

# Robert M. Corless

Scientific Director, Ontario Research Centre for Computer Algebra  
Western University  
London, CANADA N6A 5B9

Email: [Rob.Corless@gmail.com](mailto:Rob.Corless@gmail.com), TWITTER: @corless\_rob, YOUTUBE Robert M. Corless

Born: Prince George British Columbia  
Nationality: Canadian

## Current position

*Emeritus Distinguished University Professor*, Western University  
*Adjunct Professor*, David R. Cheriton School of Computer Science, University of Waterloo  
*Member* The Rotman Institute of Philosophy, Western University

## Areas of specialisation

Computational linear and polynomial algebra; computational dynamical systems; computational special functions; hybrid symbolic-numeric computation. Computational Discovery and Computational Epistemology: 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

1988–2025	NSERC \$1,180,000 cumulative Discovery Grants
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 \$120,000 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

98. Neil Calkin, Eunice Y.S. Chan, Robert M. Corless, David J. Jeffrey, and Piers W. Lawrence, “A Fractal Eigenvector”. Accepted 2021.03.25 to the American Mathematical Monthly.
97. Robert M. Corless [Sobre La Iteración Cúbica Inversa](#), La Gaceta de la RSME, **24**(1) 147–159.
96. Robert M. Corless, D.J. Jeffrey, & D.R. Stoutemyer, [Integrals of Functions Containing Parameters](#), Mathematical Gazette, vol. 104, no. 561, 2020, pp. 412–426.
95. E.Y.S. Chan, Robert M. Corless, L. Gonzalez-Vega, J. Rafael Sendra, Juana Sendra, and Steven E. Thornton, [Bohemian Upper Hessenberg and Toeplitz Matrices](#), Linear Algebra and its Applications, Volume 601, pp 72-100 (2020).
94. Robert H. C. Moir, Robert M. Corless, David J. Jeffrey, [An Unwinding Number Pair for Continuous Expressions of Integrals](#), J. Symbolic Computation 2020.
93. N. Fillion and Robert M. Corless, [Concepts of Solution and the Finite Element Method: a Philosophical Take on Variational Crimes](#). Philos. Technol. 1-20 (2019).
92. R.H.C. Moir, Robert M. Corless, M. Moreno Maza, and N. Xie, [Symbolic-Numeric Integration of Rational Functions](#) Numerical Algorithms 1-26, May 2019

91. Robert M. Corless, M. Moreno Maza, and S.E. Thornton, “Comprehensive Rank Computation for Matrices Depending on Parameters.” Accepted 2019 to Comm. on Comp. Algebra.
90. Ao Li and Robert M. Corless [Revisiting Gilbert Strang’s “A Chaotic Search for  \$i\$ ”](#), ACM Communications on Computer Algebra. Vol 53 no 1 pp1–22 March 2019
89. A. Amiraslani, Robert M. Corless and M. Gunasingham, [Differentiation Matrices for Univariate Polynomials](#) Numerical Algorithms, 83 1–31, 2019.
88. Robert M. Corless and Leili Rafiee Sevyeri, [The Runge Example for Interpolation and Wilkinson’s Examples for Rootfinding](#) SIAM Review 62.1 (2020): 231-243.
87. Robert 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, 2019.
86. E.Y.S. Chan, Robert M. Corless, L. Gonzalez-Vega, J. Rafael Sendra and Juana Sendra, [Algebraic Linearizations of Matrix Polynomials](#), Linear Algebra and its Applications, 563: 373-399, 2019. <https://doi.org/10.1016/j.laa.2018.10.028>
85. Robert M. Corless, C. Y. Kaya and R.H.C. Moir, [Optimal Residuals and the Dahlquist Test Problem](#) Numerical Algorithms, 1-22, 2018.
84. Robert M. Corless and Julia E. Jankowski, [Revisiting the Discharge Time of a Cylindrical Leaking Bucket](#) ACM Communications in Computer Algebra, 1-10, 2018.
83. E.Y.S. Chan and Robert M. Corless, [Minimal Height Companion Matrices for Euclid Polynomials](#) Math. in Comp Sci, 1-16, 2018.
82. J. M. Borwein and Robert M. Corless, [Gamma and Factorial in the Monthly](#), American Mathematical Monthly 125 (4), 400–424, 2018.
81. E.Y.S. Chan and Robert M. Corless, [A new kind of companion matrix](#) The Electronic Journal of Linear Algebra, vol. 32, 335-342, 2017
80. Robert M. Corless and Julia E. Jankowski, [Variations on a Theme of Euler](#) SIAM Review, 58 (4), 775-792, 2016.
79. P.W. Lawrence and Robert M. Corless, [Backward Error of Polynomial Eigenvalue Problems Solved by Linearization of Lagrange Interpolants](#) SIMAX., 36(4), 1425–1442. (October 2015)
78. D.A. Aruliah, Robert M. Corless, G.M. Diaz-Toca, L. Gonzalez-Vega, A. Shakoori, [The Bézout matrix for Hermite interpolants](#) Linear Algebra and its Applications. Vol 474, 12-29, 2015.
77. T.D. Lamb, Robert 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 Robert 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. Robert 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 Robert M. Corless, [Stability of Rootfinding for Barycentric Lagrange Interpolants](#) Numerical Algorithms. vol 65 (3) (March 2014) 447-464
73. N. Fillion and Robert M. Corless, “On the epistemological analysis of modeling and computational error in the mathematical sciences,” Synthèse, 191 (May 2014): 1451-1467
72. Robert M. Corless, “Pseudospectra for Exponential Matrix Polynomials,” Theoretical Computer Science, Volume 479 (April 2013) 70–80.
71. C. Chen, Robert M. Corless, M. Moreno Maza, P. Yu, and Y. Zhang, “An Application of Reg-

