appear.
3. Martin Snelgrove, **"Oscillators"** and **"Negative Resistance Circuits"**, articles in *McGraw-Hill Encyclopaedia of Science and Technology*, 7th Ed.
4. A.S. Sedra and Martin Snelgrove, **"Switched Capacitor Filter Synthesis"**, chapter in *Design of MOS VLSI Circuits for Telecommunications*, 2nd Ed., editors Y. Tsividis and J. Franca, Prentice-Hall 1993.
5. W. Martin Snelgrove, **"Silicon Compiler Technology for SC Filters"**, chapter in *Introduction to Analog VLSI Design Automation,* edited by M. Ismail and J. Franca, Kluwer Academic Publishers, pp. 151-162, 1990.

Acronyms:

AES	Audio Engineering Society;
ASICON	International Conference on Application-Specific Integrated Circuits;
BCTM	Bipolar Circuits and Technology Meeting;
CCECE	Canadian Conference on Electrical and Computer Engineering;
CCVLSI	Canadian Conference on Very Large Scale Integration;
CICC	Custom Integrated Circuits Conference;
CMC	Canadian Microelectronics Corporation;

CSDA	Canadian Semiconductor Design Association;
ESSDERC	European Solid-State Device Research Conference;
ICASSP	International Conference on Acoustics, Speech and Signal Processing;
ICCAD	International Conference on Computer-Aided Design;
ICCD	International Conference on Computer Design;
ICIAM	International Conference on Industrial and Applied Mathematics;
ICMC	International Computer Music Conference;
ICPP	International Conference on Parallel Processing;
ICSPAT	International Conference on Signal Processing Applications and Technology;
IFIP	International Federation for Information Processing;
ISCAS	International Symposium on Circuits and Systems;
JSSC	Journal of Solid-State Circuits;
MJ	Elsevier Microelectronics Journal;
MWSCAS	Midwest Symposium on Circuits and Systems;
SLPE	Symposium on Low-Power Electronics;
T-CAD	Transactions on Computer-Aided Design;
T-CAS	Transactions on Circuits and Systems (T-CAS-I and -II since 1992);
T-SP	Transactions on Signal Processing.

Graduate Theses Supervised and Co-supervised

Doctoral

1. S. Bazarjani, **"Mixed Analog-Digital Design Considerations in Deep Submicron CMOS Technologies,"** Ph.D., Carleton, 1996
2. O. Shoaei, **"Continuous-Time Delta-Sigma A/D Converters for High Speed Applications"**, Ph.D., Carleton 1995
3. A. Shoval, **"Analog Adaptive Filtering Techniques for High-Speed Data Communications"**, Ph.D., Toronto 1995
4. X.Y. Gao, **"Adaptive Linear and Nonlinear Filters"**, Ph.D., Toronto 1992
5. R. Schreier, **"Noise-Shaped Coding"**, Ph.D., Toronto 1991
6. D.A. Johns, **"Analog and Digital State-Space Adaptive IIR Filters",** Ph.D., Toronto 1989.
7. T.H. Szymanski, **"Multiprocessor Interconnection Networks"**, Ph.D., Toronto 1988.
8. J.S. Rose **"Fast, High Quality VLSI Placement on an MIMD Multiprocessor"**, Ph.D., Toronto 1986.

Doctoral students: summary data

In Progress: 5 **Last three years**: **3** **Lifetime: 8**

Masters

1. Ashok Swaminathan, **"A Single-IF Receiver Architecture using a Complex Sigma-Delta Modulator,"** Carleton 1997
2. J.M. Patenaude, **"A Methodology for Analog Circuit Design and Knowledge Transfer"**, M.Eng., Carleton, 1996
3. B. Korst Fagundes, **"Acoustical Equalization at Multiple Listening Positions"**, M.Eng., Carleton, 1996
4. C. D. Cojocaru, **"Computational RAM: Implementation and Bit-Parallel Architecture"**, M.Eng., Carleton, 1995

