

Robert M. Corless

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MATHSTODON: @rcorless, YOUTUBE Robert M. Corless

Born: Prince George British Columbia
Nationality: Canadian

Current position

Editor-in-Chief, [Maple Transactions](#)
Emeritus Distinguished University Professor, Western University
Adjunct Professor, Cheriton School of Computer Science, University of Waterloo
Member The Rotman Institute of Philosophy, Western University
Member The Ontario Research Centre for Computer Algebra (ORCCA)
Member Computer-Aided Research in Mathematics and Applications (CARMA), executive board

Areas of specialisation/interest

Areas of specialisation: Computational linear and polynomial algebra; computational dynamical systems; computational special functions. Areas of interest: Computational Discovery and Computational Epistemology (that is, how we can use computers to learn new things, and how we can increase our confidence that those new things are true); The Ethics of AI, especially in teaching.

Appointments held

2006–2019	Distinguished University Professor, Applied Mathematics, Western University
1998–2006	Professor, Applied Mathematics, Western University
1993–1998	Associate Professor, Applied Mathematics, Western University
1987–1993	Assistant Professor, Applied Mathematics, Western University

Education

1987	PHD in Mechanical Engineering, University of British Columbia
1982	M.MATH in Applied Mathematics, University of Waterloo
1980	B.Sc in Math and Computer Science, University of British Columbia

Grants, honours & awards

1988–2026	NSERC \$1,209,000 cumulative Discovery Grants
2021–2024	MICINN €114,334 co-investigator with Sonia Pérez-Díaz and Laureano González-Vega, PIs
2020	MITACS \$49,000 co-investigator with Marc Moreno Maza PI
2018–2021	SSHRC \$77,000 co-investigator with Nic Fillion PI
2003–2007	MITACS \$250,000 co-investigator with Stephen Watt PI
1999–2003	ORDCF \$514,000 co-investigator with Stephen Watt PI
1999–2003	NSERC CRD \$514,000 co-investigator with Stephen Watt PI
1987–present	Various small grants, over \$140,000 cumulative
2019	Visiting Fellow, Program CAT, Isaac Newton Institute, Cambridge
2019	Fellowship Giner de los Rios, Universidad de Alcalá
2017	Fellowship Giner de los Rios, Universidad de Alcalá
2012	Visiting Fellow, University of Otago, Dunedin, NZ
2011	Visiting Fellow, John Curtin School of Medical Research, ANU, Canberra, Australia
2007–2008	Visiting Fellow, John Curtin School of Medical Research, ANU, Canberra, Australia
1995	Visiting Fellow, Center for Experimental and Computational Mathematics, SFU, Vancouver, Canada
1994	Visiting Fellow, IBM T.J. Watson Research Center, Yorktown Heights, NY, USA
2019	Paul Halmos/Lester Ford award from the Mathematical Association of America
2018	Teaching Fellowship: Computational Discovery on Jupyter
2017	Pi Mu Epsilon Fraternity lecturer University of Western Michigan
2004	NSERC SYNERGY Award
2003	Mapstone Lecturer, SUNY Geneseo

Publications & talks

JOURNAL ARTICLES

107. R. M. Corless, An Hermite–Obreshkov method for 2nd order equations, Numerical Algorithms January 9, 2024. <https://doi.org/10.1007/s11075-023-01738-z>
106. Chris Brimacombe, R. M. Corless, and Mair Zamir, “Elliptic cross sections in blood flow regulation,” Mathematics, Science, and Industry. <https://www.aimspress.com/article/doi/10.3934/math.20231176> 2023.
105. Eunice Y.S. Chan and R. M. Corless, “Chaos Game Representation”, SIAM Review **65** 1 pp. 261–290 2023.
104. R. M. Corless and Leili Rafiee Sevyeri, “Compact Cubic Splines”, Journal of Approximation Theory. 283 2022. This is a shortened and revised version of <https://arxiv.org/abs/1805.07659> (2018)
103. Eunice Y. S. Chan, R. M. Corless, Laureano González-Vega, J. Rafael Sendra, Juana Sendra, “Inner Bohemian inverses,” Appl. Math. & Comp. 421 2022.

