

**Faculty of Engineering****Engineering Mathematics and Internetworking**

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# CURRICULUM VITAE WILLIAM J. PHILLIPS

## BIOGRAPHICAL DATA

### Present Position:

Professor and Head  
Department of Engineering Mathematics  
Dalhousie University  
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### Place of Birth:

Kingston, Ontario, Canada.

### Date of Birth:

August 29, 1949.

### Citizenship:

Canadian.

### Marital Status:

Married.

### Children:

Two.

## EDUCATION

1978

Ph.D. in Mathematics, University of British Columbia.

1972

M.Sc. in Mathematics, Queen's University at Kingston.

1971

B.Sc. in Mathematics and Engineering, Queen's University at Kingston. This is an accredited Engineering program which is unique in Canada.

## EMPLOYMENT HISTORY

1997-

Professor, Department of Engineering Mathematics, Dalhousie University.

1994-1997

Professor, Department of Applied Mathematics, TUNS.

1988-94

Associate Professor, Department of Applied Mathematics, TUNS.

1983-88

Assistant Professor, Department of Applied Mathematics, TUNS.

1982-83

Assistant Professor (contractually limited appointment), Department of Mathematics and Computing Science, Saint Mary's University.

1980-82

Post Doctoral Fellow, Department of Mathematics, Statistics and Computing Science, Dalhousie University.

1979-80

Research Associate, Department of Mathematics, Queen's University.

1978-79

Assistant Professor (contractually limited appointment), Department of Mathematics University Guelph.

## ADMINISTRATIVE ACTIVITIES

1997-

Head of the Department of Engineering Mathematics.

1997-2000

Member of the Dalhousie Senate

1996-

Member of the Planning Committee of Senate.

1993-

Member of the Steering Committee of the Faculty of Engineering.

1993-94

Member of the Search Committee for the Director of Computer Science.

1992-

Chairman of the PC Infrastructure Committee. This is a committee reporting to the Dean of Engineering. The major accomplishment of the committee has been to set up the Engineering Novell network in C300 (budget: \$120,000), the third floor B-wing alcove ( budget: \$80,000) and D240 (budget: \$80,000).

1992-94

Chairman of the Steering Committee of Senate. Responsible for setting the agenda of Senate meetings, routing items to the proper committees and generally expediting the business of Senate. This position initially required a great deal of work as we had did not have a Secretary of Senate when I took over as Chairman and for the first year I had to fill the role that the Secretary of Senate now plays in the Steering Committee.

1991- 1997

Head of the Department of Applied Mathematics.

1989-

Member of the Undergraduate Studies Committee of the Faculty of Engineering.

1990-91

Acting Head of the Department of Applied Mathematics.

1990-91

Meeting Chairman of the Faculty of Engineering. Responsible for ensuring business meetings were ran efficiently and effectively.

1990-91

Recording Secretary of the Faculty of Engineering.

1988-91

Member of the Graduate program committee of the Faculty of Engineering.

1985-87

Chairman of the Associated University Visit Committee. This committee reports to the Dean and is responsible for organizing the annual visit by students from the Associated Universities.

## PROFESSIONAL ACTIVITIES

Member of the Canadian Mathematical Society

Member of the American Mathematical Society

Examiner for the Association of Professional Engineers of Nova Scotia. Duties consist of setting and administering confirmatory examinations in various mathematical areas. These examinations are part of a program offered by the Canadian Council of Professional Engineers through its provincial organizations to enable a person to enter the profession without completing a degree in an accredited university program.

1996-

Treasurer of the TUNS Faculty Association.

1994-

Member of the Mathematics Subcommittee of the Atlantic Provinces Council on the Sciences.

1990-92

Secretary of the Mathematics Subcommittee of the Atlantic Provinces Council on the Sciences. Duties consisted of acting as recording secretary for meetings.

1990

Member of the Organizing Committee for the Canadian Mathematical Society Summer Meeting, Dalhousie University.

1990-93

Treasurer of the TUNS Faculty Association.

1990-

CAUT Defense Fund Trustee for the TUNS Faculty Association. Responsible for representing TUNSFA's point of view at the Annual Meeting.