- ular Chain Theory to the Study of Limit Cycles” *Int. J. Bifurcations and Chaos*. Volume 23, Issue 9 (September 2013).
70. Robert M. Corless, G.M. Diaz-Toca, M. Fioravanti, L. Gonzalez-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
  69. G.A. Kalugin, D.J. Jeffrey, Robert M. Corless, “Bernstein, Pick, Poisson and related integral expressions for Lambert W,” *Integral Transforms and Special Functions*. Volume 23, Issue 11 (2012) 817–829.
  68. P. W. Lawrence, Robert M. Corless, and D.J. Jeffrey, “Algorithm 917: Complex Double-Precision Evaluation of the Wright  $\omega$  Function,” *ACM Transactions on Mathematical Software*, Volume 38 Issue (April 2012), Article No. 20
  67. G.A. Kalugin, D.J. Jeffrey, Robert M. Corless and P.B. Borwein, “Stieltjes and other integral representations for functions of Lambert W,” *Integral Transforms and Special Functions*, Volume 23, Issue 8, 2012 581–593.
  66. Robert 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, Robert M. Corless, L. Gonzalez-Vega and A. Shakoori, “Polynomial Algebra for Birkhoff Interpolants,” *Numerical Algorithms*, Volume 56, Issue 3 (March 2011) 319–347.
  64. P. Yu and Robert 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. Robert 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 & Robert 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 & Robert M. Corless, “Creating a Warmer Environment for Women in the Mathematical Sciences and in Philosophy,” *Atlantis*, Vol 33(2) (2009) 54–61.
  60. Robert M. Corless, A. Shakoori, D.A. Aruliah, & L. Gonzalez-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, Robert 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. Robert M. Corless & S. Ilie, “Polynomial cost for solving IVP for high-index DAE,” *BIT Numerical Mathematics*, (2008) 48: 29–49.
  57. G. Söderlind, S. Ilie & Robert M. Corless, “Adaptivity and Computational Complexity in the Numerical Solution of ODEs,” *Journal of Complexity*, 24 3 (2008) 341–361
  56. S. Ilie, Robert M. Corless & G.C. Essex, “The computational complexity of extrapolation methods,” *Mathematics in Computer Science* (2008) 557–566
  55. A. Amiraslani, D.A. Aruliah and Robert M. Corless, “Block LU Factors of Generalized Companion Matrix Pencils,” *Theoretical Computer Science* 381.1–3 (2007) 134–147
  54. Robert M. Corless, N. Rezvani, & A. Amiraslani, “Pseudospectra of matrix polynomials expressed in alternative bases,” *Mathematics and Computer Science*, 1 (2007) 353–374

53. C. Essex, S. Ilie, and Robert M. Corless, "Symmetry Breaking and Long-Term Forecasting," *J. Geophys. Research* (2007) Vol. 112, D24S17
52. J. Zhao, M. Davison & Robert M. Corless, "Compact Finite Difference Method for American Option Pricing," *Journal of Computational and Applied Mathematics* 26(1)(2007) 306-321
51. Robert M. Corless, "On a generalized companion matrix pencil for matrix polynomials expressed in the Lagrange basis," *Trends in Mathematics* (2007) 1-16
50. J. Zhao, Robert M. Corless & M. Davison "Financial Applications of Symbolically Generated Compact Finite Difference Formulae," *Trends in Mathematics* (2006) 361-374.
49. S. Ilie, Robert 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 & Robert M. Corless, "Compact Finite Difference Method for Integro-Differential Equations," *Appl. Math. Comput.* 177, No. 1, (2006) 271-288.
47. J. Zhao, T. Zhang, & Robert 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 & Robert M. Corless, "Solving some delay differential equations with computer algebra," *The Mathematical Scientist*, 31, no. 1, (2006) 21-34.
45. N.Rezvani & Robert 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 & Robert 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 & Robert M. Corless, "Power series solutions of fractional differential equations," *Int. Journal of Pure and Applied Mathematics*, 15, no. 3 (2004) 333-352.
42. Robert 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. Robert M. Corless, L. Gonzalez-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.
40. R.J. Bradford, Robert M. Corless, J.H.Davenport, D.J.Jeffrey, & S.M. Watt: "Reasoning about the elementary functions of complex analysis," *Ann. Maths Art. Intel.*, 36, (2002) 303-318.
39. Robert M. Corless, "A new view of the computational complexity of initial value problems for ordinary differential equations," *Numerical Algorithms*, 31 (2002) 115-124.
38. E. Kaltofen, with Robert M. Corless & D.J. Jeffrey, "Challenges in symbolic computation: My favourite open problems," 29, 6 *Journal of Symbolic Computation*, July (2000) 891-919.
37. S.R. Valluri, Robert M. Corless, & D.J. Jeffrey, "Some applications of the Lambert W function to physics", 78, *Canadian J. of Physics* (2000) 823-831.
36. L.F. Shampine & Robert M. Corless, "Initial value problems for ODEs in problem solving environments," *J. Computational and Applied Mathematics*, 125 (2000) 31-40.
35. J.M. Borwein & Robert M. Corless, "Emerging tools in experimental mathematics," *American Mathematical Monthly*, vol. 106, (December 1999) 889-909.
34. E. Katende, A. Jutan & Robert M. Corless, "Quadratic nonlinear predictive control," *Industrial and Engineering Chemistry Research*, 37 (1998) 2721-2728.
33. Robert M. Corless, "Variations on a theme of Newton," *Math Mag*, 71 (Feb 1998) 34-41.

