CURRICULUM VITAE

Nicholas Ian Mark Gould

2023

1 Personal data

Date of birth: 25th April, 1957.
Place of birth: Woking, England.
Nationality: British.

Degrees:

1982 D. Phil. Oxford.
Thesis title: Numerical methods for linear and quadratic programming.

1979 B.A. (1st class honours moderations, 1st class honours) Oxford.

Positions held:

2011– Band H (Individual Merit)/STFC Senior Fellow, Computational Mathematics Group, Rutherford Appleton Laboratory, Oxfordshire (part time from 2017).

2006–2008 Professor of Numerical Optimisation and Fellow of Exeter College, University of Oxford.

1999–2011 Band 2 (Individual Merit)/STFC (CCLRC) Fellow, Numerical Analysis Group, Computational Science and Engineering Department, Rutherford Appleton Laboratory, Oxfordshire.

1990–1999 Grade 7, Numerical Analysis Group, Computational Science and Engineering Department (previously Central Computing Department, Computing and Information Systems Department and Department for Computation and Information), Rutherford Appleton Laboratory, Oxfordshire.

1989–1990 Principal Scientific Officer/PMG1, Numerical Analysis Group, Computer Science and Systems Division, Harwell Laboratory, Oxfordshire.

1985–1989 Senior Scientific Officer/PMG2, Numerical Analysis Group, Computer Science and Systems Division, Harwell Laboratory, Oxfordshire.

1982–1985 Assistant Professor, Department of Combinatorics and Optimization, University of Waterloo, Ontario, Canada.

1976 Assistant Scientific Officer, Division of Numerical Analysis and Computing, National Physical Laboratory, Teddington, Middlesex.

Visiting appointments:

2008– Visiting Professor in Numerical Optimisation, University of Oxford.

2004 Senior Visiting Scientist, Argonne National Laboratory, Illinois, U.S.A.

1998– Visiting Professor, Department of Mathematics and Statistics, University of Edinburgh.

1993 Senior, Parallel Algorithms Team, CERFACS, Toulouse, France.

1989 Visiting fellow, Royal Military College of Science, Shrivenham.

1981–1982 Visiting scholar, Department of Operations Research, Stanford University, California, U.S.A.

Awards:

Inaugural SIAM Fellow, May 2009.

Beale–Orchard-Hays Prize for excellence in computational mathematical programming, August 1994.

Leslie Fox Prize in numerical analysis, September 1986.

Exhibitioner, Corpus Christi College, Oxford 1976–1977, Scholar of the College, 1977–1979.

Research grants:

2000–2020 EPSRC strategic and responsive-mode research grants:

- **2015–2020.** Least Squares: Fit for the Future (£970k, EP/M025179/1, CoI)
- **2013–2015.** Preconditioners for Large-Scale Atomistic Simulations (£Â£33k, EP/J021377/1, PI)
- **2011–2015.** Algorithms and Software for Emerging Architectures (£482k, EP/J010553/1, CoI)
- **2011–2015.** Linear Algebra and Optimization: Structure, Sparsity, Algorithms and Software (£1,489k, EP/I013067/1, CoI)
- **2010.** Iterative Methods for PDE-Constrained Optimization (£12k, EP/H026053/1, PI)
- **2009.** Multilevel Methods for Large-Scale Nonlinear Optimization (£12k, EP/G038643/1, PI)

2007–2010. Algorithms for Large-Scale Nonlinearly Constrained Optimization (£336k, EP/F005369/1, PI)

2007–2011. Algorithms and Software for Large-Scale Sparse or Structured Systems (£1,604k EP/E053351/1, CoI)

2003–2007. Research and development of algorithms and software for large-scale linear and nonlinear systems (£433k GR/S42170/01, CoI)

2002–2003. Development of GALAHAD, a library of packages for the solution of large-scale nonlinear optimization problems (£6k GR/S02969/01, CoI)

1999–2001. Research and development of algorithms and software for large-scale linear and nonlinear systems (£375k, GR/M78502/01, CoI)

1996–1997 British Council-MURST/CRUI grant.

1994–1995 Alliance grant from the British Council.

1990–1995 NATO travel grant.

1983–1985 Natural Science and Engineering Research Council of Canada grant.

1979–1982 Science and Engineering Research Council of Great Britain grant.

2 Research Interests

- Numerical optimization
- Numerical analysis
- Linear algebra
- Large scale scientific computation
- High performance computation

3 Publications

ORCID: 0000-0002-1031-1588, Web of Science: AAS-2273-2020, Scopus: 7006035543
[DOI] = active DOI link, [PDF] = active link to PDF

Books:

1. C. Cartis, N. I. M. Gould and Ph. L. Toint, "Evaluation complexity of algorithms for nonconvex optimization: theory, computation and perspectives", MOS-SIAM Series on Optimization, SIAM, Philadelphia (2022), ISBN 978-1-611976-98-4. [DOI]

2. A. R. Conn, N. I. M. Gould and Ph. L. Toint, "Trust-region methods", SIAM/MPS Series on Optimization, SIAM, Philadelphia (2000), ISBN 0-89871-460-5. [DOI]

3. A. R. Conn, N. I. M. Gould and Ph. L. Toint, "LANCELOT: a Fortran package for large-scale nonlinear optimization, release A", Series in Computational Mathematics **17**, Springer-Verlag, Berlin (1992), ISBN 3-540-55470-X. [DOI]

Edited collections:

1. N. I. M. Gould, S. Leyffer and Ph. L. Toint, "Nonlinear programming: theory and practice" *Mathematical Programming B* **100(1)** (2004). [DOI]

2. I. S. Duff, N. I. M. Gould, C. C. Douglas and L. Giraud, "Direct methods, linear algebra in optimization, and iterative methods: Proceedings from the International Linear Algebra Year workshops, September 1995–June 1996" *BIT* **37(3)** (1997). [DOI]

3. A. R. Conn, N. I. M. Gould and Ph. L. Toint, "Large-Scale Optimization—Applications" *Mathematical Programming B* **48(1)** (1990). [DOI]

4. A. R. Conn, N. I. M. Gould and Ph. L. Toint, "Large-Scale Optimization" *Mathematical Programming B* **45(3)** (1989).