5. J. A. Cherry, **"Distortion Analysis of Weakly Nonlinear Filters using Volterra Series"**, M.Eng., Carleton, 1994
6. F. W. Singor, **"High-Frequency Bandpass Delta-Sigma Analog-to-Digital Conversion"**, M.A.Sc., Toronto, 1994
7. Z. Gu, **"Self-Calibrated High-Speed A/D Converters: Analysis and Design"**, M.A.Sc., Toronto, 1993
8. W. Gao, **"Analog Trimming Using Floating Gate Devices"**, M.A.Sc., Toronto, 1992
9. E. Distefano, **"A Synchronization Mechanism for Audio Digital Signal Processing Applications"**, M.A.Sc. Toronto 1992
10. S. Jantzi, **"Bandpass Sigma-Delta Analog-to-Digital Conversion",** M.A.Sc., Toronto, 1992
11. A. Shoval, **"Median-Based Offset Cancellation Circuits for Integrated Analog Filters",** M.A.Sc., Toronto, 1991.
12. S. Jundler, **"An Electronic Pacemaker for the Electrical Control Activity of the Stomach"**, M.A.Sc., Toronto, 1991.
13. R. Lansdale, **"Texture Mapping and Resampling for Computer Graphics"**, M.A.Sc., Toronto, 1991.
14. C. Sommerfeldt, **"Optimal Hypertorus Configurations for Wafer Scale Multiprocessor Interconnection Networks"**, M.A.Sc., Toronto, 1990.
15. M. Moraes, **"A Hierarchical VLSI Design Rule Checker on an MIMD Multiprocessor",** M.A.Sc., Toronto, 1990.
16. A. Munshi, **"Multi-Loudspeaker Multi-Point Room Equalization"**, M.A.Sc., Toronto, 1990.
17. M. Mukhopadhyay, **"Design & Implementation of a Global Ring for Hector"**, M.A.Sc., Toronto, 1990.
18. A. Eivin, **"Synchronous Circuit Verifier (SCV) - an Artificial Intelligence Approach to Interactive Incremental Verification of Sequential Circuits"**, M.A.Sc., Toronto, 1989.
19. I.M. Osman, **"Application of Transconductance -C Technology in Ultrasound Imaging Systems",** M.A.Sc., Toronto, 1989.
20. Wenyi Song, **"Test Generation for Static Combination Logic Circuits: Analyses Algorithms",** M.A.Sc., Toronto, 1988
21. D.G. Elliott, **"Circuit Routing with Iterative Refinement"**, M.A.Sc., Toronto, 1988.
22. Frederick Gohh, **"CMOS Current Conveyors"**, M.A.Sc., Toronto, 1988.
23. Jeffrey Culbert, **"On Transconductance-C Filters"**, M.A.Sc., Toronto, 1988.
24. E.P. Nowicki, **"Matrix Switched-Capacitor Filters"**, M.A.Sc., Toronto, 1987.
25. R. Bicevskis, **"Complex-Valued Phase Locked Loops"**, M.A.Sc., Toronto, 1986.
26. L.J. McNaughton, **"Fault Simulation on Multiprocessors"**, M.A.Sc., Toronto, 1986.
27. J. Kitamura, **"A General Purpose Signal Processor for Music Synthesis"**, M.A.Sc., Toronto, 1986.
28. G.W. Roberts, **"Switched-Capacitor State Space Filters"**, M.A.Sc., Toronto, 1985.
29. R. Schreier, **"Transfer Function Design",** M.A.Sc., Toronto, 1985.
30. Qingli Liu, **"Switched-Capacitor Complex Filters"**, M.A.Sc., Toronto, 1985.

31. R.H. Allen, **"Complex Analog Filters Obtained From Shifted Lowpass Prototypes"**, M.A.Sc., Toronto, 1985.
32. W.H. Lo, **"VASTOR Controller and its Programming Environment"**, M.A.Sc., Toronto, 1984.
33. T.H. Yeap, **"Design of a VASTOR Processing Element Suitable for VLSI Layout"**, M.A.Sc., Toronto, 1984.
34. C.H. McQueen, **"A Data Structure for VLSI Layout"**, M.A.Sc., Toronto, 1984.