102. Fahimeh Rezaei, Mahmoud Hadizadeh, R. M. Corless, and Amirhossein Amiraslani, “[Structural Analysis of Matrix Integration Operators in Polynomial Bases](#)”, Banach Journal of Mathematical Analysis 16:5 22 pages (2021).
101. Eunice Y.S. Chan, R. M. Corless, and Leili Rafiee Sevyeri, “[Generalized Standard Triples](#)”, Electronic Journal of Linear Algebra Vol 37. September (2021) pp 640–658.
100. C. Brimacombe, R. M. Corless, & M. Zamir, “[Computation and applications of the Mathieu Functions: A historical perspective](#)”, SIAM Review, 63 (4) pp 653–720 (2021).
99. Neil J. Calkin, Eunice Y.S. Chan, R. M. Corless, David J. Jeffrey, and Piers W. Lawrence, “A Fractal Eigenvector”. [American Mathematical Monthly](#) 129 6 (2022) pp 503–523. arXiv preprint
98. R. M. Corless [Sobre La Iteración Cúbica Inversa](#), La Gaceta de la RSME, 24 1 (2021) 147–159.
97. R. M. Corless, D.J. Jeffrey, & D.R. Stoutemyer, [Integrals of Functions Containing Parameters](#), Mathematical Gazette, vol. 104, no. 561, 2020, pp. 412–426.
96. Eunice Y.S. Chan, R. M. Corless, L. González-Vega, J. Rafael Sendra, Juana Sendra, and Steven E. Thornton, [Bohemian Upper Hessenberg and Toeplitz Matrices](#), Lin. Alg. Appl., Volume 601, pp 72–100 (2020).
95. Robert H. C. Moir, R. M. Corless, David J. Jeffrey, [An Unwinding Number Pair for Continuous Expressions of Integrals](#), J. Symbolic Computation 105 pp 97–113 (2020).
94. R. M. Corless and Leili Rafiee Sevyeri, [The Runge Example for Interpolation and Wilkinson’s Examples for Rootfinding](#) SIAM Review 62.1 (2020): 231–243.
93. R.H.C. Moir, R. M. Corless, M. Moreno Maza, and N. Xie, [Symbolic-Numeric Integration of Rational Functions](#) Numerical Algorithms 83 1295–1320, (2020)
92. N. Fillion and R. M. Corless, [Concepts of Solution and the Finite Element Method: a Philosophical Take on Variational Crimes](#). Philos. Technol. 1–20 (2019).
91. A. Amiraslani, R. M. Corless and M. Gunasingham, [Differentiation Matrices for Univariate Polynomials](#) Numerical Algorithms, 83 1–31, (2020).
90. R. M. Corless, M. Moreno Maza, and S.E. Thornton, “Comprehensive Rank Computation for Matrices Depending on Parameters.” Accepted 2019 to Comm. on Comp. Algebra.
89. Ao Li and R. M. Corless [Revisiting Gilbert Strang’s “A Chaotic Search for \$i\$ ”](#), ACM Communications on Computer Algebra. 53 (1) pp 1–22 (2019)
88. R. M. Corless and Leili Rafiee Sevyeri, [Stirling’s Original Asymptotic Series from a Formula like one of Binet’s and its Evaluation by Sequence Acceleration](#), Experimental Mathematics, April 2019, pp 1–8.
87. Eunice Y.S. Chan, R. M. Corless, L. González-Vega, J. Rafael Sendra and Juana Sendra, [Algebraic Linearizations of Matrix Polynomials](#), Lin. Alg. Appl., 563: 373–399, (2019)
86. R. M. Corless, C. Y. Kaya and R.H.C. Moir, [Optimal Residuals and the Dahlquist Test Problem](#) Numerical Algorithms, 1–22, 2018.
85. R. M. Corless and Julia E. Jankowski, [Revisiting the Discharge Time of a Cylindrical Leaking Bucket](#) ACM Communications in Computer Algebra 52 (1) 1–10 (2018).
84. Eunice Y.S. Chan and R. M. Corless, [Minimal Height Companion Matrices for Euclid Polynomials](#) Math. in Comp Sci 13 pp 1–16 (2018).
83. J. M. Borwein and R. M. Corless, [Gamma and Factorial in the Monthly](#), American Mathematical Monthly 125 (4), 400–424 (2018)
82. Eunice Y.S. Chan and R. M. Corless, [A new kind of companion matrix](#) The Electronic Journal