1989

Attended a Course on Real Time Operating Systems given by Intel, College Park Maryland.

1989-92

Treasurer of the TUNS Faculty Club.

1988-89

Member of the Executive of the TUNS Faculty Association.

1987-89

Secretary of the TUNS Faculty Club.

1986-88

Secretary of the TUNS Faculty Association.

1986-87

President of the TUNS Faculty Club.

1984-86

Treasurer of the TUNS Faculty Association.

1984-86

CAUT Defense Fund Trustee for the TUNS Faculty Association. Responsible for representing TUNSFA's point of view at the Annual Meeting.

1985-86

Vice President of the TUNS Faculty Club.

1983-84

Member of the Organizing Committee for the 1984 IEEE International Conference on Systems, Man and Cybernetics, Halifax.

## RESEARCH ACTIVITIES

### Current Activities and Collaborations

My main area of research is the applications of Numerical Linear Algebra in Digital Signal Processing (DSP). In this area I am collaborating with Dr. Robertson and Dr. Ilow in Electrical and Computer Engineering, Dalhousie University and Dr. Jost in Computer Science, Dalhousie University. Our research program is aimed at the development and efficient implementation of DSP algorithms. The work ranges over algorithm development, analysis, efficient implementation, and architectural development. We combine our experience in applied math, hardware and architectures, digital signal processing and VLSI to address specific problems. Our backgrounds are complementary allowing us to address the entire spectrum from algorithms to digital and VLSI implementations.

The architectures we work on are for systems, that is they incorporate a number of architectural modules. This work has lead us to VLSI research in the automation of the entire design process from algorithms to silicon. We received an NSERC strategic grant (\$336,000 over three years: 1988-91) to investigate the automation of the design process.

We received an NSERC Strategic Grant (\$172,000 over three years: 1995-98) in the area of Digital Signal Processing.

Work in the area of VLSI design has also been supported by periodic Equipment and Software Loans from the Canadian Microelectronics Corporation totaling more than \$,1,000,000 since 1988.

A secondary area of research is information retrieval. I have collaborated with Dr. M. Shepherd of Dalhousie University and with Dr. K. MacLeod of St. Mary's University in this area.

### Grants and Contracts Awarded

1997-2000

NSERC (Commun. Computers & Components Committee) individual operating grant: \$14,000 per year.

1996

Canadian Microelectronics Corporation Equipment Loan Competition (with 4 colleagues). Approximate value: \$30,000

1995-97

Contract with DREA (with 1 colleague). Value: \$30,000.

1995-98

NSERC Strategic Grant , S. Stergiopoulos (principal), W.J. Phillips, and W. Robertson for the "Development of a generic signal processing structure providing array gain improvements in real time systems". Value: \$172,000 over three years.

1995

Canadian Microelectronics Corporation Equipment Loan Competition (with 4 colleagues). Approximate value: \$35,000

1994

Canadian Microelectronics Corporation Equipment Loan Competition (with 4 colleagues). Approximate value: \$16,000

1993

Canadian Microelectronics Corporation Equipment Loan Competition (with 4 colleagues). Approximate value: \$16,900

1993

Canadian Microelectronics Corporation Equipment Loan Competition (with 3 colleagues). Obtained 64 MB memory and 4GB disk expansions for SPARCstation 2 workstations. Approximate value: \$16,000.

1992-95

NSERC (Pure and Applied Math Committee) individual operating grant: \$8,000 per year.

1991

Canadian Microelectronics Corporation Equipment Loan Competition (with 3 colleagues). Obtained two SPARCstation 2 workstations, one SPARCstation 2 upgrade, disk expansions and tape drive. Approximate value: \$109,000.

1990

Canadian Microelectronics Corporation Equipment Loan Competition (with 3 colleagues). Obtained SPARCserver 390, SPARCstation 1, and expansions. Approximate value: \$143,000.

1989-92

NSERC (Pure and Applied Math Committee) individual operating grant: \$6,000 per year.

1989

Canadian Microelectronics Corporation Equipment Loan Competition (with 3 colleagues). Obtained SPARCstation 330 workstation. Approximate value: \$50,000.