32. D. J. Jeffrey, D.E.G. Hare, & Robert M. Corless, "Exact rational solutions of a transcendental equation," *Comptes Rendus (Mathematics)*, vol 20, 3 (1998) 71-76.
31. H.B. Bauschke & Robert 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. Robert M. Corless & D.J. Jeffrey, "Scientific computing: One part of the revolution," special issue *J. of Symbolic Computation* 23 (1997) 485-495.
29. Robert 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, Robert M. Corless, & L. Jorgenson, "Digitally activated mathematics for a brave new world wide web," *Ed. Res. & Persp*, 23, no. 2 (1996) 28-47.
27. Robert 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 & Robert M. Corless, "Unwinding the branches of the Lambert W Function," *Mathematical Scientist*, 21, (1996) 1-7.
25. D.J. Jeffrey, Robert M. Corless, D.E.G. Hare & D.E. Knuth, "Sur l'inversion de yaey au moyen des nombres de Stirling associés," *Comptes Rendus de L'Académie des Sciences, Paris*, 320, 1, 12 (1995) 1449-1452.
24. Robert M. Corless & S. Yu Pilyugin, "Approximate and real trajectories for generic dynamical systems," *J. Mathematical Analysis & Applications*, 189 (1995) 409-423.
23. Robert M. Corless, "Bifurcation in a flow-induced vibration model," *American Math Society; Fields Institute Communications*, vol. 4 (1995) 43-59.
22. Robert M. Corless & S. Yu Pilyugin, "Evaluation of upper Lyapunov exponents on hyperbolic sets," *Journal of Mathematical Analysis and Applications* 189 (1995) 145-159.
21. Robert M. Corless, "Symbolic computation in nonlinear dynamics," *Open Systems & Information Dynamics* 3.1 (1995) 131-147.
20. Robert M. Corless & M.B. Monagan, "Simplification and the assume facility", *MapleTech* (1994) 24-31.
19. T. Scott, B. Madore & Robert M. Corless, "Maple in Science education," *Special Issue of MapleTech* (1994) 58-68.
18. T. Scott, G. Fee, Robert M. Corless & M.B. Monagan, "Applications of Maple to mathematical, scientific, and engineering problems," *Special Issue of MapleTech* (1994) 49-57.
17. Robert 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. Robert M. Corless, "Error backward," *Contemporary Mathematics* 172 (1994) 31-62.
15. Robert M. Corless, "Six, Lies, and Calculators," *American Mathematical Monthly*, vol 100, no. 4, (1993) 344-350.
14. Robert 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 & Robert M. Corless, "An experimental interval arithmetic package in Maple," *Interval Computations*, No. 2, (1993) 120-134.
12. Robert M. Corless, G.H. Gonnet, D.E.G. Hare and D.J. Jeffrey, "Lambert's W function in Maple," *MapleTech* #9 (1993) 12-22.
11. T.C. Scott, M.B. Monagan, G.J. Fee & Robert M. Corless, "Some Applications of Maple to

- mathematical, scientific and engineering problems,” *Artificial Intelligence, Expert Systems & Symbolic Computing* (1992) 165-176.
10. P.A. Rosati, Robert 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. Robert 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. Robert M. Corless, “Continued fractions and chaos,” *The American Mathematical Monthly* vol. 99, no. 3, March (1992) 203-215.
  7. Robert 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.
  6. Robert M. Corless, C. Essex, M.A.H. Nerenberg, “Numerical methods can suppress chaos,” *Physics Letters A* 157, 1 (1991) 27-36.
  5. Robert M. Corless, G.W. Frank & J.G. Monroe, “Chaos & Continued Fractions,” *Physica D.* 46 (1990) 241-253.
  4. Robert M. Corless & D.J. Jeffrey, “Solution of a hydrodynamic lubrication problem with Maple,” *J. Symbolic Computation* 9 (1990) 503-513.
  3. Robert M. Corless & G.V. Parkinson, “A model of the combined effects of vortex-induced oscillation and galloping,” *J. Fluids and Structures* 2 (1988) 203-220.
  2. Robert M. Corless & D.J. Jeffrey, “Stress moments of nearly touching spheres in low Reynolds number flows,” *ZAMP* 39 (1988) 874-884.
  1. D.J. Jeffrey & Robert M. Corless, “Forces and Stresslets for the axisymmetric motion of nearly touching unequal spheres,” *J. Physico-Chemical Hydrodynamics*, vol. 10, no. 4 (1988) 461-470.

#### ARTICLES IN REFEREED CONFERENCE PROCEEDINGS

52. Robert M. Corless & Erik Postma, “Blends in Maple”, [arXiv preprint](#) Accepted to the Proceedings of the Maple 2020 Conference (2021).
51. Robert M. Corless, M.W.Giesbrecht, L. Rafiee Sevyeri, B.D. Saunders, [On Parametric Linear System Solving](#) Computer Algebra and Scientific Computing 2020 188–205.
50. Leili Rafiee Sevyeri and Robert M. Corless, Approximate GCD in the Lagrange Basis, accepted to SYNASC 2020
49. A.C. Camargos Couto, Marc Moreno Maza, David W. Linder, David J. Jeffrey, & Robert M. Corless, “Comprehensive LU Factors for Polynomial Matrices”, *MACIS 2019*, 80–88
48. Robert M. Corless and Leili Rafiee Sevyeri, “Approximate GCD in the Bernstein Basis”, In: Gerhard J., Kotsireas I. (eds) *Maple in Mathematics Education and Research*. MC 2019. Communications in Computer and Information Science, vol 1125. Springer, pp 77–91.
47. Robert M. Corless and N. Fillion, “Backward Error Analysis for Perturbation Methods”, *Proceedings of ACMES*, (2019) 35-79.
46. H. Al Kafri, D.J. Jeffrey, and Robert M. Corless, “Rapidly Convergent Integrals and Function Evaluation.” *MACIS* (2017), 270-274.
45. S.E. Thornton, M. Moreno Maza, and Robert M. Corless, “Jordan Canonical Form with Parameters from Frobenius Form with Parameters.” *MACIS* (2017), 179-194.
44. K.A. Folitse, D.J. Jeffrey, and Robert M. Corless, “Inverse of the Gamma function.” *SYNASC*