- of Linear Algebra, 32 pp 335–342 (2017)
81. R. M. Corless and Julia E. Jankowski, [Variations on a Theme of Euler](#) SIAM Review, 58 (4), 775-792, 2016.
 80. P.W. Lawrence and R. M. Corless, [Backward Error of Polynomial Eigenvalue Problems Solved by Linearization of Lagrange Interpolants](#) SIMAX., 36(4), 1425–1442. (October 2015)
 79. D.A. Aruliah, R. M. Corless, G.M. Diaz-Toca, L. González-Vega, A. Shakoori, [The Bézout matrix for Hermite interpolants](#) Linear Algebra and its Applications. Vol 474, 12–29, 2015.
 78. R. M. Corless, M.M. Maza, and S.E. Thornton, “Zigzag Form of Families of Parametric Matrices,” ACM Communications in Computer Algebra. Vol 48:3, 109–112, 2015
 77. T.D. Lamb, R. M. Corless, and A.D. Pananos, [The kinetics of regeneration of rhodopsin under enzyme-limited availability of 11-cis retinoid](#) Vision Research. Vol 110, 23-33, 2015.
 76. Y. Zhang and R. M. Corless, [High-Accuracy Series Solution for Two-Dimensional Convection in a Horizontal Concentric Cylinder](#) SIAM J. Appl. Math. vol 74, no. 3 (2014): 599-617.
 75. R. M. Corless, J. Hu , and D.J. Jeffrey, [On some definite integrals containing the Tree \$T\$ Function](#) ACM Communications in Computer Algebra. Vol 48:2, 33–41, 2014.
 74. P.W. Lawrence and R. M. Corless, [Stability of Rootfinding for Barycentric Lagrange Interpolants](#) Numerical Algorithms. vol 65 (3) (March 2014) 447-464
 73. N. Fillion and R. M. Corless, “On the epistemological analysis of modeling and computational error in the mathematical sciences,” Synthèse, 191 (May 2014): 1451-1467
 72. R. M. Corless, “Pseudospectra for Exponential Matrix Polynomials,” Theoretical Computer Science, Volume 479 (April 2013) 70–80.
 71. C. Chen, R. M. Corless, M. Moreno Maza, P. Yu, and Y.Zhang, “An Application of Regular Chain Theory to the Study of Limit Cycles” Int. J. Bifurcations and Chaos. Volume 23, Issue 9 (September 2013) 21 pages.
 70. R. M. Corless, G.M. Diaz-Toca, M. Fioravanti, L. González-Vega, I.F. Rua, and A.Shakoori, “Computing the topology of a real algebraic plane curve whose defining equations are available only ‘by values’,” Computer Aided Geometric Design, 30 (7) (Oct 2013) 675–706
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 66. R. M. Corless, E. Postma, and D.R. Stoutemyer. 2011. “Rounding coefficients and artificially underflowing terms in non-numeric expressions,” ACM Commun. Comput. Algebra 45, 1/2 (July 2011) 17-48
 65. J.C. Butcher, R. M. Corless, L. González-Vega and A. Shakoori, “Polynomial Algebra for Birkhoff Interpolants,” Numerical Algorithms, Volume 56, Issue 3 (March 2011) 319-347.
 64. P. Yu and R. M. Corless, “Symbolic computation of limit cycles associated with Hilbert’s 16th problem,” Comm. Nonlin. Science and Numerical Simulation, Vol 14, (2009), 4041–4056

63. R. M. Corless, K. Gatermann, & I.S. Kotsireas, "Using symmetries in the eigenvalue method for polynomial systems," Special Issue of the Journal of Symbolic Computation (Chemistry and Biological Applications) in honour of Karin Gatermann 44:1,(2009) 1536-1550.
62. A. Amiraslani, P. Lancaster & R. M. Corless, "Linearization of matrix polynomials expressed in polynomial bases," IMA Journal of Numerical Analysis Vol 29, No. 1, (2009) 141-157
61. S.Brennan & R. M. Corless, "Creating a Warmer Environment for Women in the Mathematical Sciences and in Philosophy," Atlantis, Vol 33(2) (2009) 54-61.
60. R. M. Corless, A. Shakoori, D.A. Aruliah, & L. González-Vega, "Barycentric Hermite Interpolants for Event Location in Initial-Value Problems," Journal of Numerical Analysis, Industrial and Applied Mathematics, Vol. 3, no. 1-2 (2008) 1-16
59. M. Bronstein, R. M. Corless, J.H. Davenport & D.J. Jeffrey, [Algebraic Properties of the Lambert W Function](#) Integral Transforms & Special Functions , Vol. 19 (10) (2008) 709-712.
58. R. M. Corless & S. Ilie, "Polynomial cost for solving IVP for high-index DAE," BIT Numerical Mathematics, (2008) 48: 29-49.
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55. A. Amiraslani, D.A. Aruliah and R. M. Corless, "Block LU Factors of Generalized Companion Matrix Pencils," Theoretical Computer Science 381.1-3 (2007) 134-147
54. R. M. Corless, N. Rezvani, & A. Amiraslani, "Pseudospectra of matrix polynomials expressed in alternative bases," Mathematics and Computer Science, 1 (2007) 353-374
53. G.C. Essex, S. Ilie, and R. M. Corless, Broken symmetry and long-term forecasting. *Journal of Geophysical Research: Atmospheres*, 112(D24), 2007.
52. J. Zhao, M. Davison & R. M. Corless, "Compact Finite Difference Method for American Option Pricing," Journal of Computational and Applied Mathematics 26(1)(2007) 306-321
51. R. M. Corless, On a generalized companion matrix pencil for matrix polynomials expressed in the Lagrange basis. In Dongming Wang and Lihong Zhi, editors, *Symbolic-Numeric Computation*, pages 1-15. Birkhäuser Basel, 2007.
50. J. Zhao, R. M. Corless & M. Davison "Financial Applications of Symbolically Generated Compact Finite Difference Formulae," Financial applications of symbolically generated compact finite difference formulae. In Dongming Wang and Lihong Zhi, editors, *Symbolic-Numeric Computation*, pages 361-374. Birkhäuser, Basel, 2007.
49. S. Ilie, R. M. Corless & G. J. Reid, "Numerical solutions of index-1 differential algebraic equations can be computed in polynomial time" Numer. Algorithms 41, (2006) 161-171
48. J. Zhao & R. M. Corless, "Compact Finite, Difference Method for Integro-Differential Equations," Appl. Math. Comput. 177, No. 1, (2006) 271-288.
47. J. Zhao, T. Zhang, & R. M. Corless, "Convergence of compact finite difference methods for second-order elliptic equations," Appl. Math. Comput. 182, No. 2, (2006) 1454-1469.
46. J. M. Heffernan & R. M. Corless, "Solving some delay differential equations with computer algebra," The Mathematical Scientist, 31, no. 1, (2006) 21-34.
45. N.Rezvani & R. M. Corless, "The nearest polynomial with a given zero, revisited," SIGSAM Bulletin, Communications in Computer Algebra, 39, no. 3 (September 2005) 73-79.

