

Curriculum Vitae

**Michael A. Saunders**

December 26, 2011

**Personal Data**

Home: 2671 Ross Rd, Palo Alto, CA 94303 650-494-0226  
Work: Dept of Management Science and Engineering  
Stanford University, Stanford, CA 94305-4026  
Office: Room M03, ICME, Huang Engineering Center, Stanford 650-723-1875  
Internet: saunders@stanford.edu, <http://www.stanford.edu/~saunders>  
Birth: January 6, 1944, Christchurch, New Zealand

**Education**

1965 BSc (Hons), Mathematics, University of Canterbury, New Zealand  
1970 MS, Computer Science, Stanford University  
1972 PhD, Computer Science, Stanford University

**Employment**

1965–67 Scientific Officer, Applied Mathematics Division, Dept of Scientific and Industrial Research (DSIR), Wellington, New Zealand  
1967–72 Research Assistant and Teaching Assistant, Computer Science Dept, Stanford University; Graduate Study Leave (part salary) from DSIR  
1972–74 Scientific Officer, Applied Mathematics Division, DSIR, Wellington, New Zealand  
1975–76 Research Associate, Systems Optimization Laboratory, Dept of Operations Research, Stanford University  
1977–78 Scientist, Applied Mathematics Division, DSIR, Wellington, New Zealand  
1979–87 Senior Research Associate, Systems Optimization Laboratory, Dept of Operations Research, Stanford University  
1987–present Research Professor, Systems Optimization Laboratory, Depts of OR, EESOR, and Management Science and Engineering, Stanford University

**Other Employment**

1972 (Oct) Visiting Research Fellow, Division of Numerical Analysis and Computing, National Physical Laboratory, Teddington, England  
1981 (May–Jun) Visiting Scholar, Dept of Mathematics, University of Linköping, Linköping, Sweden  
1990 (Jul–Aug) Visiting Fellow, Dept of Operations Research, University of Canterbury, Christchurch, New Zealand  
1995–96 Visiting Scholar, IBM Almaden Research Center (2 days/week)  
1998 (Jul–Oct) Visiting Professor, Dept of Engineering Science, University of Auckland, New Zealand (taught Master's class on Nonlinear Optimization)  
1999 (Aug) Visiting Professor, Institute of Mathematical Modelling (IMM), Technical University of Denmark, Lyngby, Denmark  
2000 (Jul) Visiting Professor, Dept of Mathematics and Physics, Mälardalen University, Västerås, Sweden  
2001 (Aug) Visiting Professor, IMM, Technical University of Denmark

## Honors

1962–64	New Zealand University National Scholarship
1965	New Zealand University Senior Scholarship
1968–71	New Zealand University Postgraduate Scholarship
1967, 1972	U.S. Fulbright Travel Grant
1985	William Orchard-Hays Prize in Computational Mathematical Programming, Mathematical Programming Society, first recipient
1988	Visiting Scientist, Special Year on Numerical Linear Algebra, University of Tennessee and Oak Ridge National Laboratory
1990	Erskine Visiting Fellowship, University of Canterbury, New Zealand
1997	Inventor Recognition Award, Office of Technology Licensing, Stanford University
2001	IBM Faculty Partnership Award
2004	Best Paper award (with <b>M. P. Friedlander</b> ), ICCOPT 1, RPI, NY
2004	ISI Highly Cited Researcher, Computer Science
2005	First Prize in software section (with <b>H. H. Jin</b> , M. W. Carter, and Y. Ye) Stanford-Berkeley Innovators' Challenge
2007	ISI Highly Cited Researcher, Mathematics
2007	Elected Hon FRSNZ (Honorary Fellow of the Royal Society of NZ)

## Grants

Co-Principal Investigator with Walter Murray

1987–1989	AFOSR	Annual budget	\$ 50,000
1988–1991	DOE	Annual budget	\$316,000
1992–1995	DOE	Annual budget	\$ 75,000
1987–1998	NSF	Annual budget	\$100,000
2000–2002	NSF	Annual budget	\$150,000
2003–2006	NSF	Annual budget	\$172,000
1989–2001	ONR	Annual budget	\$150,000
2002–2004	ONR	Annual budget	\$163,000
2004–2007	ONR	Annual budget	\$170,000
2007–2010	ONR	Annual budget	\$180,000
2010–2013	ONR	Annual budget	\$200,000