- Proceedings (2017).
43. S. Ilie, D.J. Jeffrey, Robert M. Corless, and X. Zhang, "Computation of Stirling numbers and generalizations." SYNASC Proceedings (2015), 57-60.
  42. Robert M. Corless, S.E. Thornton, "A Package for Parametric Matrix Computations, Mathematical Software-ICMS 2014.", Springer, eds. H. Hong, C. Yap, January (2014), 442-449.
  41. D.A. Aruliah, Robert M. Corless, G.M. Diaz-Toca, L. Gonzalez-Vega and A. Shakoori, "The Confluent Bezout Matrix", Proc. EACA, J.Elias et al. eds, Barcelona (2014) 49-52.
  40. Robert M. Corless, M.Moreno Maza and S.E. Thornton, "Zigzag Form over Families of Parametric Matrices", Proc. EACA 2014, J.Elias et al. eds, Barcelona (2014) 87-91.
  39. R.H.C. Moir, Robert M. Corless and D.J. Jeffrey, "Unwinding Paths on the Riemann Sphere for Continuous Integrals of Rational Functions", Proc. EACA 2014, J.Elias et al. eds, Barcelona (2014) 141-144.
  38. Robert M. Corless, D.J. Jeffrey and F. Wang, "The asymptotic analysis of some interpolated nonlinear recurrence relations," Proc. ISSAC 2014, Kobe, Japan, 115-121.
  37. N. Rezvani and Robert M. Corless, "Using Weighted Norms to Find Nearest Polynomials Satisfying Linear Constraints," Proc. SNC (2011) 81-87.
  36. P.W. Lawrence and Robert M. Corless, "Numerical Stability of Barycentric Hermite root-finding," Proc. SNC (2011) 147-148.
  35. Robert M. Corless, E. Postma and D.R. Stoutemyer, "GCD of Multivariate Approximate Polynomials using Beautification with the Subtractive Algorithm," Proc. SNC (2011) 153-154.
  34. Robert M. Corless, H. Ding, N.J. Higham, & D.J. Jeffrey, "The solution of  $S \exp S = A$  is not always Lambert  $W(A)$ ," Proc. ISSAC (2007) 116-121.
  33. Robert M. Corless & D. Assefa, "A Case Study on Elliptic Functions in a CAS: Jeffery-Hamel Flow in Maple," Proc. ISSAC (2007) 108 - 115.
  32. Robert M. Corless, Y. Lin, L. Ma & J. Zhao, "A highly efficient and accurate algorithm for solving partial differential equation in cardiac tissue models," WSEAS, Miami, USA, (January 2006) 81-86.
  31. W. Zou, D.J. Jeffrey & Robert M. Corless, "Fraction-free forms of LU matrix factoring," Proceedings of Transgressive Computing, Granada, Spain, (2006) 443-446.
  30. Robert M. Corless, S. Ilie, & G. Reid, "Computational complexity of numerical solution of polynomial systems," Proc. Transgressive Computing, Granada, Spain (2006) 405-408.
  29. J. Zhao, Robert M. Corless, & M. Davison, "Financial Applications of Symbolically Generated Compact Finite Difference Formulae," SNC, Xi'an, D. Wang & L. Zhi eds. (2005) 220-234.
  28. Robert M. Corless & S.M. Watt, "Bernstein Bases are Optimal, but, sometimes, Lagrange bases are Better," Symbolic and Numeric Algorithms for Scientific Computing, (2004) 141-152.
  27. Robert M. Corless, "Computer-mediated thinking," Proceedings of the TIME-2004 Workshop, July 15-18, (2004), Montreal, Canada. [Homepage link: online proceedings has evaporated](#)
  26. Robert M. Corless, "Generalized Companion Matrices in the Lagrange Basis," Proc EACA 2004, Univ Cantabria, Santander, Spain, L. González Vega, T. Recio, eds. (2004) 317-322.
  25. D.A. Aruliah, & Robert M. Corless, "Numerical Parameterization of Affine Varieties Using ODEs", Proc. ISSAC, Univ Cantabria, Santander, Spain, J. Gutierrez, ed. (2004) 12-18.
  24. Robert M. Corless, A. Galligo, I.S. Kotsireas, & S.M. Watt, "A Geometric-Numeric Algorithm for Absolute Factorization of Multivariate Polynomials," Proc. ISSAC (2002) 37-4