Masters students: summary data

In progress: 8 **Last three years: 6** **Lifetime: 34**

Collaborations

Company	Contact	Nature of collaboration; Evidence of technology transfer.
Adamson System Engineering (Ajax, Ont.)	Brock Adamson	Consulting and co-development in DSP architectures, filter design, DSP algorithms. Student Fagundes visiting for four months in 1994.
Advanced Fiber-Optic Technology Corp, Toronto	Erwin Weinberger	Precision optoelectronic instrumentation, using a "zero-IF" receiver structure
Analog Devices, Boston	Paul Ferguson	Analog/digital converter research
AT&T Bell Labs (Pennsylvania)	T.R. Viswanathan	Sabbatical research: low-voltage oscillator design; video A/D; sigma-delta data converters
Nortel	Peter Schvan	High-performance data-communications circuits. Students Shoval and Singor completed research internships; Bazarjani is on research leave from BNR; Gao and Shoaei will complete IC designs in 1994; research associate Varelas is located at NT.
Communications Research Centre, Kanata, Ont.	Valek Szwarc	(also involved: David Nairn, Queen's University). A/D strategy for digital radio
Crosfield (Mississauga)	Barry Batchelor	Complex filter design for facsimile datacom
Ford Motor (Michigan)	Henry Blind	Signal processing for automotive electronics
Goring-Kerr	Dino Rosati	Adaptive filtering for ultrasensitive metal detectors.
Innovations Foundation, Univ. of Toronto	Don Urquhart	Marketing filter design software. Copies sold to about 20 companies, and distributed free to a similar number of universities.
Mitel	John Miller	Codec chip designed using our advanced filter approximator. Short course and consulting on delta-sigma conversion.
MOSAID, Carp, Ont.	Peter Gillingham	"Smart memory" design.
Novatel	Andy Sendyk	Several visits and discussions on novel A/D converters for digital radio

Training of Highly Qualified Personnel

Name	Level	Present Position
Seyfi Bazarjani	Ph.D.	Design Engineer, Qualcomm, San Diego
Omid Shoaei	Ph.D.	MTS, Lucent, Allentown PA
Ayal Shoval	Ph.D.	MTS, Lucent, Allentown PA
Xiang-Yang (Frank) Gao	Ph.D.	President, Gao Research and Consulting Ltd.
Richard Schreier	Ph.D.	Assistant Professor, Oregon State U.
David Johns	Ph.D.	Associate Professor, U. of Toronto
Ted Szymanski	Ph.D.	Associate Professor, McGill U.
Jonathan Rose	Ph.D.	Associate Professor, U. of Toronto
Ashok Swaminathan	M.Eng.	Ph.D. Candidate at Carleton
Jean-Marc Patenaude	M.Eng.	Product Manager, LSI Logic, Milpitas
Bruno Korst Fagundes	M.Eng.	Engineer, Nortel, Calgary
James Cherry	M.Eng.	Ph.D. candidate at Carleton
Christian Cojocaru	M.Eng.	Engineer, Philsar, Ottawa
Frank Singor	M.A.Sc.	Engineer, Maxim, Sunnyvale
Zhiqiang “Garry” Gu	M.A.Sc.	Engineer, BNR Ottawa
Weinan Gao	M.A.Sc.	Ph.D. candidate at Carleton
Stephen Jantzi	M.A.Sc.	Ph.D. candidate at Toronto
Sam Jundler	M.A.Sc.	Private design consulting
Robert Lansdale	M.A.Sc.	Founder, Okino Computer Graphics
Mark Moraes	M.A.Sc.	Systems analyst, D.E. Shaw Ltd., NY
Anees Munshi	M.A.Sc.	Ph.D. candidate at Toronto
Maitreya Mukhopadhyay	M.A.Sc.	Ph.D. candidate at Waterloo
Arkady Eivin	M.A.Sc.	Private software consulting
Ismail Osman	M.A.Sc.	Instrumentation engineer at Ford, Markham
Wenyi Song	M.A.Sc.	Engineer at Mitel