Co-Principal Investigator with Stephen Boyd and David Donoho

1998–2000	NSF	Annual budget	\$133,000
-----------	-----	---------------	-----------

Co-Principal Investigator with Yinyu Ye

2009–2012	DOE	Annual budget	\$484,000
-----------	-----	---------------	-----------

Principal Investigator

2010–2011	NSF	Annual budget	\$114,000
-----------	-----	---------------	-----------

2001	IBM Faculty Partnership Award, \$20,000
------	---

2001–2003	General Motors, Work Systems Lab, faculty participant
-----------	---

2004	Research Gift, Robert Bosch Corp, \$25,000
2005	Contract, Robert Bosch Corp, \$108,500
2005	Research Gift, COMSOL Inc, \$42,000
2005	Birdseed Funding, Stanford OTL, \$15,000
2008	Stanford/KAUST AEA Agreement, \$100,000
2008–2009	Member, Technical Area 4, AHPARC, Stanford
2010–present	Member, Technical Area 1, AHPARC, Stanford

### Professional Affiliations

ACM	Association for Computing Machinery
INFORMS	Institute for Operations Research and the Management Sciences
MOS	Mathematical Optimization Society
NAG	Numerical Algorithms Group Limited
ORSNZ	Operational Research Society of New Zealand
SIAM	Society for Industrial and Applied Mathematics
SIAG	SIAM Activity Group on Optimization
SIGPLAN	ACM Fortran Forum

### Professional Activities

1982–2004	Associate Editor, ACM TOMS ( <i>ACM Transactions on Mathematical Software</i> )
1989–2002	Associate Editor, SIOPT ( <i>SIAM Journal on Optimization</i> )
1999–present	Associate Editor, OPTE ( <i>Optimization and Engineering</i> )
2010–present	Associate Editor, NACO ( <i>Numerical Algebra, Control and Optimization</i> )
2002–present	Member, International Scientific Advisory Board, NZIMA (New Zealand Institute of Mathematics and its Applications)
1980	Co-organizer, Conference on Practical Optimization, Stanford University
1988	Member, Orchard-Hays Prize committee, Mathematical Programming Society
1995	Proposal Review panelist, NSF DMII, Production Systems and Operations Research
1999	Organizer, Minisymposium, SIAM Conference on Optimization, Atlanta
2000	Member, Beale/Orchard-Hays Prize committee, Math. Programming Society
2001	Member, Dantzig Dissertation Prize committee, INFORMS
2002	Proposal Review panelist, NSF DMII, Operations Research
2002	Organizer, Minisymposium, SIAM Conference on Optimization, Toronto
2005	Organizer, Minisymposium, IFORS Triennial Conference, Honolulu
2005	Member, Student Paper Competition committee, IMACS
2006	Organizer, Minisymposium, ISMP Triennial Symposium, Rio de Janeiro
2007	Co-organizer, Stanford 50: Conference on State of the Art and Future Directions of Computational Mathematics and Numerical Computing, Stanford University, Mar 29–31
2007	Organizer, Minisymposium, INFORMS Annual Meeting, Seattle
2008	Co-organizer, Symposium on Gene Golub’s Legacy: Matrix Computations – Foundation and Future, Stanford University, Mar 1

2008	Technical program committee, MELT08, First ACM International workshop on Mobile Entity Localization and Tracking in GPS-less Environments, San Francisco
2009	Proposal Review panelist, NSF DMS, Numerical Linear Algebra and Optimization
2009	Cluster Chair, ISMP, Chicago
2009	Minisymposium Organizer, SIAM Conf on Applied Linear Algebra, Monterey
2012	Cluster Chair, ISMP, Berlin