1988-91

NSERC Strategic Grant (Microelectronics Fund), W. Robertson (principal), W.J. Phillips, A. Jost, M. Cada, and N. Scrimger, for the development of VLSI "Architectures to Silicon" research. Value: \$336,000 over three years.

1988

Canadian Microelectronics Corporation Software Loan Program (with 4 colleagues). Obtained 2 copies of the Cadence/Edge integrated circuit design software. List value: \$401,000.

1988

Canadian Microelectronics Corporation Software Loan Competition (with 4 colleagues). Obtained IMS integrated circuit testing system. Approximate value: \$215,000.

1986-89

NSERC (Pure and Applied Math Committee) individual operating grant: \$5,592 per year.

1983-86

NSERC (Pure and Applied Math Committee) individual operating grant: \$3,180 per year.

## Publications

Where I have published with colleagues (e.g. Robertson and Jost) they each have contributed significantly in their own area of expertise. Robertson and I consider our individual contributions to be of equal importance.

## Journal Papers

- S. Sivakumer W. Robertson, and W. J. Phillips; "On-line stabilization of block diagonal recurrent neural networks", *IEEE Transactions on Neural Networks*, Vol. 10, No. 1, pp. 167-175, 1999.
- W. Robertson, W. Phillips,; "A system of systolic modules for the MUSIC algorithm", *IEEE Transactions on Signal Processing*, Vol. 39, No. 11, pp. 2524-2534, 1991.

- M.A. Shepherd, W.J. Phillips, C-K. Chu; "A fixed-size Bloom filter for searching textual documents", *The Computer Journal*, Vol. 32 No. 3, pp. 212-219, 1989.
- M.A. Shepherd, W.J. Phillips and T. Lui; "Overlap of title keywords and assigned descriptors in the OON database", *Canadian Journal of Information Science*, Vol.12, pp. 58-66, 1987.
- M.A. Shepherd and W.J. Phillips; "The profile-query relationship", *Journal of the American Society for Information Science*, 37, pp. 146-152, 1986.
- J.A. Mingo and W.J. Phillips; "Equivariant trivality theorems on hilbert modules", *Proceedings of the American Mathematical Society*, 91, pp. 225-230, 1984
- W.J. Phillips; "Flow under a function and discrete decomposition of properly infinite  $W^*$ -algebras", *Pacific Journal of Mathematics*, 114, pp. 221- 234, 1984.
- W.J. Phillips, "On The Relation  $PQ - QP = -I$ ", *Pacific Journal of Mathematics*, 95(1981), 435-441.
- P. Ghatge and W.J. Phillips, "C\*-algebras Generated By Weighted Shifts II", *Indiana University Mathematics Journal*, 30(1981), 539-546.