Refereed articles:

1. J. M. Fowkes and N. I. M. Gould, "GALAHAD 4.0: an open source library of Fortran packages with C and Matlab interfaces for continuous optimization". *Journal of Open Source Software* **8(87)** (2023) 4882. [DOI] [PDF]

2. C. Cartis, N. I. M. Gould and M. Lange, "On monotonic estimates of the norm of the minimizers of regularized quadratic functions in Krylov spaces". *BIT* **60(2)** (2020) 583–589. [DOI] [PDF]

3. C. Cartis, N. I. M. Gould and Ph. L. Toint, "Sharp worst-case evaluation complexity bounds for arbitrary-order nonconvex optimization with inexpensive constraints". *SIAM Journal on Optimization* **30(1)** (2020) 513–541. [DOI] [PDF]

4. C. Cartis, N. I. M. Gould and Ph. L. Toint, "A concise second-order complexity analysis for unconstrained optimization using high-order regularized models", *Optimization Methods and Software*, **35(2)** (2020) 243–256. [DOI] [PDF]

5. N. I. M. Gould and V. Simoncini, "Error estimates for iterative algorithms for minimizing regularized quadratic subproblems". *Optimization Methods and Software*, **35(2)** (2020) 304–328. [DOI] [PDF]

6. N. I. M. Gould, T.Rees and J. A. Scott, "Convergence and evaluation-complexity analysis of a regularized tensor-Newton method for solving nonlinear least-squares problems". *Computational Optimization and Applications*, **73(1)** (2019) 1–35. [DOI] [PDF]

7. C. Cartis, N. I. M. Gould and Ph. L. Toint, "Universal regularization methods-varying the power, the smoothness and the accuracy". *SIAM Journal on Optimization* **29(1)** (2019) 595-–615. [DOI] [PDF]

8. C. Cartis, N. I. M. Gould and Ph. L. Toint, "Optimality of orders one to three and beyond : characterization and evaluation complexity in constrained nonconvex optimization". *Journal of Complexity* **53** (2019) 68-–94. [DOI] [PDF]

9. F. Furini, E. Traversi, P. Belotti, A. Frangioni, A. Gleixner, N. I. M. Gould, L. Liberti, A. Lodi, R. Misener, H. Mittelmann, N. V. Sahinidis, S. Vigerske and A. Wiegele, "QPLIB: a library of quadratic programming instances". *Mathematical Programming Computation*, **10(2)** (2019) 237-–265. [DOI] [PDF]

10. C. Cartis, N. I. M. Gould and Ph. L. Toint, "Second-order optimality and beyond: characterization and evaluation complexity in nonconvex convexly-constrained optimization". *Foundations of Computational Mathematics*, **18(5)** (2018) 1073—1107. [DOI] [PDF]

11. C. Cartis, N. I. M. Gould and Ph. L. Toint, "Worst-case evaluation complexity of regularization methods for smooth unconstrained optimization using Hölder continuous gradients". *Optimization Methods and Software* **32(6)** (2017) 1273–1298. [DOI] [PDF]

12. N. I. M. Gould and D. P. Robinson, "A dual gradient-projection method for large-scale strictly convex quadratic problems". *Computational Optimization and Applications* **67(1)** (2017) 1–38. [DOI] [PDF]

13. C. Cartis, N. I. M. Gould and Ph. L. Toint, "Corrigendum: On the complexity of finding first-order critical points in constrained nonlinear optimization". *Mathematical Programming* **161(1-2)** (2017) 611–626. [DOI] [PDF]

14. F. E. Curtis, N. I. M. Gould, D. P. Robinson and Ph. L. Toint, "An interior-point trust-funnel algorithm for nonlinear optimization". *Mathematical Programming* **161(1-2)** (2017) 73–134. [DOI] [PDF]

15. N. I. M. Gould and J. A. Scott, "The state-of-the-art of preconditioners for sparse linear least-squares problems", *ACM Transactions on Mathematical Software* **43(4)** Article 36 (2016). [DOI] [PDF]

16. N. I. M. Gould and J. A. Scott, "A note on performance profiles for benchmarking software", *ACM Transactions on Mathematical Software* **43(2)** Article 15 (2016). [DOI] [PDF]

17. D. Packwood, J. R. Kermode, L. Mones, N. Bernstein, J. Woolley, N. I. M. Gould, C. Ortner and G. Csányi, "A universal preconditioner for simulating condensed phase materials". *Journal of Chemical Physics* **144(16)** (2016) 164109. [DOI] [PDF]

18. N. I. M. Gould, C. Ortner and D. Packwood, "A dimer-type saddle search algorithm with preconditioning and linesearch". *Mathematics of Computation* **85** (2016) 2939–2966. [DOI] [PDF]

19. F. E. Curtis, N. I. M. Gould, H. Jiang and D. P. Robinson, "Adaptive augmented Lagrangian methods: algorithms and practical numerical experience". *Optimization Methods and Software*, **31(1)** (2016) 157–186. [DOI] [PDF]

20. N. I. M. Gould, Y. Loh and D. P. Robinson "A nonmonotone Filter SQP Method: local convergence and numerical results". *SIAM Journal on Optimization* **25(3)** (2015) 1944–1963. [DOI] [PDF] [PDF]

21. C. Cartis, N. I. M. Gould and Ph. L. Toint, "On the evaluation complexity of constrained nonlinear least-squares and general constrained nonlinear optimnization using second-order methods". *SIAM Journal on Numerical Analysis* **52(3)** (2015) 836–851. [DOI] [PDF]