### Referee for Journals, Publishers, Foundations, etc

ACM Trans. on Math. Software	Acta Numerica 2005
APMOD	APNUM
Applied Numerical Mathematics	BIT
CDC04	Computational Opt. and Applies.
EPSRC (Britain)	European J. of Operational Research
FCAR (Canadian Research Foundation)	IEEE TOIT
IJHPCA	IMA J. of Numerical Analysis
IMACS student paper competition	Institute of Physics J. on Inverse Problems
Int. J. Mathematics in OR	International Science Foundation
Inverse Problems	J. of Combinatorial Optimization
J. of Comp. and Applied Mathematics	J. of Comp. and Graphical Statistics
J. of Global Optimization	J. of Industrial and Management Optimization
J. of Mathematical Analysis and Applies.	Linear Algebra and Applications
Mathematical Programming	Mathematics and Computers in Simulation
NSERC	NSF
Numerical Algorithms	Numerische Mathematik
NZFRST	NZIMA
NZ J. of Mathematics	Optimization and Engineering
Optimization Methods and Software	ORSA J. on Computing
Parallel Processing Letters	PNAS
Research Grants Council, Hong Kong	RSNZ
SIAM J. on Matrix Anal. Applies.	SIAM J. on Optimization
SIAM J. on Scientific Computing	Swedish Research Council for Eng. Sciences
Wiley & Sons, Ltd.	

### Consulting

1981–1986	General Electric
1990–present	Barra
1989–present	McDonnell-Douglas (now Boeing)
2000–present	DemandTec (member of Science Advisory Board)
2007–present	Cardinal Optimization (Chief Scientist)
2011–present	ProPlus Design Solutions (member of Technical Advisory Board)

### Teaching

1997	EESOR 406 Colloquium, Winter and Spring EESOR 408 Tutorial (3 students)
1998	EESOR 406 Colloquium, Winter EESOR 408 Tutorial (2 students) Master's class, Nonlinear Optimization, Dept of Engineering Science, University of Auckland, New Zealand (12 students)

1999	EESOR 406 Colloquium, Winter EESOR 408 Tutorial (1 student)
2000	MS&E 406 Colloquium, Winter and Spring MS&E 408 Tutorial (1 student)
1989–2001	SCCM Affiliated Faculty member
2001–present	SCCM Core Faculty member
2004–present	ICME Affiliated Faculty member
2003–present	MS&E 318 (CME 338) Large-scale Numerical Optimization <a href="http://www.stanford.edu/class/msande318">http://www.stanford.edu/class/msande318</a>
2001–2004	CS 531 Linear Algebra Seminar
2005–present	CME 510 Linear Algebra and Optimization Seminar <a href="http://icme.stanford.edu/seminars/seminars.php">http://icme.stanford.edu/seminars/seminars.php</a>

## Graduate Advising

1987	Engineer, <b>R. Entri</b>
1988	Engineer, <b>S. K. Eldersveld</b>
1991	PhD co-principal advisor, <b>S. K. Eldersveld</b>
2001	PhD co-principal advisor, <b>M. J. O’Sullivan</b>
2002	PhD principal advisor, <b>M. P. Friedlander, B. Kim</b>
2003	PhD co-principal advisor, <b>C.-M. Fransson</b>
2005	PhD co-principal advisor, <b>Z. Su, H. H. Jin</b>
2006	PhD co-principal advisor, <b>S.-C. Choi</b>
2006	Postdoctoral advisor, <b>H. H. Jin</b>
2008	PhD co-principal advisor, <b>C. Green</b>
2008	PhD principal advisor, <b>H. M. Huynh</b>
2009	PhD principal advisor, <b>D. F. Gleich, L. Tenenblat</b>
2009–2011	Postdoctoral co-advisor, <b>D. Kourounis</b>
2010	PhD principal advisor, <b>L. Deng, C. M. Maes</b>
2011	PhD principal advisor, <b>D. C.-L. Fong</b>
Current	PhD co-principal advisor, <b>S. Akle</b>
Current	PhD principal advisor, <b>X. Meng, Y. Sun</b>
1981	PhD external examiner, J. Eriksson, Linköping University, Sweden
2000	PhD external examiner, M. Adlers, Linköping University, Sweden
1979–2011	PhD reading committee member, 70 students
1987–2011	PhD orals committee member, 107 students