Name	Level	Present Position
Duncan Elliott	M.A.Sc.	Assistant Professor at U of Alberta
Fred Gohh	M.A.Sc.	ASIC design at Theoretix, Toronto.
Jeff Culbert	M.A.Sc.	software engineer at Kerr-Vayne, Brampton
Rob Bicevskis	M.A.Sc.	Head of Desktop Graphics, ATI, Toronto
Larry McNaughton	M.A.Sc.	Engineer at BNR.
John Kitamura	M.A.Sc.	Multimedia software group leader, ATI
Gordon Roberts	M.A.Sc.	Associate Professor, McGill
Qingli Liu	M.A.Sc.	Design Engineer, Novatel, Calgary
Tet Yeap	M.A.Sc.	Associate Professor, Ottawa U.
Catherine Gebotys (née McQueen)	M.A.Sc.	Assistant Professor, U. Waterloo

Professional Activities

95-96	Associate Editor, IEEE Trans. Circuits and Systems part II
93-96	IEEE Circuits and Systems Society Awards Committee member
92-93	Programme committee member (area co-chair) for ISCAS-93
92	Programme committee member for CCVLSI-92
89-92	University of Toronto representative, Canadian Microelectronics Corporation Technical Advisory Committee. (chair 91/92)
86-89	Director, Electrical Engineering Consociates Limited.
86-88	Director, Designing Aids for Disabled Adults.
83-88	Student Counsellor, IEEE University of Toronto Student Branch

Teaching

Subject	Level	Last taught	Notes
Circuit Theory	Second-year Undergraduate	1995	Course Coordinator for 3 sections
Analog electronics	Second-year undergraduate	1989	
Analog electronics	Third-year undergraduate	1990	Developed new labs
Analog electronics	Fourth-year undergraduate	1996	From text in development. Developed new labs.
Analog electronics	First-level graduate	1990	
Analog electronics	Second-level graduate	1993/4	From text in development. Also taught in Oulu, Finland
Analog electronics	Continuing education	1984	
Filter theory and design	Fourth-year undergraduate/first-level graduate	1985	

Subject	Level	Last taught	Notes
VLSI	First-level graduate	1996	Layout expertise from Dan Clein of MOSAID
Filter theory and design	Second-level graduate	1983	
Switched-capacitor circuits	Second-level graduate	1987	Taught in Beijing, China
Semiconductor Memory Design	Second-level graduate	1996	Supported by MOSAID
Computer-aided design	First-level graduate	1990	
Digital signal processing	continuing education	1988	Two-day intensive format, for IEEE and for Ford Motor Co.
B.A.Sc./ B.Eng. theses	fourth year undergraduate	1993	Approximately six per year.

Honours and Awards

1993	Honourable Mention, CSDA award at the 1993 CMC Workshop
1986	Guillemin-Cauer Award for best paper in the IEEE Transactions on Circuits and Systems.
1985	CCVLSI Best Paper award (joint)
1989/90, 1990/91	University of Toronto Electrical Club award “for exceptional teaching”. Selected by third-year class
1988/89	University of Toronto Electrical Engineering Teaching Award, from the Electrical Engineering Club, for “devotion to and distinction in excellent undergraduate teaching”. Selected by third-year class.

Administration

1996	Academic Planning and Core committees, Carleton Engineering
1991	Three-year performance review, for two assistant professors, Toronto
1990	Three-year performance review, for three assistant professors, Toronto
1988	Group Chair, Electronics Group, Toronto
1986	Computer Engineering Task Force, Toronto
1986-87	Member, search committee for new Electronics Group staff, Toronto
1985	Committee to set up Centre for Computer Integrated Engineering, Toronto
1984-	Member, Electrical Engineering Advisory Committee on Computing, Toronto
1982-85	Member, Engineering Computer Facility Advisory Committee, Toronto

Sabbatical and Other Leaves taken

January 1 - June 30, 1991, 1992	Partial research leave: working on textbook for analog VLSI. Based at BNR Ottawa in ‘92.

January 1 - June 30, 1990 and 1989	Sabbatical, AT&T Bell Labs, Reading, PA. Working with T.R. Viswanathan's group in analog CMOS design.