22. C. Cartis, J. M. Fowkes and N. I. M. Gould, "Branching and bounding improvements for global optimization algorithms with Lipschitz continuity properties". *Journal of Global Optimization* **61(3)** (2015) 429–457. [DOI] [PDF]

23. N. I. M. Gould, D. Orban and T. Rees, "Projected Krylov methods for saddle-point systems". *SIAM Journal on Matrix Analysis and Applications* **35(4)** (2014) 1329–1343. [DOI] [PDF]

24. N. I. M. Gould, D. Orban and Ph. L. Toint, "CUTEst : a Constrained and Unconstrained Testing Environment with safe threads for mathematical optimization". *Computational Optimization and Applications* **60 (3)** (2014) 545–557. [DOI] [PDF]

25. C. Cartis, N. I. M. Gould and Ph. L. Toint, "On the complexity of finding first-order critical points in constrained nonlinear optimization". *Mathematical Programming* **144(1-2)** (2014) 93–106. [DOI] [PDF]

26. N. I. M. Gould, Y. Loh and D. P. Robinson "A filter method with unified step computation for nonlinear optimization". *SIAM Journal on Optimization* **24(1)** (2014) 175–209. [DOI] [PDF]

27. C. Cartis, N. I. M. Gould and Ph. L. Toint, "On the evaluation complexity of cubic regularization methods for potentially rank-deficient nonlinear least-squares problems and its relevance to constrained nonlinear optimization". *SIAM Journal on Optimization* **23(3)** (2013) 1553–1574. [DOI] [PDF]

28. N. I. M. Gould, D. Orban and D. P. Robinson, "Trajectory-following methods for large-scale degenerate convex quadratic programming". *Mathematical Programming Computation* **5(2)** (2013) 113–142. [DOI] [PDF]

29. C. Cartis, N. I. M. Gould and Ph. L. Toint, "A note about the complexity of minimizing Nesterov's smooth Chebyshev-Rosenbrock function". *Optimization Methods and Software* **28(3)** (2013) 451-457. [DOI] [PDF] [PDF]

30. J. M. Fowkes, N. I. M. Gould and C. L. Farmer, "A branch and bound algorithm for the global optimization of Hessian Lipschitz continuous functions". *Journal of Global Optimization* **56(4)** (2013) 1791–1815. [DOI] [PDF]

31. P. A. Browne, C. J. Budd, N. I. M. Gould, H. A. Kim and J. A. Scott, "A fast method for binary programming using first-order derivatives, with application to topology optimization with buckling constraints" *International Journal for Numerical Methods in Engineering* **92(12)** (2012) 1026–1043. [DOI] [PDF]

32. C. Cartis, N. I. M. Gould and Ph. L. Toint, "How much patience do you have? A worst-case perspective on smooth nonconvex optimization", *Optima* **88** (2012) 1–10. [PDF]

33. C. Cartis, N. I. M. Gould and Ph. L. Toint, "On the oracle complexity of first-order and derivative-free algorithms for smooth nonconvex minimization". *SIAM Journal on Optimization* **22(1)** (2012) 66–86. [DOI] [PDF]

34. C. Cartis, N. I. M. Gould and Ph. L. Toint "An adaptive cubic regularization algorithm for nonconvex optimization with convex constraints and its function-evaluation complexity". *IMA Journal of Numerical Analysis* **32(4)** (2012) 1662–1695. [DOI] [PDF]

35. N. I. M. Gould, M. Porcelli and Ph. L. Toint, "Updating the regularization parameter in the adaptive cubic regularization algorithm". *Computational Optimization and Applications.* **53(1)** (2012) 1–22. [DOI] [PDF]

36. C. Cartis, N. I. M. Gould and Ph. L. Toint "Evaluation complexity of adaptive cubic regularization methods for convex unconstrianed optimization". *Optimization Methods and Software* **27(2)** (2012) 197–219. [DOI] [PDF]

37. C. Cartis, N. I. M. Gould and Ph. L. Toint "Complexity bounds for second-order optimality in unconstrained optimization". *Journal of Complexity* **28(1)** (2012) 93–108. [DOI] [PDF]

38. N. I. M. Gould, "How good are extrapolated bi-projection methods for linear feasibility problems?". *Computational Optimization and Applications* **51(3)** (2012) 1089–1095. [DOI] [PDF] [PDF]

39. N. I. M. Gould and D. P. Robinson, "A second-derivative trust-region SQP method with a "trust-region-free" predictor step". *IMA Journal of Numerical Analysis* **32(2)** (2012) 580–601. [DOI] [PDF]

40. C. Cartis, N. I. M. Gould and Ph. L. Toint, "On the evaluation complexity of composite function minimization with applications to nonconvex nonlinear programming". *SIAM Journal on Optimization* **21(4)** (2011) 1721–1739. [DOI] [PDF]

41. C. Cartis, N. I. M. Gould and Ph. L. Toint "Adaptive cubic regularisation methods for unconstrained optimization. Part II: worst-case function and derivative-evaluation complexity" *Mathematical Programming* **130(2)** (2011) 295–319. [DOI] [PDF]

42. C. Cartis, N. I. M. Gould and Ph. L. Toint "Adaptive cubic regularisation methods for unconstrained optimization. Part I: motivation, convergence and numerical results" *Mathematical Programming* **127(2)** (2011) 245–295. [DOI] [PDF]

43. C. Cartis, N. I. M. Gould and Ph. L. Toint "On the complexity of steepest descent, Newton's method and regularized Newton's methods for nonconvex unconstrained optimization problems". *SIAM Journal on Optimization* **20(6)** (2010) 2833–2852. [DOI] [PDF]

44. N. I. M. Gould, D. P. Robinson and H. S. Thorne, "On solving trust-region and other regularised subproblems in optimization". *Mathematical Programming Computation* **2(1)** (2010) 21–57. [DOI] [PDF]

45. N. I. M. Gould and D. P. Robinson, "A second derivative SQP method: local convergence and practical issues". *SIAM Journal on Optimization* **20(4)** (2010) 2049–2079. [DOI] [PDF]