## Contributions to Books

- [B1] P. E. Gill, W. Murray, B. A. Murtagh, M. A. Saunders, and M. H. Wright, GAMS/MINOS, in A. Brooke, D. Kendrick, and A. Meeraus, *GAMS: A User’s Guide*, The Scientific Press, Redwood City, CA, 201–224 (1988).
- [B2] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Constrained nonlinear programming, in G. L. Nemhauser, A. H. G. Rinnooy Kan, and M. J. Todd (eds.), *Optimization*, Handbooks in Operations Research and Management Science, Volume 1, North-Holland, Amsterdam, 171–210 (1989).

- [B3] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Some theoretical properties of an augmented Lagrangian merit function, in P. M. Pardalos (ed.), *Advances in Optimization and Parallel Computing*, North-Holland, Amsterdam, 101–128 (1992).
- [B4] M. A. Saunders, Commentary on Methods for modifying matrix factorizations, in R. H. Chan, C. Greif, and D. P. O’Leary, *Milestones in Matrix Computation: Selected Works of Gene H. Golub, With Commentaries*, Oxford University Press, Oxford, 310–310 (2007).

## Refereed Journal Articles

- [J1] P. E. Gill, G. H. Golub, W. Murray, and M. A. Saunders, Methods for modifying matrix factorizations, *Mathematics of Computation* 28, 505–535 (1974).
- [J2] P. E. Gill, W. Murray, and M. A. Saunders, Methods for computing and modifying the LDV factors of a matrix, *Mathematics of Computation* 29, 1051–1077 (1975).
- [J3] C. C. Paige and M. A. Saunders, Solution of sparse indefinite systems of linear equations, *SIAM J. Numerical Analysis* 12, 617–629 (1975).
- [J4] C. C. Paige and M. A. Saunders, Least squares estimation of discrete linear dynamic systems using orthogonal transformations, *SIAM J. Numerical Analysis* 14, 180–193 (1977).
- [J5] B. A. Murtagh and M. A. Saunders, Large-scale linearly constrained optimization, *Mathematical Programming* 14, 41–72 (1978).
- [J6] C. C. Paige and M. A. Saunders, Towards a generalized singular value decomposition, *SIAM J. Numerical Analysis* 18, 398–405 (1981).
- [J7] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Aspects of mathematical modelling related to optimization, *Applied Mathematical Modelling* 5, 71–83 (1981).
- [J8] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, A note on a sufficient decrease criterion for a non-derivative steplength procedure, *Mathematical Programming* 23, 349–352 (1982).
- [J9] B. A. Murtagh and M. A. Saunders, A projected Lagrangian algorithm and its implementation for sparse nonlinear constraints, *Mathematical Programming Study* 16 (Constrained Optimization), 84–117 (1982).
- [J10] C. C. Paige and M. A. Saunders, LSQR: An algorithm for sparse linear equations and sparse least squares, *ACM Trans. Math. Software* 8(1), 43–71 (1982).
- [J11] C. C. Paige and M. A. Saunders, Algorithm 583; LSQR: Sparse linear equations and least-squares problems, *ACM Trans. Math. Software* 8(2), 195–209 (1982).
- [J12] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Computing forward-difference intervals for numerical optimization, *SIAM J. Scientific and Statistical Computing* 4, 310–321 (1983).
- [J13] P. E. Gill, N. I. M. Gould, W. Murray, M. A. Saunders, and M. H. Wright, A weighted Gram-Schmidt method for convex quadratic programming, *Mathematical Programming* 30, 176–195 (1984).
- [J14] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Sparse matrix methods in optimization, *SIAM J. Scientific and Statistical Computing* 5, 562–589 (1984).
- [J15] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Procedures for optimization problems with a mixture of bounds and general constraints, *ACM Trans. Math. Software* 10, 282–298 (1984).