23. Robert M. Corless & D.J. Jeffrey, "On the Wright  $\omega$  Function," Proceedings of Joint International Conferences, AISC Artificial Intelligence, Automated Reasoning 2002, and Symbolic Computation, and Calculemus 2002, Marseille, France, (July 2002) 76-90.
22. Robert M. Corless, M.W. Giesbrecht, M. van Hoeij, I.S. Kotsireas, & S.M. Watt, "Towards Factoring Bivariate Approximate Polynomials," Proc. ISSAC, Western University, London, Canada, B. Mourrain, ed. (2001) 85-92.
21. D.J. Jeffrey, M.W. Giesbrecht, & Robert M. Corless, "Integer roots computation for Integer-power-content calculations," Computer Mathematics, Proc. ASCM, World Scientific Lecture Notes Series on Computing, vol. 8, (2001) 71-74.
20. Robert M. Corless, M.W. Giesbrecht, I. Kotsireas, & S.M. Watt, "Numerical Implicitization of Curves and Surfaces," Proc AISC, Madrid, LNAI, vol. 1930, (2001) 174-183.
19. Robert M. Corless, J.H. Davenport, D.J. Jeffrey, G. Litt, & S.M. Watt, "Reasoning About the Elementary Functions of Complex Analysis," Proc. AISC (2001) 115-126.
18. Robert M. Corless, M.W. Giesbrecht, D.J. Jeffrey, X. Liu & S.M. Watt, "Approximate Polynomial Decomposition," Proc. FRISCO Workshop, Oxford, (1999), 6-8
17. Robert M. Corless, M. W. Giesbrecht, D.J. Jeffrey, & S.M. Watt, "Approximate Polynomial Decomposition," Proc. ISSAC, Vancouver, (1999) 213-220.
16. P. Chin, Robert M. Corless, and G.F. Corliss, "Optimization Strategies for the Approximate GCD Problem," Proc. ISSAC (1998) 228-235.
15. J.M. Borwein, P.B. Borwein, Robert M. Corless, Loki Jørgenson & N. Sinclair, "What is Organic Mathematics," Proc. Organic Mathematics Workshop, Dec. 12-14, 1995. eds. J.M. Borwein, P.B. Borwein, Robert M. Corless, & L. Jorgenson; <http://www.cecm.sfu.ca/organics>, Canadian Mathematical Society Proceedings vol. 20. (1997), 1-18.
14. Robert M. Corless, "Continued Fractions and Chaos," Canadian Mathematical Society Proceedings vol. 20. (1997), 205-237
13. Robert M. Corless, P.M. Gianni, & B.M. Trager, "A reordered Schur factorization method for zero-dimensional polynomial systems with multiple roots," ISSAC, (1997), 133-140.
12. Robert M. Corless, D.J. Jeffrey, & D.E. Knuth, "A sequence of series for the Lambert W function," ISSAC, (1997) 197-204.
11. Robert M. Corless & Jacek Rokicki, "The symbolic generation of finite difference formulae," Proc. ICIAM, Hamburg, eds. G. Alefeld, O. Mahrenholtz, R. Mennicken, Zeitschrift für Angewandte Mathematik und Mechanik, 76, supp. 1 (1996) 381-382.
10. Anne-Marie E. Allison and Robert M. Corless, "A Bifurcation Study of a flow-induced vibration model," Proc. ASME FIV, Montreal, M.J. Pettigrew ed., vol. PVP-328 (July 1996) 143-156.
9. Robert M. Corless, P.M. Gianni, B.M. Trager, & S.M. Watt, "The Singular Value Decomposition for Polynomial Systems," Proc. ISSAC (1995) 195-207.
8. Robert M. Corless and K. El-Sawy, "Solution of banded linear systems of equations in Maple using LU factorization," Maple V: Mathematics and Its Application – Proc. of the Maple Summer Workshop and Symposium, Rensselaer Polytechnic Inst., Troy, NY, (August 1994) 219-227.
7. Robert M. Corless, "Sufficiency conditions in the calculus of variations," Proc. ISSAC, Oxford, U.K., July (1994) 197-204.
6. Robert M. Corless & G.V. Parkinson, "Mathematical modelling of the combined effects of vortex-induced vibration and galloping, Part II," Proc. ASME International Symposium on

- Flow-Induced Vibration and Noise, vol. 6 (1992) 39-62.
5. Robert M. Corless & Honglin Ye "Solving linear integral equations in Maple," Proc. ISSAC Symposium Berkeley, CA. (July 1992) 95-103.
  4. Robert M. Corless, C. Essex, T. Lookman, P.A. Rosati, & P.J. Sullivan, "The HP28S/HP48S in first year engineering mathematics," The Fourth Annual Int'l. Conference on Technology in Collegiate Mathematics, Portland, Oregon, (November 1991) 244-250.
  3. Robert M. Corless & G.F. Corliss, "Rationale for guaranteed ODE defect control," Proc. SCAN International Symposium, Oldenburg, Germany (1992) 11 pages.
  2. P.A. Rosati, Robert M. Corless, C. Essex, P. Sullivan, "Student Reaction to the HP28s Calculator in Calculus," Proc. East-West Congress on Engineering Education, Jagiellonian University, Cracow, Poland, (1991) 80-84.
  1. Robert M. Corless, "Chaos in a Flow-induced Vibration Model," Proc. ASME International Symposium on Flow Induced Vibrations and Noise, Chicago, vol. 7, (1988) 77-85.

## BOOKS

3. Robert M. Corless and N. Fillion, [Graduate Introduction to Numerical Methods](#) 868 pages, Springer, (2013), ISBN 978-1-4614-8452-3. Selected as a "Notable Book" in ACM Computing Review's list "Best of 2013". See also A. Townsend, [A review of "A graduate introduction to numerical methods" by Corless and Fillion](#) SIAM Review, pp 795-807, vol 58, no 4 (2016).
2. Robert M. Corless, "Essential Maple 7" Springer, (2002), 282 pages. (2nd ed.), ISBN 0-387-95352-3
1. Robert M. Corless, C. Essex and P.J. Sullivan, "First Year Engineering Mathematics Using Supercalculators" SciTex, The University of Western Ontario 1991, 1992, 1993 (2nd ed), (1995), 400 pages.

## CHAPTERS IN BOOKS

8. Jack Betteridge, Eunice Y.S. Chan, Robert M. Corless, James H. Davenport, and James Grant. "Teaching Programming for Mathematical Scientists." [arXiv preprint](#) Accepted to Artificial Intelligence for Mathematics Education.
7. N. Fillion and Robert M. Corless, "Perturbation Theory", accepted January 2017, for The Sage Encyclopedia of Theory (forthcoming) J. Mattingly (Ed). Golson Publishing.
6. E.Y.S. Chan and Robert M. Corless, [A Random Walk through Experimental Mathematics](#), in Analysis to Visualization: A Celebration of the Life and Legacy of Jonathan M. Borwein. March 2020, pp 203-226.
5. Robert M. Corless and D. J. Jeffrey, [The Lambert W Function](#) in the Princeton Companion to Applied Mathematics, August 2015, 151-155.
4. D.J. Jeffrey & Robert M. Corless, "Linear Algebra in Maple, CRC Handbook of Linear Algebra", Leslie Hogben ed. (2007), 1st ed., 89.1-89.24 2nd ed., (2013).
3. Robert M. Corless and P.W. Lawrence, [The largest roots of the Mandelbrot polynomials](#) in D. Bailey, H.H. Bauschke, P. Borwein, F. Garvan, M. Thera, J. Vanderwerff and H. Wolkowicz, editors, Computational and Analytical Mathematics, (2013) 305-324.

2. Robert M. Corless, E. Kaltofen, S.M. Watt, “Hybrid Methods,” in Computer Algebra Handbook, Springer, eds. J. Grabmeier, E. Kaltofen, V. Weispfenning, December (2002), 113-125.
1. Robert M. Corless, “First Encounters of an AXIOM-XL Novice,” in the AXIOM-XL Library Compiler User Guide, NAG, (1994), 293-320.