## Refereed Conference Proceedings

- E. Fgee, W. Robertson, and W. J. Phillips; "Comparing audio compression using wavelets with other audio compression schemes", *Canadian Conference on Electrical and Computer Engineering*, Edmonton, 1999.
- M. Artimy, W. Robertson, and W. J. Phillips; "Detection of acoustic subword boundaries for single digit recognition", *Canadian Conference on Electrical and Computer Engineering*, Edmonton, 1999.
- S. Stergiopoulos, W. Robertson, W. Phillips; "Development of a generic signal processing structure providing array gain improvements for real time systems including 1-dimensional and 2-dimensional arrays of sensors", *Canadian Conference on Electrical and Computer Engineering*, Calgary May 1996, pp. 683-686
- A. C. Dhanantwari, S. Stergiopoulos, W. Phillips, W. Robertson; "Adaptive beamforming with near-instantaneous convergence for matched filter processing", *Canadian Conference on Electrical and Computer Engineering*, Calgary, May 1996, pp. 778-781
- S. Sen, W. Robertson, W. J. Phillips; "The effects of reduced precision bit lengths on feed forward neural networks for speech recognition", *IEEE International Conference on Neural Networks, ICNN'96*, June 1996.
- W. Robertson, S. Sen, W. J. Phillips; "The investigation of using limited precision on a TDNN for consonant recognition", *ISCAS'95*, Seattle, May 1995.
- W. J. Phillips, C. Tosuner, W. Robertson; "Speech recognition techniques using RBF networks", *WESCANEX 1995*.
- M. J. Gingell, W. Robertson, W. J. Phillips; "Design considerations for a general purpose systolic processing element using bit serial techniques", *Canadian Conference on Electrical and Computer Engineering*, pp. 636-639, 1994.
- W. Robertson, S. Periyalwar, W.J. Phillips; "RTL synthesis for systolic arrays" *Proceedings of the IEEE International Conference on Circuits and Systems*, Chicago, May 1993.
- W.J. Phillips, W. Robertson, S. Sarkar; "Systolic designs for speech processing", *Proc. Canadian Conf. on Electrical and Computer Engineering*, Vancouver, BC, Sept.14-17 1993, pp.274-276.
- S. Periyalwar, W. Robertson, W.J. Phillips; "Mobility based scheduling for the register-transfer synthesis of systolic arrays" *Proc. 1993 IEEE Pacific Rim Conference*, Victoria, BC, May 1993, pp. 657-661.
- S.R. Pillai, W. Robertson, W. Phillips; "VLSI design of a digital architecture for quadrature mirror filter banks" *Proceedings of the Canadian Conference on VLSI*, Halifax, Oct.1992, pp. 244-250.
- R. Balasundaram, W. Robertson, W.J. Phillips; "Application of real time operating systems to improve the quality of life style for the elderly and the disabled", *Biomedical Engineering Symposium 1992, Technology for Health*, Hong Kong, April

11-12, 1992.

- S.R. Pillai, W. Robertson, W. Phillips; "Subband filters using allpass structures", *Proceedings of the IEEE 1991 International Conference on Acoustics, Speech and Signal Processing*, Toronto, May 1991.
- W. Robertson, W. Phillips, A. Jost, R. Mason; "A cordic processing element to implement Given's rotations", *Proceedings of the Canadian Conference on VLSI*, Vancouver, October 1989, pp. 123-129.
- K. MacLeod, W. Robertson, W. Phillips; "Application of connectionist models in information retrieval", *Proc. IEEE 3rd Annual Parallel Processing Symposium*, Fullerton, CA, March 1989.
- W. Robertson, W. Phillips; "A systolic MUSIC system with secondary pipelining", *Proceedings of the Third International Conference on Systolic Arrays*, Killamey, Ireland, May 1989, pp. 83-95.
- W. Robertson, W. Phillips; "A systolic MUSIC system for VLSI implementation", *Proceedings of the IEEE 1989 International Conference on Acoustics, Speech and Signal Processing*, Glasgow, May 1989, pp. 2577-2580.
- W. Phillips, W. Robertson, and R. Mason; "A systolic system for the MUSIC algorithm", *Proc. 31st Midwest Symposium on Circuits and Systems*, St. Louis, Aug. 1988.
- W. Phillips, W. Robertson; "A systolic architecture for the symmetric tridiagonal eigenvalue problem", *Proceedings of the International Conference on Systolic Arrays*, San Diego, May 1988, pp. 145-150.
- W. Robertson, W. Phillips; "A pipelined architecture for a real time implementation of the Levinson-Durbin algorithm", *Proc. 30th Midwest Symposium on Circuits and Systems*, Syracuse, N.Y., pp. 1329-1332, Aug. 1987.
- W. Robertson, W. Phillips; "A systolic signal processing architecture for beamforming", *Proc. 29th Midwest Symposium on Circuits and Systems*, Lincoln, Nebraska, pp. 644-647, Aug. 1986.
- W. Robertson, W. Phillips; "Towards a systolic computer for digital signal processing", *Int'l Workshop on Systolic Arrays*, Oxford, England, pp. J4.1-10. July 1986.
- M.A. Shepherd, T. Lui and W.J. Phillips; "A study of the relationship between user profiles and user queries", *Proceedings of the Eighth Annual ACM SIGIR Conference*, pp. 274-281, June 1985.
- W.J. Phillips and M.A. Shepherd; "Statistical analysis of the rank-frequency distribution of elements of a large database", *Proceedings of the Thirteenth Annual CAIS Conference*, pp. 52-58, June 1985.