- [J16] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Trends in nonlinear programming software, *European J. of Operational Research* 17, 141–149 (1984).
- [J17] S. M. Gorelick, C. I. Voss, P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Aquifer reclamation design: the use of contaminant transport simulation combined with nonlinear programming, *Water Resources Research* 20, 415–427 (1984).
- [J18] P. E. Gill, W. Murray, M. A. Saunders, G. W. Stewart, and M. H. Wright, Properties of a representation of a basis for the null space, *Mathematical Programming* 33, 172–186 (1985).
- [J19] P. E. Gill, W. Murray, M. A. Saunders, J. A. Tomlin, and M. H. Wright, On projected Newton barrier methods for linear programming and an equivalence to Karmarkar’s projective method, *Mathematical Programming* 36, 183–209 (1986).
- [J20] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Maintaining LU factors of a general sparse matrix, *Linear Algebra and its Applications* 88/89, 239–270 (1987).
- [J21] M. A. Saunders, H. D. Simon, and E. L. Yip, Two conjugate-gradient-type methods for unsymmetric linear equations, *SIAM J. Numerical Analysis* 25, 927–940 (1988).
- [J22] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Recent developments in constrained optimization, *J. Computational and Applied Mathematics* 22, 257–270 (1988).
- [J23] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, A practical anti-cycling procedure for linearly constrained optimization, *Mathematical Programming* 45, 437–474 (1989).
- [J24] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Inertia-controlling methods for general quadratic programming, *SIAM Review* 33, 1–36 (1991).
- [J25] F. Jarre and M. A. Saunders, An adaptive primal-dual method for linear programming, *Mathematical Programming Society, Committee on Algorithms Newsletter* 19, 7–16 (1991).
- [J26] **S. K. Eldersveld** and M. A. Saunders, A block-LU update for large-scale linear programming, *SIAM J. Matrix Analysis and Applies.* 13, 191–201 (1992).
- [J27] P. E. Gill, W. Murray, D. B. Ponceleón and M. A. Saunders, Preconditioners for indefinite systems arising in optimization, *SIAM J. Matrix Analysis and Applies.* 13, 292–311 (1992).
- [J28] M. A. Saunders, Major Cholesky would feel proud, *ORSA J. on Computing* 6, 23–27 (1994).
- [J29] H.-D. Chen, P. M. Pardalos, and M. A. Saunders, The simplex algorithm with a new primal and dual pivot rule, *Operations Research Letters* 16, 121–127 (1994).
- [J30] F. Jarre and M. A. Saunders, A practical interior-point method for convex programming, *SIAM J. Optimization* 5, 149–171 (1995).
- [J31] J. W. Chinneck and M. A. Saunders, MINOS(IIS) version 4.2: Analyzing infeasibilities in linear programming, *European J. Operational Research* 81, 217–218 (1995).
- [J32] P. E. Gill, W. Murray, D. B. Ponceleón, and M. A. Saunders, Primal-dual methods for linear programming, *Mathematical Programming* 70, 251–277 (1995).
- [J33] M. A. Saunders, Solution of sparse rectangular systems using LSQR and CRAIG, *Nordisk Tidskr. Informationsbehandling (BIT)* 35, 588–604 (1995).
- [J34] P. E. Gill, M. A. Saunders, and J. R. Shinnerl, On the stability of Cholesky factorization for quasi-definite systems, *SIAM J. Matrix Analysis and Applies.* 17(1), 35–46 (1996).
- [J35] M. A. Saunders, Computing projections with LSQR, *Nordisk Tidskr. Informationsbehandling (BIT)* 37:1, 96–104 (1997).