46. N. I. M. Gould and D. P. Robinson, "A second derivative SQP method: global convergence". *SIAM Journal on Optimization* **20(4)** (2010) 2023–2048. [DOI] [PDF]

47. S. Bellavia, C. Cartis, N. I. M. Gould, B. Morini and Ph. L. Toint, "Convergence of a regularized Euclidean residual algorithm for nonlinear least-squares". *SIAM Journal on Numerical Analysis* **48(1)** (2010) 1–29. [DOI] [PDF]

48. H. S. Dollar, N. I. M. Gould, M. Stoll and A. J. Wathen, "Preconditioning Saddle-Point Systems with Applications in Optimization". *SIAM Journal on Scientific Computing* **32(1)** (2010) 249– 270. [DOI] [PDF]

49. N. I. M. Gould and Ph. L. Toint, "Nonlinear programming without a penalty function or a filter." *Mathematical Programming* **122(1)** (2010) 155–196. [DOI] [PDF]
See also "Corrigendum: Nonlinear programming without a penalty function or a filter" with additionally D. P. Robinson, *Mathematical Programming* **131(1)** (2012) 403-404. [DOI] [PDF]

50. N. I. M. Gould and V. Simoncini, "Spectral analysis of saddle point matrices with indefinite leading blocks". *SIAM Journal on Matrix Analysis and Applications* **31(3)** (2009) 1152–1171. [DOI] [PDF]

51. C. Cartis, N. I. M. Gould and Ph. L. Toint, "Trust-region and other regularisations of linear least-squares problems". *BIT* **49(1)** (2009) 21–53. [DOI] [PDF]

52. N. I. M. Gould, "How good are projection methods for convex feasibility problems?" *Computational Optimization and Applications* **40(1)** (2008) 1–12. [DOI] [PDF] [PDF]

53. H. S. Dollar, N. I. M. Gould, W. H. A. Schilders and A. J. Wathen, "Using constraint preconditioners with regularized saddle-point problems". *Computational Optimization and Applications* **36(2-3)** (2007) 249–270. [DOI] [PDF]

54. N. I. M. Gould, Y. Hu and J. A. Scott, "A numerical evaluation of sparse direct solvers for the solution of large, sparse, symmetric linear systems of equations". *ACM Transactions on Mathematical Software* **33(2)** (2007). Article 2. [DOI] [PDF]

55. N. I. M. Gould and Ph. L. Toint, "FILTRANE, a fortran 95 filter-trust-region package for solving nonlinear feasibility problems". *ACM Transactions on Mathematical Software* **33(1)** (2007) Article 3. [DOI] [PDF]

56. H. S. Dollar, N. I. M. Gould, W. H. A. Schilders and A. J. Wathen, "Implicit-factorization preconditioning and iterative solvers for regularized saddle-point systems". *SIAM Journal on Matrix Analysis and Applications* **28** (2006) 170–189. [DOI] [PDF]

57. R. H. Byrd, N. I. M. Gould, J. Nocedal and R. A. Waltz, "On the convergence of successive linear-quadratic programming algorithms". *SIAM Journal on Optimization* **16(2)** (2006) 471–489. [DOI] [PDF]

58. N. I. M. Gould, C. Sainvitu and Ph. L. Toint, "A filter-trust-region method for unconstrained optimization" *SIAM Journal on Optimization* **16(2)** (2006) 341–357. [DOI] [PDF]

59. N. I. M. Gould, D. Orban, A. Sartenaer and Ph. L. Toint, "Sensitivity of trust-region algorithms to their parameters". *4OR*, **3(1)** (2005) 227–241. [DOI] [PDF]

60. N. I. M. Gould, D. Orban and Ph. L. Toint, "Numerical methods for large-scale nonlinear optimization" *Acta Numerica* **14** (2005) 299–361. [DOI] [PDF]

61. N. I. M. Gould, S. Leyffer and Ph. L. Toint, "A multidimensional filter algorithm for nonlinear equations and nonlinear least-squares". *SIAM Journal on Optimization* **15(1)** (2005) 17–38. [DOI] [PDF]

62. N. I. M. Gould and J. A. Scott "A numerical evaluation of HSL packages for the direct-solution of large sparse, symmetric linear systems of equations". *ACM Transactions on Mathematical Software* **30(3)** (2004) 300-325. [DOI] [PDF]

63. N. I. M. Gould and Ph. L. Toint, "Preprocessing for quadratic programming", *Mathematical Programming B* **100:1** (2004) 95–132. [DOI] [PDF]

64. R. H. Byrd, N. I. M. Gould, J. Nocedal and R. A. Waltz "An algorithm for nonlinear programming using linear programming and equality constrained subproblems". *Mathematical Programming B* **100:1** (2004) 27–48. [DOI] [PDF]

65. N. I. M. Gould, D. Orban and Ph. L. Toint, "CUTEr (and SifDec), a Constrained and Unconstrained Testing Environment, revisited", *ACM Transactions on Mathematical Software* **29(4)** (2003) 373–394. [DOI] [PDF]

66. N. I. M. Gould, D. Orban and Ph. L. Toint, "GALAHAD—a library of thread-safe fortran 90 packages for large-scale nonlinear optimization". *ACM Transactions on Mathematical Software* **29(4)** (2003) 353–372. [DOI] [PDF]

67. N. I. M. Gould, "Some Reflections on the Current State of Active-Set and Interior-Point Methods for Constrained Optimization" *SIAG/Optimization Views-and-News* **14(1)** (2003) 2–7. [PDF]

68. R. Fletcher, N. I. M. Gould, S. Leyffer, Ph. L. Toint and A. Wächter, "Global convergence of trust-region SQP-filter algorithms for general nonlinear programming", *SIAM Journal on Optimization* **13** (2002) 635–659. [DOI] [PDF]