## Invited Lectures

1994

Colloquium Speaker, Dalhousie University, Department of Mathematics, Statistics and Computing Science. Title: "Systolic Arrays and Numerical Linear Algebra".

1990

Colloquium Speaker, Queen's University, Department of Mathematics and Statistics. Title: "Systolic Arrays".

1986

Seminar given at Dalhousie University, Department of Mathematics, Statistics and Computing Science, Title: "QR Decomposition of Matrices and Systolic Arrays".

1986

Seminar given at Dalhousie University, Department of Mathematics, Statistics and Computing Science, Title: "Zipf's Law".

## Conferences Attended

1994

The Canadian Conference on Electrical and Computer Engineering, Halifax, 1994.

1992

The Canadian Conference on VLSI, Halifax, Oct. 1992.

1989

The Third International Conference on Systolic Arrays, Killarney, Ireland, May 1989.

1989

IEEE International Conference on Acoustics, Speech and Signal Processing, Glasgow, May 1989.

1988

International Conference on Systolic Arrays, San Diego, May 1988.

1987

The 30th Midwest Conference on Circuits and Systems, held at University of Syracuse, August 17 to August 19, 1987.

1987

The 15th Canadian Symposium on Operator Theory and Operator Algebras, held at Queen's University, May 11 to May 15, 1987.

1986

The International Workshop on Systolic Arrays, held at Oxford University, June 28 to July 4, 1986.

1985

The 8th Annual ACM SIGIR Conference, held in Montreal June 5 to June 7, 1985.

1985

The 13th Annual CAIS Conference, held in Montreal, June 4 to June 6, 1985.

1985

The 13th Canadian Symposium on Operator Theory and Operator Algebras, held at the University of Saskatchewan (Saskatoon), May 20 to May 24, 1985.

1984

The APICS meeting, held at Mount Allison University, Oct. 26-27, 1984.

1984

The 12th Canadian Symposium on Operator Theory and Operator Algebras, held at Dalhousie University, May 21 to May 25, 1984.

1983

The Winter Meeting of the Canadian Mathematical Society, held at McGill University, Dec. 10 to Dec. 12, 1983. (Special Session on Operator Theory).

## Post Doctoral Fellows Supervised

Name	Period	Project Title	Present Position
Dr. S. Sarkar	Oct. 1992-Nov. 1993	Single digit speech recognition algorithms	Professor in India
Dr. Ayman Tawfik	Feb. 1996 -	Implementation of DSP algorithms providing array gain improvements in real time systems	in progress
		Implementation of DSP algorithms	in progress

Dr. Shyamala Sivakumer	April 1998 -	providing array gain improvements in real time systems	
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## Research Associates Supervised

Name	Period	Project Title	Present Position
B. Maaraoui, M.A.Sc.	1989-1991	Algorithms to Silicon project	unknown
S. Periyalwar, M.A.Sc.	1990-1992	Algorithms to Silicon project	BNR Ottawa
S. Sen, Ph.D.	1996-1997	Algorithms to Silicon project	Senior Design Engineer, Micro Linear, San Jose

## Graduate Students Supervised

In the follow table the the notation P is used to denote principal supervisor and C to denote co-supervisor. In fact, I played almost the same role in all cases. The difference lies in whether the student was registered in Electrical Engineering or Applied Mathematics. As can be seen from the thesis titles, there was no essential difference in research topics.