44. M. Benghorbal & R. M. Corless, "A unified formula for arbitrary order symbolic derivatives and integrals of a rational polynomial," *Int. Journal of Pure and Applied Mathematics*, 16, no. 2 (2004) 193-201.
43. M. Benghorbal & R. M. Corless, "Power series solutions of fractional differential equations," *Int. Journal of Pure and Applied Mathematics*, 15, no. 3 (2004) 333-352.
42. R. M. Corless, S.M. Watt & L. Zhi, "QR Factoring to compute the GCD of univariate approximate polynomials," *IEEE Trans. Sig. Proc.*, 52, no. 12, (December 2004) 3394-3402.
41. R. M. Corless, L. González-Vega, I. Necula, A. Shakoori, "Topology Determination of Implicitly Defined Real Algebraic Plane Curves," *An. Univ. Timisoara Ser. mat.-Inform.*, 41 (Special Issue): (2003) 83-96.
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39. R. M. Corless, "A new view of the computational complexity of initial value problems for ordinary differential equations," *Numerical Algorithms*, 31 (2002) 115-124.
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37. S.R. Valluri, R. M. Corless, & D.J. Jeffrey, "Some applications of the Lambert W function to physics", 78, *Canadian J. of Physics* (2000) 823-831.
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35. J.M. Borwein & R. M. Corless, "Emerging tools in experimental mathematics," *American Mathematical Monthly*, vol. 106, (December 1999) 889-909.
34. E. Katende, A. Jutan & R. M. Corless, "Quadratic nonlinear predictive control," *Industrial and Engineering Chemistry Research*, 37 (1998) 2721-2728.
33. R. M. Corless, "Variations on a theme of Newton," *Math Mag*, 71 (Feb 1998) 34-41.
32. D.J. Jeffrey, D.E.G. Hare, & R. M. Corless, "Exact rational solutions of a transcendental equation," *Comptes Rendus (Mathematics)*, vol 20, 3 (1998) 71-76.
31. H.B. Bauschke & R. M. Corless, "Analyzing a projection method with Maple," *Maple Tech* (special issue Maple in the Mathematical Sciences), vol 4, no. 1 (1997) 2-7.
30. R. M. Corless & D.J. Jeffrey, "Scientific computing: One part of the revolution," special issue *J. of Symbolic Computation* 23 (1997) 485-495.
29. R. M. Corless, D.J. Jeffrey, Pratibha & M.B. Monagan, "Two perturbation calculations in fluid mechanics using large expression management," *J. Symb. Comp*, 23 (1997) 427-443.
28. J.M. Borwein, P.B. Borwein, S. Braham, R. M. Corless, & L. Jorgenson, "Digitally activated mathematics for a brave new world wide web," *Ed. Res. & Persp*, 23, no. 2 (1996) 28-47.
27. R. M. Corless, G.H. Gonnet, D.E.G. Hare, D.J. Jeffrey & D.E. Knuth, "On the Lambert W function", *Advances in Computational Mathematics* 5 (1996) 329-359.
26. D.J. Jeffrey, D.E.G. Hare & R. M. Corless, "Unwinding the branches of the Lambert W Function," *Mathematical Scientist*, 21, (1996) 1-7.
25. D.J. Jeffrey, R. M. Corless, D.E.G. Hare & D.E. Knuth, "Sur l'inversion de $y^\alpha e^y$ au moyen des nombres de Stirling associés," *Comptes Rendus de L'Académie des Sciences, Paris*, 320, 1, 12 (1995) 1449-1452.
24. R. M. Corless & S. Yu Pilyugin, "Approximate and real trajectories for generic dynamical sys-