69. N. I. M. Gould and Ph. L. Toint, "An iterative working-set method for large-scale non-convex quadratic programming". *Applied Numerical Mathematics* **43(1–2)** (2002) 109–128. [DOI] [PDF]

70. N. I. M. Gould, D. Orban, A. Sartenaer and Ph. L. Toint, "Componentwise fast convergence in the solution of full-rank systems of nonlinear equations". *Mathematical Programming B* **92** (2002) 481–508. [DOI] [PDF]

71. N. I. M. Gould, M. E. Hribar and J. Nocedal, "On the solution of equality constrained quadratic programming problems arising in optimization", *SIAM Journal on Scientific Computing* **23(4)** (2001) 1375–1394. [DOI] [PDF]

72. N. I. M. Gould, D. Orban, A. Sartenaer and Ph. L. Toint, "Superlinear convergence of primal-dual interior point algorithms for nonlinear programming". *SIAM Journal on Optimization* **11** (2001) 974–1002. [DOI] [PDF]

73. N. I. M. Gould, S. Lucidi, M. Roma and Ph. L. Toint, "Exploiting Negative Curvature Directions in Linesearch Methods for Unconstrained Optimization", *Optimization Methods and Software* **14** 1–2 (2000) 75–98. [DOI] [PDF]

74. C. Keller, N. I. M. Gould and A. J. Wathen, "Constraint preconditioning for indefinite linear systems", *SIAM Journal on Matrix Analysis and Applications* **21** (2000) 1300–1317. [DOI] [PDF]

75. A. R. Conn, N. I. M. Gould, D. Orban and Ph. L. Toint, "A primal-dual trust-region algorithm for non-convex nonlinear optimization". *Mathematical Programming* **87** (2000) 215–249. [DOI] [PDF]

76. M. J. Daydé, J. P. Décamps and N. I. M. Gould, "Subspace-by-Subspace preconditioners for structured linear systems". *Numerical Linear Algebra* **6** (1999) 213–234. [DOI] [PDF]

77. N. I. M. Gould and Ph. L. Toint, "A note on the convergence of barrier algorithms to second-order necessary points", *Mathematical Programming* **85** (1999) 433–438. [DOI] [PDF]

78. N. I. M. Gould, "On modified factorizations for large-scale linearly-constrained optimization". *SIAM Journal on Optimization* **9(4)** (1999) 1041–1063. [DOI] [PDF]

79. N. I. M. Gould, S. Lucidi, M. Roma and Ph. L. Toint, "Solving the trust-region subproblem using the Lanczos method", *SIAM Journal on Optimization* **9(2)** (1999) 504–525. [DOI] [PDF]

80. M. J. Daydé, J. P. Décamps and N. I. M. Gould, "On the Use of Block Stretching for Solving Unassembled Linear Systems", *Calculateurs Paralléles, Réseaux et Systémes Répartis* **10 (4)** (1998) 391–399. [PDF]

81. N. I. M. Gould and J. A. Scott, "Sparse approximate-inverse preconditioners using norm-minimization techniques", *SIAM Journal on Scientific and Statistical Computing* **19** (1998) 605–625. [DOI] [PDF]

82. M. J. Daydé, J.-Y. L'Excellent and N. I. M. Gould, "Element-by-element preconditioners for large partially separable optimization problems", *SIAM Journal on Scientific and Statistical Computing* **18** (1997) 1767–1787. [DOI] [PDF]

83. A. R. Conn, N. I. M. Gould and Ph. L. Toint, "On the number of inner iterations per outer iteration of a globally convergent algorithm for optimization with general nonlinear inequality constraints and simple bounds", *Computational Optimization and Applications* **7** (1997) 41–69. [DOI] [PDF]

84. A. R. Conn, N. I. M. Gould and Ph. L. Toint, "A globally convergent Lagrangian barrier algorithm for optimization with general inequality constraints and simple bounds", *Mathematics of Computation* **66** (1997) 261–288 and S1-S11. [DOI] [PDF] [PDF]

85. A. R. Conn, N. I. M. Gould, A. Sartenaer and Ph. L. Toint, "Convergence properties of minimization algorithms for convex constraints using a structured trust region", *SIAM Journal on Optimization* **6** (1996) 1059–1086. [DOI] [PDF]

86. A. R. Conn, N. I. M. Gould, A. Sartenaer and Ph. L. Toint, "Convergence properties of an augmented Lagrangian algorithm for optimization with a combination of general equality and linear constraints" *SIAM Journal on Optimization* **6** (1996) 674–703. [DOI] [PDF]

87. A. R. Conn, N. I. M. Gould and Ph. L. Toint, "Numerical experiments with the LANCELOT package (Release A) for large-scale nonlinear optimization", *Mathematical Programming* **73** (1996) 73–110. [DOI] [PDF]

88. I. Bongartz, A. R. Conn, N. I. M. Gould and Ph. L. Toint, "CUTE: Constrained and Unconstrained Testing Environment", *ACM Transactions on Mathematical Software* **21** (1995) 123–160. [DOI] [PDF]

89. A. R. Conn, N. I. M. Gould and Ph. L. Toint, "A note on exploiting structure when using slack variables", *Mathematical Programming* **67** (1994) 89–98. [DOI] [PDF]

90. A. R. Conn, N. I. M. Gould and Ph. L. Toint, "A note on using alternative second-order models for the subproblems arising in barrier function methods for minimization", *Numerische Mathematik* **68** (1994) 17–33. [DOI] [PDF]

91. A. R. Conn, N. I. M. Gould, A. Sartenaer and Ph. L. Toint, "Global convergence of a class of trust region algorithms for optimization using inexact projections on convex constraints", *SIAM Journal on Optimization* **3** (1993) 164-221. [DOI] [PDF]

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93. A. R. Conn, N. I. M. Gould and Ph. L. Toint, "Convergence of Quasi-Newton matrices generated by the symmetric rank-one update", *Mathematical Programming* **50** (1991) 177–195. [DOI] [PDF]