Name	Period	Degree	P/C	Project Title	Present Position
M. Artimy	1997-	M.A.Sc.	C	Automatic detection of acoustic subwords	M.A.Sc. in progress
J. Karam	1996-	Ph.D.	P	Wavelets for speech recognition	Ph.D. in progress
E. Fgee	1997-	M.A.Sc.	C	A comparision of voice compression using wavelets with other compression schemes	M.A.Sc. in progress
S. Sivakumer	1991-97	Ph.D. 1997	C	Stability issues in block diagonal recurrent neural networks	Combat System Engineering Instructor
S. Sen	1992-96	Ph.D. 1996	C	Analysis of the effect of accuracy on the performance and implementation of neural networks	Senior Design Engineer, Micro Linear, San Jose
R. Alterson	1995-97	M.A.Sc.	C	Implementation of speech algorithms using multiple	Halifax

				DSP processors	
A. C. Dhanantwari	1994-96	M.A.Sc. 1996	C	Adaptive beamforming with near instantaneous convergence for matched filter processing.	Ph.D. program TUNS
C. Tosuner	1994-96	M.A.Sc. 1996	C	Speech recognition techniques using RBF networks	Halifax
B. Zhang	1993-95	M.Sc. 1995	P	Speaker independent isolated digit recognition using artificial neural networks	Nortel
A. Yasmin	1992-94	M.A.Sc. 1994	C	Speaker Independent Speech Recognition Using Statistical Properties of Isolated Words	Ph.D. program Waterloo
M. Gingell	1991-93	M.A.Sc. 1993	C	A Programmable Systolic Processing Element Using Bit Serial Processing and Communication	Dept. of Defence, Halifax
H. Phonchareon	1991-93	M.Sc. 1993	P	An investigation of the convergence rate of singular value decomposition in the MUSIC algorithm	Revenue Canada Ottawa
S.R. Balasundaram	1990-92	M.A.Sc. 1992	C	The application of real time computer systems to improve the quality of life of the elderly and disabled	India
R. Pillai	1990-92	M.A.Sc. 1992	C	The design of a VLSI implementation of a digital	Ph.D. program

				architecture for use in quadrature mirror filter banks	
Y. Zhang	1989-91	M.S. 1991	P	A Systematic Method of Deriving Systolic Arrays	Mitel Corp. Ottawa
C. Roper	1989-91	M.Sc. 1991	P	Using Complete Spatial Randomness tests for Edge Detection	Victoria General Hospital, Halifax
K.J. MacLeod	1986-90	Ph.D. 1990	C	Neural architectures for clustering in document retrieval	Asst. Prof. Saint Mary's Univ.
T.S. Lee	1988-90	M.A.Sc. 1990	C	VLSI implementation for singular value decomposition of a bidiagonal matrix	unknown
B. Maaroufi	1986-88	M.A.Sc. 1989	C	The design and simulation of a singular value decomposition based systolic beamformer	Toronto
S. Slade	1986-88	M.Sc. 1988	P	Zipf's Law for a database of ACM abstracts	unknown
T. Sutanto	1984-86	M.Sc. 1986	P	An investigation of various forms of Zipf's Law	unknown

## TEACHING ACTIVITIES

### New undergraduate courses personally introduced:

- AM3352 Numerical Methods and Linear Algebra.
- AM4331 Probability and Statistics for Mechanical Engineers.

### New undergraduate courses personally introduced and taught:

- AM3281 Software Engineering for Electrical Engineers
- AM3601 Discrete and Combinatorial Mathematics

### Undergraduate courses amended and taught:

- AM3030 (old AM611) Applied Probability and Statistics

- AM3131 Probability and Statistics for Civil Engineers
- AM3243 Linear Algebra
- AM3652 Applied Numerical Methods
- AM3911 Engineering Mathematics for Industrial Engineering
- AM3941 (old AM647) Applied Linear Algebra
- AM4931 (old AM645) Mathematical Statistics
- CS3010 Data Structures

## **New graduate courses personally introduced and taught:**

- AM6671 Applied Regression Analysis
- AM6610 Wavelets and Filter Banks

## **Graduate courses amended and taught:**

- AM6620 Functional Analysis
- AM6653 (now AM6657) Numerical Linear Algebra
- CS6053 Numerical Analysis I
- AM6000 Directed Studies, 1993-1994: Speech Processing
- AM6000 Directed Studies, 1992-1993: Hidden Markov Models
- AM6000 Directed Studies, 1990-1991: Spline Algorithms for Curves and Surfaces
- AM6000 Directed Studies, 1989-1990: Applied Graph Theory

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*Dr. W. J. Phillips*  
1999-03-19