- tems," J. Mathematical Analysis & Applications, 189 (1995) 409-423.
23. R. M. Corless, "Bifurcation in a flow-induced vibration model," American Math Society; Fields Institute Communications, vol. 4 (1995) 43-59.
22. R. M. Corless & S. Yu Pilyugin, "Evaluation of upper Lyapunov exponents on hyperbolic sets," Journal of Mathematical Analysis and Applications 189 (1995) 145-159.
21. R. M. Corless, "Symbolic computation in nonlinear dynamics," Open Systems & Information Dynamics 3.1 (1995) 131-147.
20. R. M. Corless & M.B. Monagan, "Simplification and the assume facility", MapleTech (1994) 24-31.
19. T. Scott, B. Madore & R. M. Corless, "Maple in Science education," Special Issue of MapleTech (1994) 58-68.
18. T. Scott, G. Fee, R. M. Corless & M.B. Monagan, "Applications of Maple to mathematical, scientific, and engineering problems," Special Issue of MapleTech (1994) 49-57.
17. R. M. Corless, "What good are numerical solutions of chaotic differential equations?," Computers in Mathematics with Applications vol 28, no. 10-12 (1994) 107-121.
16. R. M. Corless, "Error backward," Contemporary Mathematics 172 (1994) 31-62.
15. R. M. Corless, "Six, Lies, and Calculators," American Mathematical Monthly, vol 100, no. 4, (1993) 344-350.
14. R. M. Corless & G.V. Parkinson, "Mathematical modelling of the combined effects of vortex-induced vibration and galloping, Part II," J. of Fluids & Structures 7, (1993) 825-848.
13. A.G. Connell & R. M. Corless, "An experimental interval arithmetic package in Maple," Interval Computations, No. 2, (1993) 120-134.
12. R. M. Corless, G.H. Gonnet, D.E.G. Hare and D.J. Jeffrey, "Lambert's W function in Maple," MapleTech #9 (1993) 12-22.
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10. P.A. Rosati, R. M. Corless, C. Essex, & P.J. Sullivan, "An evaluation of the HP28S calculator in calculus," Australian J. of Engineering Education vol 3, no. 1 (1992) 79-88.
9. R. M. Corless, "Defect-controlled numerical methods and shadowing for chaotic differential equations," Physica D 60(special issue on Experimental Mathematics: Computational Issues in Nonlinear Science) (1992) 323-334.
8. R. M. Corless, "Continued fractions and chaos," The American Mathematical Monthly vol. 99, no. 3, March (1992) 203-215.
7. R. M. Corless, D.J. Jeffrey & H. Rasmussen, "Numerical evaluation of Airy functions with complex arguments," J. Computational Physics vol. 99, no. 1 March (1992) 106-114.
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4. R. M. Corless & D.J. Jeffrey, "Solution of a hydrodynamic lubrication problem with Maple," J. Symbolic Computation 9 (1990) 503-513.
3. R. M. Corless & G.V. Parkinson, "A model of the combined effects of vortex-induced oscillation

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2. R. M. Corless & D.J. Jeffrey, Stress moments of nearly touching spheres in low Reynolds number flow. *ZAMP Zeitschrift für angewandte Mathematik und Physik*, 39(6):874–884, 1988.
 1. D.J. Jeffrey & R. M. Corless, Forces and stresslets for the axisymmetric motion of nearly touching spheres. *Physico-Chemical Hydrodynamics*, 10(4):461–470, 1988.