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2. C. Cartis, N. I. M. Gould and Ph. L. Toint, "Worst-case evaluation complexity and optimality of second-order methods for nonconvex smooth optimization" *Proceedings of the International Congress of Mathematics, Rio de Janeiro, 2018*, **3** (2019) 3697—3737. [DOI] [PDF]

3. C. Cartis, N. I. M. Gould and Ph. L. Toint, "Evaluation complexity bounds for smooth constrained nonlinear optimization using scaled KKT conditions and high-order models". In "Approximation and Optimization" (I. C. Demetriou and P. M. Pardalos, eds.), Springer Optimization and Its Applications **145** (2019) 5–26. [DOI] [PDF]

4. N. I. M. Gould, D. Orban and Ph. L. Toint, "An interior-point ℓ_1-penalty method for nonlinear optimization". In "Recent Developments in Numerical Analysis and Optimization" (M. Al-Baali, ed), Springer Proceedings in Mathematics and Statistics (2015), 117–150. [DOI] [PDF]

5. N. I. M. Gould, "Quadratic Programming". In "Encyclopedia of Applied and Computational Mathematics" (B. Engquist, ed.), Springer-Verlag Berlin (2015) 1185-1187. [DOI]

6. C. L. Farmer, J. M. Fowkes and N. I. M. Gould, "Optimal well placement". Article B033, ECMOR X11—12th European Conference on the Mathematics of Oil Recovery (2010). [PDF] & [PDF]

7. C. Cartis and N. I. M. Gould. "Finding a point in the relative interior of a polyhedron, with applications to compressed sensing". Proceedings of SPARS'09 (Signal Processing with Adaptive Sparse Structured Representations), Saint-Malo, France (2009). [PDF]

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6. N. I. M. Gould, T. Rees and J. A. Scott, "Convergence and evaluation-complexity analysis of a regularized tensor-Newton method for solving nonlinear least-squares problems subject to convex constraints". Technical Report RAL-TR-2019-001 (2019), Rutherford Appleton Laboratory, Chilton, England. [PDF]

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22. N. I. M. Gould, D. Orban and Ph. L. Toint, "Results from a numerical evaluation of LANCELOT B". Numerical Analysis Group Internal Report 2002-1 (2002), Rutherford Appleton Laboratory, Chilton, England. [PDF]

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24. I. Bongartz, A. R. Conn, N. I. M. Gould, M. A. Saunders and Ph. L. Toint, "A numerical comparison between the LANCELOT and MINOS packages for large-scale nonlinear optimization: the complete results", Technical Report 97/14 (1997), Dept. of Mathematics, FUNDP, Namur, Belgium.

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33. N. I. M. Gould, "The generalized steepest-edge for linear programming: part 2, practicalities", report CORR 84-1, Department of Combinatorics and Optimization, University of Waterloo, Canada (1984)

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Books in preparation:

1. N. I. M. Gould, "An introduction to algorithms for continuous optimization".

2. N. I. M. Gould and Ph. L. Toint, "Computational quadratic programming".

Technical reports in preparation:

1. J. M. Fowkes, N. I. M. Gould and J. A. Scott, "Approximating large-scale Hessian matrices using secant equations".

2. Z. Coulibaly, N. I. M. Gould and D. Orban, "Fast local convergence of interior-point methods in the absence of strict complementarity".

3. N. I. M. Gould, "Linear least-squares over polyhedral sets".

4. N. I. M. Gould, M. Kočvara, D. P. Robinson and Ph. L. Toint, "Enriched recursive multi-level optimization".

Library software:

- Fortran packages FD05, ID05, KB12, KD01, LA06, MA39, MC46, MI01, MI02, MI03, MI04, MI05, MI11, MI12, SV02, VE09, VE14, YV01, ZE02, HSL_FA04, HSL_KB12, HSL_MA69, HSL_MI02, HSL_VE12, HSL_VE13, HSL_VE15, HSL_VE19, HSL_VF05, HSL_VF06, HSL_VH01, HSL_ZA03, HSL_ZD01, and HSL_ZD02, in the Harwell Subroutine Library.
- The fortran packages LANCELOT/SBMIN, LANCELOT/AUGLG and CUTE for large-scale nonlinear programming.
- The replacement optimization testing environments CUTEr/SifDec and their fortran 2003 revisions CUTEst/SifDecode.
- The fortran 2003 library GALAHAD for large-scale nonlinear programming; version 4 (2022) includes interfaces to C and Matlab, and, additionally, version 4.2 to Python and Julia.
- Fortran packages E04GEF, E04HEF, E04HFF, E04FDF, E04GBF, and E04GCF in the NAG Library.
- Various fortran subroutines in the NPL optimization software library.
- The Matlab package gltr for solving the trust-region subproblem, as well as Matlab interfaces to various GALAHAD packages.

4 Activities

(My conference talks have been somewhat limited over the past 15 years for health reasons. I have unfortunately turned down many invitations on these grounds.)

Invited addresses:

2018 Bath–RAL Numerical Analysis Day, RAL.

2015 Bath–RAL Numerical Analysis Day, Bath.

2014 SIAM UKIE annual meeting, London.

2013 U. Bath Landscape lecture. ICCOPT 4, Lisbon, Portugal. MNR13, Manchester.

2012 Bath–RAL Numerical Analysis Day, RAL. 21st International Symposium on Mathematical Programming, Berlin.

2011 Eleventh SIAM conference on Numerical Optimization, Darmsdadt, Germany.

2010 OPTEC Workshop on Large Scale Convex Quadratic Programming, Leuven, Belgium.

2006 Sparse days, CERFACS. Numerical Optimization, Beijing, China.

2005 Ninth SIAM conference on Numerical Optimization, Stockholm. Bath–RAL Numerical Analysis Day, RAL. 2nd European Workshop on Automatic Differentiation, Shrivenham.