#### VOLUMES EDITED

5. Robert M. Corless, Jürgen Gerhard, and I.S. Kotsireas, eds, Proceedings of the Maple 2020 Conference, Springer, to appear.
4. Robert M. Corless, N. Fillion, and I.S. Kotsireas, eds, Fields Institute Communications, [Algorithms & Complexity in Mathematics, Epistemology and Science \(ACMES\)](#) Springer (2019).
3. Robert M. Corless & I.S. Kotsireas, editors, Special Issue of the Canadian Applied Mathematics Quarterly (Scientific and Symbolic Computing), vol 17, no 3, (2009)
2. Robert M. Corless, R. Lauterbach & H.M. Möller, editors, Special Issue of the Journal of Symbolic Computation in honour of Karin Gatermann, vol 44, no 1, (2009)
1. J.M. Borwein, P.B. Borwein, Robert M. Corless, & L. Jorgenson, editors, Proceedings of The Organic Mathematics Workshop, CMS Conference Proceedings, vol 20, (1997), 412 pages

#### PAPERS BY MY STUDENTS WHILE THEY WERE UNDER MY SUPERVISION

5. S. Bangu and R.H.C. Moir, “The Miracle of Applicability? The Curious Case of the Simple Harmonic Oscillator”, Foundations of Physics (2018) 1-19.
4. R.H.C. Moir, “Feasible Computation: Methodological Contributions of Computer Science”, Physical Perspectives on Computation, Computational Perspectives on Physics (2018) 172-194.
3. P.W. Lawrence, “Fast reduction of Generalized Companion Matrix Pairs for Barycentric Lagrange Interpolants”, SIAM J. Matrix Anal Appl. vol 35, no. 3 (2013): 1277-1300.
2. A. Amiraslani, “Dividing polynomials when you only know their values”, EACA (2004) 5-10.
1. A. Shakoori, “The Bézout matrix in the Lagrange basis”, EACA (2004) 295-299.

#### SUBMITTED PAPERS

5. Robert M. Corless, Leili Rafiee Sevyeri, and B. David Saunders, “Equivalences for Linearizations of matrix polynomials”, [arXiv preprint](#) (2021).
4. Eunice Chan and Robert M. Corless, “Chaos Game Representation”, [arXiv preprint](#) (2020).
3. C. Brimacombe, Robert M. Corless, & M. Zamir, “Computation and applications of the Mathieu Functions: A historical perspective” [arXiv preprint](#) (2020).
2. Eunice Y.S. Chan, Robert M. Corless, and Leili Rafiee Sevyeri, “Generalized Standard Triples”, [arXiv preprint](#) (2020).
1. Robert M. Corless “Compact Finite Differences and Cubic Splines”, [arXiv preprint](#) (2018)

#### BOOK REVIEWS

6. Robert M. Corless, “Review of Numerical Analysis, by Brian Sutton” Zentralblatt (2019)
5. Robert M. Corless, “Review of Approximation Theory and Approximation Practice, by L.N. Trefethen” SIAM Review, vol. 58, issue 1 (March 2016)

4. Robert M. Corless, "Review of Solving Transcendental Equations, by John P. Boyd" SIAM Review vol. 57, issue 4 (December 2015).
3. Robert M. Corless, "A review of Modern Computer Algebra, by Joachim von zur Gathen and Jürgen Gerhard" SIGSAM Bulletin, vol. 35, no. 1, issue 135, (2001).
2. J.M. Borwein & Robert M. Corless, review of "An Encyclopedia of Integer Sequences by N.J.A. Sloane and S. Plouffe," SIAM Review 38, 2 (June 1996) 333-337.
1. Robert M. Corless, review of "Differential Equations with Maple V by M.L. Abell and J.P. Braselton," SIGSAM Bulletin, vol. 30, no. 1, March 1996, 57-60.

#### TECHNICAL REPORTS AND UNREFEREED WORKS

33. Robert M. Corless, N.J. Higham, and S.E. Thornton, "Cover Image: Bohemian Matrices", [London Mathematical Society Newsletter, November 2020, page 16.](#)
32. Robert 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 31. Robert M. Corless, K Hill, C.E. Jones, S Macfie, A.J. Moehring, E Shemyakova, & L.M. Wahl, "Engaging faculty in the pedagogical literature," Conference Presentation at Western Conference on Science Education (2011).
31. Robert M. Corless, D. Aruliah, L. Gonzalez-Vega, A. Shakoori, "Geometric Applications of the Bezout Matrix in the Bivariate Tensor-Product Lagrange basis", ORCCA Technical Report TR-07-02, (2007) 8 pages
30. Robert M. Corless, N. Rezvani, "The Nearest Polynomial with Lower Degree", ORCCA Technical Report TR-06-03, (2006), 9 pages
29. Robert M. Corless, "What's  $\nu$  about the derivative?", ORCCA Technical Report TR-06-02, (2006)
28. Robert M. Corless, J. Zhao, "Symbolic Generation of Finite Differences", ORCCA Technical Report TR-05-05, (2005)
27. A.B. Pitcher, Robert M. Corless, "Quasipolynomial root-finding and applications" (Poster), ORCCA Technical Report TR-05-04, (2005), 1 page
26. A.Pitcher & Robert M. Corless, "Quasipolynomial root-finding: A numerical homotopy method," Electronic proceedings of the Canadian Undergraduate Mathematics Conference, Queen's University (August 2005) <http://eaton.math.rpi.edu/csums/papers/Homotopy/pitcher.pdf>.
25. Robert M. Corless, D.J. Jeffrey, "Complex Numerical Values for the Wright omega function", ORCCA Technical Report TR-04-04, (2004), 28 pages
24. Robert M. Corless, D.J. Jeffrey, "Computer Algebra Support for the Wright omega function", ORCCA Technical Report TR-04-03, (2004), 27 pages
23. Robert M. Corless, H. Kai, S.M. Watt, "Approximate computation of pseudovarieties," SIGSAM Bulletin, vol. 37, no. 3, issue 145, (September 2003) 67-71.
22. M. Benghorbal & Robert M. Corless. "The nth derivative," SIGSAM Bull 36(1) (2002) 10-14.
21. Robert M. Corless, "Symbolic-Numeric Algorithms for Polynomials: some recent results," Proceedings of Dagstuhl Seminar, Symbolic-Algebraic and Verification Methods, Dagstuhl, Germany (2001), 21-22
20. Robert M. Corless, "Closures of branch cuts for elementary functions in Maple 7", ORCCA Technical Report TR-01-08, (2001)