ARTICLES IN REFEREED CONFERENCE PROCEEDINGS

62. R. M. Corless, A. C. Norman, Tomás Recio, William J. Turkel, and S. M. Watt, [Symbolic Mathematical Computation 1965–1975: The View from a Half-Century Perspective](#), accepted 2025-04-18 to Proceedings of ISSAC, July (2025)
61. R. M. Corless and Nicolas Fillion, [Structured Backward Error for the WKB method, Part I: Problems without Turning Points](#), arXiv 2024-12-02. Accepted 2025-03-10 to the Proceedings of the GO20 conference, Malta, 2024, edited by Raymond Spiteri and Siqui Wei. Springer Nature Series in Mathematics and Statistics.
60. R. M. Corless “[Blendstrings: an environment for computing with smooth functions](#)” Proceedings of ISSAC, July (2023) <https://doi.org/10.1145/3597066.3597117>
59. Eunice Y. S. Chan, R. M. Corless, Laureano Gonzalez-Vega, J. Rafael Sendra, and Juana Sendra, “[Bohemian Matrices: A Source of Challenges](#)”, Proc. EACA 2022, pp 59–62.
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52. A.C. Camargos Couto, M. Moreno Maza, David W. Linder, David J. Jeffrey, & R. M. Corless, “Comprehensive LU Factors for Polynomial Matrices”, MACIS 2019, 80–88
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TECHNICAL REPORTS AND UNREFEREED WORKS

Because I am Editor-in-Chief of [Maple Transactions](#), my papers in that journal do not count as refereed. I do consult the other editors and sometimes external people and use their feedback to improve these papers. Similarly, while I was Editor-in-Chief of ACM SIGSAM Bulletin and later Chair of

SIGSAM, ie until 2003, my papers there did not count as refereed, either. Retrospectively, these papers seem to have had about half the citation impact that they might have had otherwise; I still think this was a worthwhile thing to do.

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SELECTED TALKS

28. [Perturbation Methods Using Backward Error](#), at GO20, Gozo, May 2024
27. Progress with Minimal Height Companion Matrices, at DSW70 minisymposium at SIAM Applied Linear Algebra, Paris, May 2024
26. [Surprising Companions](#), at DW75, Leuven, May 2024
25. [The Butcher Factor](#), at woRK24, Auckland, March 2024
24. [Blendstrings: an environment for computing with smooth functions](#), at Numerical Analysis in the 21st Century, Oxford, August 2023
23. [Generalized Standard Triples](#), FMD60, Madrid, July 2023
22. [Algebraic Companions](#), ILAS, Galway, 2022
21. Teaching Programming to Mathematical Scientists, CUNEF, Madrid, Spain, February 2020
20. Masterclass on Maple (parts [I](#) and [II](#)), Isaac Newton Institute, 2019
19. "[An Old Special Function meets a \(slightly\) Newer One](#)", Isaac Newton Institute, Nov 2019
18. "Bohemian Companions", MEGA 2019 plenary, Madrid, June 2019

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8. "Numerical Stability of Polynomial Eigenvalue Algorithms in the Lagrange Basis," MATFUN (Manchester, UK) (April 2013).
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Teaching

PHILOSOPHY

Teaching is an essential part of scholarship. My late friend and colleague, Vic Elias, put it this way: "You teach this stuff long enough, you learn how to use it." The 1981 Nobel Laureate for Chemistry, Roald Hoffman, similarly said "[I]t is through teaching that [young academics] become better researchers." It is also true that the teaching part of a professor's career, which nominally makes up only 40% of the workload, is expected to have by far and away the greatest direct and leveraged effect on society and civilization. Teaching makes us human. But research informs teaching, too. The first and most obvious way is in constructing syllabi and the programs they shape: research tells us what to teach, and why. Therefore, *what* to teach changes continually as knowledge advances. Further, *tools* for teaching have changed radically with the introduction of the web, wide social networks, online resources including videos, and will change even more radically as AI takes hold. But another way that research informs teaching, which is likely to remain important, is that human researchers can show themselves as excited learners, and can share the electricity of being on the border of the unknown. Research also tells us (if we're listening) *how* to teach, and how students learn. The pedagogical literature is unequivocal: engaged, active learning is a critical component in deep, integrated learning. The student must do, to understand. The addition of radical new tools has not changed that, so far. Finally, teaching is a human activity. Besides having something to teach, and knowing how to teach

it, the professor must be a social person, able to show warmth, strength, and confidence, as needed. Goethe in a letter to one of his teachers said "instruction does much, but encouragement does more." Teachers must continually learn how to best encourage students. This is critical for equity, which is a moral imperative. It also has an instrumental benefit, by effectively broadening the pool of talent for recruitment.

RECORD

I was at Applied Mathematics at Western for thirty-two years. I taught engineering mathematics at all levels, applied mathematics for scientists at all levels, and a wide variety of graduate courses. Since about 2010 I have used and continue to advocate for *active learning*. I designed the introductory undergraduate and graduate numerical analysis courses. In 2014 I designed a course in experimental mathematics, which is described in some of my publications listed above. Recent courses, ignoring sabbaticals in the dates, are listed in Table 1. The normal teaching requirements in Applied Mathematics at Western were four half-courses per year, with one half-course reduced if you supervise three graduate students. Apart from sabbaticals and the occasional overload, this is the amount I taught.