2004 GAMM annual meeting, Dresden, Germany. European Conference on Computational Optimization, Dresden, Germany. Workshop on Large Scale Nonlinear and Semidefinite Programming, Waterloo, Canada. Nonlinear Optimization and Applications, Erice, Sicily, Italy.

2003 IMA workshop on optimization, Minneapolis.

2002 18th GAMM-Seminar, Leipzig, Germany. Eighth SIAM conference on Numerical Optimization, Toronto. Bath–RAL Numerical Analysis Day, Bath.

2001 Sixth Annual Conference of ISIAM, Amritsar, India. Biennial conference on Numerical Analysis, Dundee.

2000 3rd FNRS Cycle in Mathematical Programming, Hans-sur-Leyse, Belgium. Seventh SIAM conference on Numerical Optimization, Atlanta.

1999 19th IFIP TC7 Conference on System Modelling and Optimization, Cambridge.

1998 Nonlinear Optimization and Applications, Erice, Sicily, Italy.

1997 High Performance Software for Nonlinear Optimization, Ischia, Italy. XVI Mathematical Programming Society meeting, Lausanne.

1996 The State of the Art in Numerical Analysis, York.

1995 IMA conference on Linear Algebra and its Applications, Manchester.

1994 WONSDA '94, RAL. Fifth Stockholm Optimization days. Sparse matrix days, St. Girons, France. Use of Optimization in Engineering Design, CORE, Belgium.

1993 ORBEL 7, Brussels. Leslie Fox memorial conference. Forth Stockholm Optimization days. NATO ASI on algorithms for continuous optimization, Il Ciocco, Italy.

1992 Fourth SIAM conference on Numerical Optimization, Chicago. ORSA/TIMS meeting, San Francisco.

1991 Biennial conference on Numerical Analysis, Dundee. ICIAM conference, Washington. Workshop on large-scale optimization, Coimbra, Portugal.

1989 Third SIAM conference on Numerical Optimization, Boston.

1988 XIII Mathematical Programming Society meeting, Tokyo.

1987 Canadian Mathematics Society meeting. Numerical Analysis day, Waterloo, Ontario.

1984 ORSA/TIMS meeting, San Francisco. Numerical Analysis day, Queen's University, Ontario.

Contributed talks/lectures:

2013 U. of Strathclyde (Biennial conference on Numerical Analysis).

2011 U. of Strathclyde (Biennial conference on Numerical Analysis).

2007 U. of Dundee (Biennial conference on Numerical Analysis).

2006 U. of Oxford (Optbridge meeting)

2005 U. of Oxford/U. of Dundee (Biennial conference on Numerical Analysis) U. of Cambridge (Optbridge meeting)/U. of Warwick (MIR meeting)/U. of Manchester

2004 U. of Cambridge/U. of Edinburgh/Argonne National Labs.

2003 U. of Dundee (Biennial conference on Numerical Analysis)

2002 U. of Bath/U. of Essex/U. of Edinburgh.

2001 U. of Oxford.

2000 U. of Reading/U. of Edinburgh/Daresbury Laboratory.

1999 U. of Dundee (Biennial conference on Numerical Analysis)/U. of Edinburgh/U. of Dundee.

1998 U. of Edinburgh.

1997 U. of Dundee (Biennial conference on Numerical Analysis)/Oxford U.

1995 U. of Dundee (Biennial conference on Numerical Analysis)/U. of Durham.

1994 RAL.

1993 CERFACS/Elf Petroleum, Pau.

1992 Hatfield Polytechnic.

1991 U. of Cambridge/Oxford U./U. of Bristol.

1989 U. of Reading/Harwell/L.S.E./U. of Sussex.

1988 U. of Essex/Dundee U.

1987 RMCS, Shrivenham/Imperial College/NPL/U. of Waterloo.

1986 Oxford University/U. of Reading/U. of Manchester/U. of Cambridge.

1985 U. of Essex/U. of Waterloo/U. of Dundee (Biennial conference on Numerical Analysis)/Argonne National Laboratory.

1984 Cornell U./Courant Institute/U. of Waterloo/SIAM conference on Numerical Optimization, Boulder.

1983 U. of Dundee (Biennial conference on Numerical Analysis)/U. of Waterloo/Oxford University.

1982 U. of Wisconsin-Madison/U. of Waterloo/U. of Bonn - XI Mathematical Programming Society meeting.

Teaching activities:

2022 Course on Continuous Optimization for scientists at STFC.

2018 External Ph.d examiner, Lukas Schork, University of Edinburgh.

2014 External Ph.d examiner, James Turner, University of Birmingham.

2011 External Ph.d examiner, Jennifer Pestana, University of Oxford.

2010 External Ph.d examiner, Tyrone Rees, University of Oxford.

2009 External Ph.d advisor for Phil Browne (Bath). External Ph.d examiner, Martin Stoll, University of Oxford.

2008 D.Phil advisor for Jaroslav Fowkes (Oxford). External Ph.d examiner, Nachiketa Gupta University of Oxford.

2007 Undergraduate Courses on Numerical Analysis and Continuous Optimization, Universities of Oxford. Undergraduate tutorials in applied mathematics, Exeter College, Oxford. Student supervision for MSc in Mathematical Modelling and Scientific Computation, (4 students), Universities of Oxford.

2006 Undergraduate Course on Continuous Optimization, Universities of Oxford. M.Sc. Course on Numerical Optimization, University of Edinburgh. Undergraduate tutorials in applied mathematics, Exeter College, Oxford.

2005 M.Sc. Courses on Numerical Optimization, Universities of Oxford and Edinburgh. External Ph.d examiner, Coralia Cartis (Cambridge)

2004 M.Sc. Course on Numerical Optimization, University of Edinburgh.

2003 M.Sc. Courses on Numerical Optimization, Universities of Oxford and Edinburgh.

2002 Numerical Analysis Summer School course, University of Durham.

2001 M.Sc. Course on Numerical Optimization, University of Oxford. External Ph.d examiner, University of Dundee.

2000 External Ph.d advisor for Rob Gate (Dundee).

1998 External Ph.d examiner, University of Manchester.

1997 External Ph.d advisor for Carsten Keller (Oxford). External Ph.d examiner, ENSEEIHT-IRIT.

1996 External Ph.d advisor for Jerome Décamps (ENSEEIHT-IRIT). External Promotion examiner, ENSEEIHT-IRIT. External Ph.d examiner, Imperial College.