19. Robert M. Corless, "HIV and Antiviral Therapy", ORCCA Technical Report TR-00-22, (2000)
18. Robert M. Corless, D.J. Jeffrey, "Still More Fun Results on the Lambert W Function", ORCCA Technical Report TR-00-22, (2000)
17. Robert M. Corless, J. Schicho, "Iterated Improvement using the SVD for Singular Linear Systems", ORCCA Technical Report TR-00-09, (2000), 10 pages
16. Robert M. Corless. "An elementary solution of a minimax problem arising in algorithms for automatic mesh selection," SIGSAM Bulletin: vol. 34, no. 4, issue 134, (December 2000) 7-15.
15. Robert M. Corless, J.H. Davenport, D.J. Jeffrey, S.M. Watt, "According to Abramowitz & Stegun, or Arcoth needn't be uncouth," SIGSAM Bull (34)(2) (June 2000) 58-65.
14. Robert M. Corless & S.M. Watt, "Report on the SNAP mini" SIGSAM Bull (32)2 1998 35-37.
13. Robert M. Corless and D.J. Jeffrey, "Graphing elementary Riemann surfaces," SIGSAM Bulletin, vol. 32, no. 1, issue 123, (March 1998) 11-17.
12. Robert M. Corless and D.J. Jeffrey, "The Turing factorization of a matrix," SIGSAM Bulletin, vol. 31, no. 3, issue 121, (September 1997) 21-29.
11. M.O. Ahmed and Robert M. Corless, "The method of modified equations in Maple," Electronic Proceedings 3rd International IMACS conference, Applications of Computer Algebra, Maui, (July 1997); eds. M. Wester & S. Steinberg; <http://math.unm.edu/ACA/1997.html>.
10. Robert M. Corless, "Gröbner Bases and matrix eigenproblems," SIGSAM Bulletin, vol. 30, no. 4, issue 118, (December 1996) 26-32.
9. Robert M. Corless and D.J. Jeffrey, "The unwinding number," SIGSAM Bulletin, vol. 30, no. 2, issue 116, (June 1996) 28-35.
8. Robert M. Corless, "Cofactor iteration," SIGSAM Bull (30)1 (1996) 34-39.
7. Anne-Marie E. Allison and Robert M. Corless, "Prediction of closed-loop hysteresis with a flow-induced vibration model," Proc. CANCAM, Victoria, vol. 2, (1995) 512-513.
6. T. Chen, Robert M. Corless and H. Rasmussen, "A numerical study of flow past circular cylinder using vortex method," Proc. Third Annual Conference of the CFD Society of Canada, Banff, Alberta, (June 1995) vol. 1, 409-413.
5. Robert M. Corless, "What is a solution to an ODE?," SIGSAM Bull (27)4 (1993) 15-19.
4. Robert M. Corless and D.J. Jeffrey, "Well, It isn't quite that simple," SIGSAM Bulletin vol. 26, no. 3, issue 101 (1992) 2-6.
3. Robert M. Corless, C. Essex, P. Sullivan and P. Rosati, "Using the HP28S calculator in the calculus course for engineering students," Proc. 7th Canadian Conference on Engineering Education, University of Toronto (1990).
2. Robert M. Corless and D.J. Jeffrey, "A comparison of three computer algebra systems for the solution of a problem in hydrodynamic lubrication," SIGSAM Bull, 22, no. 2 (1988): 50-62.
1. Robert M. Corless and R.B. Simpson, "An 'off-the-shelf' dynamic mesh capability", ACM SIGNUM Newsletter vol. 18, no 2 (1983): 23-24

#### OTHER PUBLICATIONS

2. The Lambert W Function Poster (2004) This poster describes some interesting properties of a recently named mathematical function. 4000 copies were produced and widely distributed. <http://www.orcca.on.ca/LambertW/>
1. Applied Math Coffee Mug Design (1998)