2012–2019	AM2813b/14g	Numerical Analysis	7/7
2017–2019	AM3811a	Complex Variables	7/7
2009–2019	AM9561a	Graduate Numerical Analysis	7/7
2014–2016	AM9619a/b	Open Problems in Experimental Mathematics	7/7
2014–2015	AM1999f	Experimental Mathematics	7/7
2013–2016	CA2303b	Calculus IV	7/7
2015–2016	AM2276b	Engineering Calculus IV	5/7
2010–2013	CA1301b	Calculus II	5/7
2010–2011	CA1000a	Calculus I	5/7

Table 1: Courses taught 2010–2019 and median student survey results

Several of my listed publications can be considered research in mathematics education; for instance, the book chapter 9 listed above. I am particularly concerned with the ethics of teaching with AI.

I have supervised or co-supervised seventeen PhD theses, twelve masters theses, and eight post-doctoral fellows (one currently). My former students have gone on to careers in academia and in industry. I have supervised twenty-six honours B.Sc. theses; many of these students have gone on to graduate degrees at excellent institutions, including Oxford.

I continue to serve on thesis committees, examining boards, as external examiner, and chairing exams.

List of PhD Students advised or co-advised:

2025	Deepak Singh Kalhan (University of Waterloo, in progress)
2020	Leili Rafiee Sevyeri, Hybrid Symbolic-Numeric Computing in Linear and Polynomial Algebra
2019	Eunice Y.S. Chan, Algebraic Companions and Linearizations
2019	Steven E. Thornton, Algorithms for Bohemian Matrices
2017	Robert H. C. Moir, Feasible Computation in Symbolic and Numeric Integration
2013	Yiming Zhang, Computation Sequences for Series and Polynomials
2013	Piers W. Lawrence, Eigenvalue methods for Interpolation Bases
2009	Hui Ding, Numerical and Symbolic Computation of the Lambert W Function in $C^{n \times n}$

2007	Azar Shakoori, Bivariate Polynomial Solver by Values
2006	Jichao Zhao, Accurate Compact Finite Difference Method and its Applications
2006	Amir Amiraslani, New Algorithms for Matrices, Polynomials, and Matrix Polynomials
2006	Marie-Paule Gagne-Portelance, Computing Feynman Integrals in Non-Commutative Spaces
2005	Silvana Ilie, Computational Complexity of Numerical Solutions of IVPs for DAEs
2004	Mhenni Benghorbal, Power Series Solutions of Fractional DE's and Symbolic Derivatives
2000	Hualiang Zhong, Non-harmonic Fourier Series and Applications
1999	Xianping Liu, Symbolic Tools for the Analysis of Nonlinear Dynamical Systems
1998	Anne-Marie E. Allison, Analytical Investigation of a Semi-empirical Flow- induced Vibration Model
1997	Mohammed O. Ahmed, Exploration of Compact Methods for Numerical Solution of PDEs

List of Masters Students advised or co-advised:

2024–	Michelle Lynn Hatzel, Western, In progress
2019	Irene Novarinho, AIMS, Backward Error for Continued Fractions
2019	Jeet Trivedi, A Survey of Quadrature Methods for Oscillatory Integration
2016	Eunice Y.S. Chan, A Comparison of solution methods for Mandelbrot-like polynomials
2016	Leili Rafiee Severyi, A Sequence of Symmetric Bézout Matrix Polynomials
2011	Nic Fillion, Backward Error Analysis as a Model of Computation
2010	Robert H. C. Moir, Reconsidering backward error
2005	Nargol Rezvani, Approximate Polynomials in Different Bases
2003	Azar Shakoori, Solving Bivariate Polynomials by Eigenvalues
2001	Xiaofang Xie, Symbolic Circuit Analysis
2001	Dicheng Liu, A Notation Selection Tool for MathML
2000	Gurjeet Litt, Unwinding Numbers for the Logarithmic, Inverse Trig & Hyperbolic Functions
1995	Xianping Liu, Perturbation Package to solve ODEs in Maple
1990	Valentin Vangelov, <record of project title lost>