1995 Course on Numerical Computations with Matrices, RAL. External Ph.d examiner, ENSEEIHT-IRIT.

1993 External Ph.d advisor for Jean-Yves L'Excellent (ENSEEIHT-IRIT).

1991 External Ph.d advisor for Marli Hernandez (Hatfield) and Sybille Schuler (Oxford).

1989 External Ph.d examiner, FUNDP, Namur, Belgium and Hatfield Polytechnic.

1989–90 Course in Data Fitting and Approximation, RMCS Shrivenham.

1988, 1992 Course in Optimization, RMCS Shrivenham.

1987–89, 1991–92 Course in Boundary Value Problems at University of Reading.

1987 External Ph.d examiner, University of Essex.

1986-90 Mathematical courses at Harwell for scientists and engineers.

1982–1985 Various undergraduate and graduate mathematics courses in discrete and continuous optimization, numerical analysis, operations research and basic pure mathematics. Supervisor for 3 M.Sc. students, thesis examiner for 3 Ph.d. students.

Organizational activities:

2006–2008 Various Departmental and Collegiate committees.

1996–2006 Departmental library representative.

1990–2006 Responsible for Numerical Analysis Group SUN/IBM/Compaq/Intel workstation network.

1985–1990 Responsible for departmental Library, seminar organizer, education course organizer.

1982–1985 Various university committees.

1978 Treasurer, junior common room, Corpus Christi College.

Professional activities:

- Editor in Chief, *SIAM Journal on Optimization* 2004–2010.
- Associate Editor of *SIAM Journal on Optimization* 1999-2016.
- Associate Editor of *Mathematical Programming* 1989–2016.
- Associate Editor of the *ACM Transactions on Mathematical Software* 2002–2016.
- Associate Editor of the *IMA Journal of Numerical Analysis* 2005–2016.
- Associate Editor of *Mathematics of Computation* 2012–2016.
- Area Editor of *Mathematical Programming Computation* 2012–2016.
- Chair of the Publications Committee, *Mathematical Optimization Society* 2012-2015.
- Member of the Publications Committee, *Mathematical Optimization Society* 2010-2015.
- Member of the SIAM Journal Committee, 2011-2016.
- Member of the SIAM Book Committee, 2015-2018.
- Member of the SIAM Fellows Selection Committee 2014-2016.
- Member of the EPSRC Peer Review College 2000-2016.
- Member of the Advisory Board, *Mathematical Programming Computation* from 2008.
- Member of the organising committee for the IMA Conference on Numerical Linear Algebra and Optimisation, U. of Birmingham, 2022, 2018, 2016, 2014, 2012, 2010 and 2007.
- Co-organiser mini-symposium on optimization, Biennial Conference on Numerical Analysis, U. of Strathclyde, 2019.
- Co-organiser LMS Summer School on Model Order Reduction, U. Durham, 2017.
- Member of the MOS/SIAM Dantzig Prize committee, 2023.
- Member of the SIAM Computational Science and Engineering Prize committee, 2016.
- Member of the Best Paper Prize committee, ICCOPT, Tokyo, 2016.
- Member of the organising committee for the EUROPT, Edinburgh, 2015
- Chair of the 17th IMA Leslie Fox Prize committee, 2015.

- Member of the 15th and 16th IMA Leslie Fox Prize committees, 2011 & 2013.
- Member of the organising committee for the SIAG-OPT Conference on Optimization, Darmstadt, Germany, 2011.
- Member of the Lagrange prize committee for the Mathematical Programming Society/SIAM, 2006.
- Organiser of the MIR one-day meeting on Optimization, University of Warwick, October 2005.
- Co-organiser of Cambridge-Oxford Optimization Days, 2004–2007.
- Member of the organising committee, ICCOPT 2004.
- Co-producer of UK Landscape document on Numerical Analysis, with N. Higham and E. Süli, 2003.
- Co-organiser of the U. Bath–RAL Numerical Analysis Days, 2002–2006.
- Member of the Beale–Orchard-Hays prize committee for the Mathematical Programming Society, 2003.
- External Course Examiner, Open University, 2002–2006.
- Member of Industrial Board for the M.Sc in Computational Mathematics, Bath University, 2001–2007.
- External Course Assessor, Open University, 2000-2002.
- Member of the organizing committee for the Foundations of Computational Mathematics meeting, Oxford, July 1999.
- Member of the organizing committee for the Sixth SIAM Conference on Applied Linear Algebra, Snowbird, Utah, USA, 1997.
- Member of the organizing committee for the 3rd CERFACS International Linear Algebra Year workshop on linear algebra in optimization, Albi, France, 1996.
- Refereeing for many mathematical journals.

Other activities:

Consulting for the U.S. Geological Survey (Menlo Park, California, U.S.A.), Royal Bank of Canada (Toronto, Ontario, Canada), British Gas, the C.E.G.B., ICI and the International Stock Exchange (London).

5 Interests

- Flat and hill walking.
- Fine wines, beers and whiskies—active local branch member, WWW manager and former membership secretary and branch pubs officer of the White Horse Branch of the Campaign for Real Ale.
- Home brewing, Alpine Brewery (Est., 2018).
- All non-operatic forms of music—a hopeless guitar player, as featured on the limited-edition CD "The Godfrey Tea Experience – live at the Corpus Pavilion, 1979".
- Mushroom collecting.
- Kayaking.
- Contract bridge.
- Canals and other slow holidays—member of the Wilts and Berks Canal Restoration Society.
- Association football—long-suffering supporter of Tottenham Hotspur FC—Come on you Spurs!