## SELECTED TALKS

27. Teaching Programming to Mathematical Scientists, CUNEF, Madrid, Spain, February 2020
26. Masterclass on Maple (parts I and II), Isaac Newton Institute, 2019
25. “[An Old Special Function meets a \(slightly\) Newer One](#)”, Isaac Newton Institute, Nov 2019
24. “Bohemian Companions”, MEGA 2019 plenary, Madrid, June 2019
23. “Bohemian Matrices”, U. Manchester (Manchester UK, 20 June, 2018) [YouTube Link](#)
22. “Bohemian Eigenvalues”, U. Alcalá (Alcalá de Henares Spain, 18 May, 2017).
21. “A new kind of companion matrix”, U. Complutense (Madrid Spain, 23 May, 2017).
20. “Gamma and Factorial in the Monthly”, opening plenary, ACA (Jerusalem Israel, 17 July, 2017).
19. “Approximating the Functional Inverse of Gamma”, [BIRS video link](#) (Oaxaca Mexico 2016).
18. “The Lambert W Function”, Celebrating 20 years of W (Western University, July 2016).
17. “Bohemian Eigenvalues”, Computational Discovery (Western, 2016). [YouTube Link](#)
16. “Twenty plus years of the Lambert W. Function”, International Conference on Analysis, Applications, and Computations: In Memory of Lee Lorch, Fields Institute (September 2015).
15. “Optimal Backward Error and the Leaky Bucket”, ACMES (Western University, May 2015)
14. “Optimal Backward Error and the Dahlquist Test Problem”, SPCOM (Newcastle AU, 2015)
13. “Computer Algebra for Experimental Mathematics”, TRICS (Western, 2014)
12. “What is Experimental Mathematics?”, Undergraduate Society of Applied Mathematics (Western University, October 2014)
11. “Numerical Stability of Polynomial Eigenvalue Algorithms in the Lagrange Basis,” MATFUN (Manchester, UK) ( April 2013).
10. “Polynomial or Rational Interpolants in the Lagrange Basis,” ANODE (Auckland 2013).
9. “Defect assessment for numerical solutions of chaotic DE,” MAGIC (Mistletoe Bay NZ 2012).
8. “First encounters of a Chebfun Novice,” ICIAM, Vancouver (2011).
7. “Polynomial Algebra for Birkhoff Interpolants,” SANUM, Stellenbosch, SA (2010).
6. “Pseudospectra of Matrix Exponential Polynomials,” SNC, Kyoto, Japan (August 2009).
5. “Polynomial Algebra by Values,” Special Semester on Gröbner Basis, ApCoA, Linz, Austria, (February 2006).
4. “On a Generalized Companion Matrix Pencil for Matrix Polynomials Expressed in the Lagrange Basis,” SNC 2005, Xi’an, China
3. “Numerical Nonlinear Algebra,” COSCOMP Conference on Scientific Computing, Vienna, Austria, (June 2005).
2. “Computer-Mediated Thinking,” Invited plenary lecture at “Technology in Mathematics Education”, TIME, Montreal, (July 2004).
1. “Software tools for mathematical communication,” Proceedings on the Future of Mathematical Communication”, Mathematical Sciences Research Institute, Berkeley, December, (1999)

## 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. This changes continually as knowledge advances. This has changed radically with the introduction of the web, wide social networks, online tools including videos, and will change even more radically as AI tools take hold. Yet a second way, a possibly more important way, that a human researcher/instructor influences teaching is that a researcher is an excited learner, 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 as we know it today 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 have been in 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.

Several of my listed publications can be considered research in mathematics education; for instance, my most recently submitted paper is intended for a volume of papers on Artificial Intelligence in Mathematics Education. I am particularly concerned with the ethics of teaching with AI.

I have supervised or co-supervised seventeen PhD theses, thirteen masters theses (one currently), 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 (most recently for two theses out of the University of Newcastle, Australia), and as chair of thesis exams at Western.



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

List of PhD Students Advised:

2020	Leili Rafiee Sevyeri, <a href="#">Hybrid Symbolic-Numeric Computing in Linear and Polynomial Algebra</a>
2019	Eunice Chan, <a href="#">Algebraic Companions and Linearizations</a>
2019	Steven E. Thornton, <a href="#">Algorithms for Bohemian Matrices</a>
2017	Robert H. C. Moir, <a href="#">Feasible Computation in Symbolic and Numeric Integration</a>
2013	Yiming Zhang, <a href="#">Computation Sequences for Series and Polynomials</a>
2013	Piers W. Lawrence, <a href="#">Eigenvalue methods for Interpolation Bases</a>
2009	Hui Ding, Numerical and Symbolic Computation of the Lambert $W$ Function in $C^{m \times n}$
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:

2020–22	Aaron Asner, U. Waterloo, In progress
2019	Irene Novarinho, AIMS, Backward Error for Continued Fractions
2019	Jeet Trivedi, <a href="#">A Survey of Quadrature Methods for Oscillatory Integration</a>
2016	Eunice Chan, <a href="#">A Comparison of solution methods for Mandelbrot-like polynomials</a>
2016	Leili Rafiee Sevyeri, <a href="#">A Sequence of Symmetric Bézout Matrix Polynomials</a>
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 have been Scientific Director since 2015 for the Ontario Research Center for Computer Algebra (ORCCA), which 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](http://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 enjoy such roles, because they give me a chance to ensure that my colleagues get the appropriate rewards for the work that they do. 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. But, speaking personally, I have found it valuable: most simply, by looking at a broader pool of students than perhaps was traditional, and by trying to measure their ability by looking beyond simple grade point averages. For instance, one valuable piece of data is the GPA trajectory over the course of a bachelor's degree: do the grades consistently increase? This often reveals a deeper and stronger talent than simply high marks.

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 “Towards 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

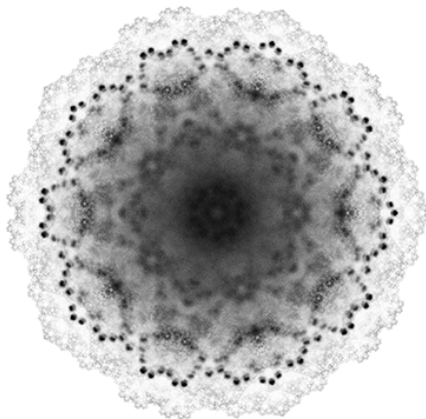
I regularly serve in various roles for conference organization; most recently I was co-Chair with Juergen Gerhard of the Program Committee for the Maple Conference Nov 2–6 2020 (held online, of course, owing to COVID-19; even so, it was the largest computer algebra conference ever held, with over four hundred active attendees). I have been the principal organizer for conferences sponsored by the Fields Institute, and for minisymposia at SIAM meetings and at ICIAM, most recently on Bohemian Matrices and Applications at ICIAM 2019 in Valencia.

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 a life member of CAIMS (the Canadian Applied and Industrial Mathematics Society) and a member of SIAM.

I have reviewed several departments and programs and for granting agencies (including for the NSF (USA) and for the FWF (Austria)). I am a regular reviewer for several journals, including 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](http://bohemianmatrices.com), the journal paper [95](#), or the unrefered note [33](#) for more information. Image by my former PhD student Steven E. Thornton.