Service to the profession

LEADERSHIP POSITIONS

I was Scientific Director of the Ontario Research Center for Computer Algebra (ORCCA) from 2015 until 2022, and the founding Deputy Director before that. ORCCA is a consortium of twelve faculty members and about sixty graduate students and postdoctoral fellows at Western University and the University of Waterloo, with other members at other Ontario universities. See www.orcca.on.ca. I was Chair of the Department of Applied Mathematics from 2002 till 2007. I was elected Chair of the ACM Special Interest Group on Symbolic and Algebraic Manipulation (SIGSAM) from 1999–2003. I enjoyed such roles, because they gave me a chance to ensure that my colleagues got the appropriate rewards for the work that they did. During my time as Department Chair of Applied Mathematics, I directed the hiring of five tenure-stream faculty, and successfully lobbied for market adjustments in salary for several outstanding faculty and staff members, successfully nominated many people for research and teaching awards, and fostered the increase in percentage of female PhD students, to the point where we were the first mathematical sciences department of any substantial size to reach 50%. Overall the Department's profile grew significantly while I was Chair, and the number of faculty members grew from 14 to 19. I also oversaw a fundamental change in research direction, away from classical

fluid mechanics and into mathematical biology, mathematical finance, and computational materials and biomaterials. All three research areas are vigorous to date.

I have been committed to equity for decades. Equity is, of course, a moral imperative, and a duty owed. However, equity and diversity are also of instrumental value, with recent publications documenting the increased impact that diverse teams have in research (as measured by citation count). But even if it were of *no* instrumental value, it would still be required of us.

The other techniques to increase equity and diversity that I have learned from my experience, beginning when I was the CAIMS delegate to the CMS Committee for Women in Mathematics, are still needed today. The principal lesson is that *warmth*—of course, rule-governed warmth—is needed, rather more than one might expect from mathematicians, and rather more than was traditionally available in a science or engineering educational context. See my paper “Creating a Warmer Environment for Women in Mathematics and in Philosophy” with Samantha Brennan (paper 61 in the list of journal papers above) for more details.

UNIVERSITY SERVICE

I have served on most of the usual committees appropriate for my years of experience, including University Senate, selection committees for Deans and Chairs, and P&T committees.

I am a member of the [Rotman Institute for Philosophy](#) and have been since its founding in 2008. I have served on its Steering Committee, and on search committees for interdisciplinary CRC candidates.

Many people *talk* about interdisciplinarity and multidisciplinary, but the Rotman Institute actually practices it. I am very proud of my connection to the Institute.

ACADEMIC EXTERNAL SERVICE

I regularly serve in various roles for conference organization; I was co-Chair with Paulina Chin of the Program Committee for the Maple Conference Nov 2–5 2021; I was previously co-Chair with Jürgen Gerhard for the 2020 conference. I have been the principal organizer for conferences sponsored by the Fields Institute, and for minisymposia at SIAM meetings and at ICIAM. I organized a successful minisymposium on Bohemian Matrices for ILAS 2023 in Madrid.

I was the Editor-in-Chief of the ACM SIGSAM Bulletin from 1996–1999. In that time I wrote several editorial columns (listed in Technical Reports and Unrefereed Contributions above), some of which later became highly cited. I instituted the Formally Reviewed Articles section of the Bulletin, and changed the name of the publication to ACM Communications in Computer Algebra. In this endeavour I was helped greatly by David Jeffrey, who became Editor-in-Chief when I became SIGSAM Chair, and who continued and solidified this work.

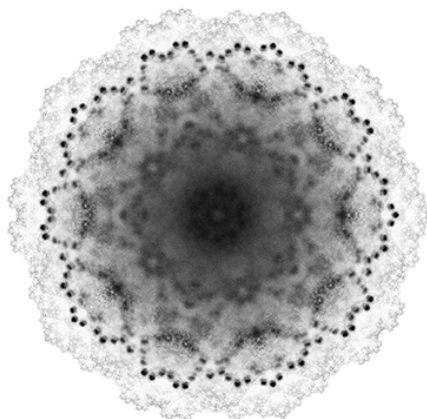
I am now the Editor-in-Chief of [Maple Transactions](#), a new open-access scholarly journal sponsored by Maplesoft and by Scholarship Western. This journal has no page charges for authors, and was launched in June 2021.

I am a life member of CAIMS (the Canadian Applied and Industrial Mathematics Society), a member of ACM and ACM SIGSAM, a member of the Canadian Society for History and Philosophy of Mathematics, and a member of SIAM.

I have reviewed several departments and programs and for granting agencies (including for the NSF (USA), the ANR (France), and the FWF (Austria)). I am a regular reviewer for several journals, includ-

ing the American Mathematical Monthly, Linear Algebra and Applications, Numerical Algorithms, the Journal of Symbolic Computation, and SIAM Review.

ENDNOTE: BOHEMIAN MATRICES AND VISUALIZATION OF MATHEMATICS



Just to have a nice picture at the end of my CV, here is a density plot of the complex eigenvalues of ten million upper Hessenberg Toeplitz matrices with population from the fifth roots of unity. See bohemianmatrices.com, the journal paper [96](#), or the unrefered note [32](#) for more information. Image by my former PhD student Steven E. Thornton.