- [J36] W. R. Purcell, L.-X. Cheng, D. D. Dixon, R. L. Kinzer, J. D. Kurfess, M. Leventhal, M. A. Saunders, J. G. Skibo, D. M. Smith, and J. Tueller, OSSE mapping of galactic 511 keV positron annihilation line emission, *Astrophysical J.* 491, 725–776, Dec. 1997.
- [J37] S. S. Chen, D. L. Donoho, and M. A. Saunders, Atomic decomposition by basis pursuit, *SIAM J. Scientific Computing* 20(1), 33–61 (1998).
- [J38] S. S. Chen, D. L. Donoho, and M. A. Saunders, Atomic decomposition by basis pursuit, SIGEST article, *SIAM Review* 43(1), 129–159 (2001).
- [J39] P. E. Gill, W. Murray, and M. A. Saunders, SNOPT: An SQP algorithm for large-scale constrained optimization, *SIAM J. Optimization* 12(4), 979–1006 (2002).
- [J40] M. Jacobsen, P. C. Hansen, and M. A. Saunders, Subspace preconditioned LSQR for discrete ill-posed problems, *Nordisk Tidskr. Informationsbehandling (BIT)* 43:5, 975–989 (2003).
- [J41] **M. P. Friedlander** and M. A. Saunders, A globally convergent linearly constrained Lagrangian method for nonlinear optimization, *SIAM J. Optimization* 15(3), 863–897 (2005).
- [J42] R. Tibshirani, M. Saunders, S. Rosset, J. Zhu, and K. Knight, Sparsity and smoothness via the fused lasso, *J. Royal Statistical Society B* 67(1), 91–108 (2005).
- [J43] P. E. Gill, W. Murray, and M. A. Saunders, SNOPT: An SQP algorithm for large-scale constrained optimization, SIGEST article, *SIAM Review* 47(1), 99–131 (2005).
- [J44] M. W. Carter, **H. H. Jin**, M. A. Saunders, and Y. Ye, SpaseLoc: An adaptive subproblem algorithm for scalable wireless sensor network localization, *SIAM J. Optimization* 17(4), 1102–1128 (2006).
- [J45] **M. P. Friedlander** and M. A. Saunders, Discussion: The Dantzig selector: Statistical estimation when  $p$  is much larger than  $n$ , *Annals of Statistics* 35(6), 2385–2391 (2007).
- [J46] P. E. Gill, W. Murray, M. A. Saunders, J. A. Tomlin, and M. H. Wright, George B. Dantzig and systems optimization, *J. Discrete Optimization* 5(2), 151–158 (2008), in memory of George B. Dantzig. <http://dx.doi.org/10.1016/j.disopt.2007.01.002>.
- [J47] G. Chantas, N. Galatsanos, A. Likas, and M. A. Saunders, Variational Bayesian image restoration based on a product of  $t$ -distributions image prior, *IEEE Trans. Image Processing* 17(10), 1795–1805 (2008).
- [J48] **C.-M. Fransson**, T. Wik, B. Lennartson, M. A. Saunders, and P.-O. Gutman, Nonconservative robust control: Optimized and constrained sensitivity functions, *IEEE Trans. Contr. Sys. Tech.* 17(2), 298–308 (2009).
- [J49] **M. J. O’Sullivan** and M. A. Saunders, Stabilizing policy improvement for large-scale infinite-horizon dynamic programming, *SIAM J. Mat. Anal. Appl.*, 31(2), 434–459 (2009).
- [J50] V. Pereyra, M. A. Saunders, and J. Castillo, Equispaced Pareto front construction for constrained bi-objective optimization, *Mathematical and Computer Modelling* (2011), doi: 10.1016/j.mcm.2010.12.044, 10 pp.
- [J51] **S.-C. Choi**, C. C. Paige, and M. A. Saunders, MINRES-QLP: a Krylov subspace method for indefinite or singular symmetric systems, *SIAM J. Scientific Computing*, 33:4 (2011) 1810–1836.
- [J52] **D. C.-L. Fong** and M. A. Saunders, LSMR: An iterative algorithm for sparse least-squares problems, *SIAM J. Scientific Computing* 33:5 (2011) 2950–2971, Copper Mountain Special Issue 2010.

- [J53] R. M. T. Fleming, **C. M. Maes**, M. A. Saunders, Y. Ye, and B. Ø. Palsson, A variational principle for computing nonequilibrium fluxes and potentials in genome-scale biochemical networks, *J. Theoretical Biology* 292 (2012) 71–77, published electronically 5 Oct 2011.
- [J54] **D. C.-L. Fong** and M. A. Saunders, CG versus MINRES: An empirical comparison, *SQU Journal for Science*, revised 9 Dec 2011, 17 pp.
- [J55] S. P. Ponnappalli, M. A. Saunders, C. F. Van Loan, and O. Alter, A higher-order generalized singular value decomposition for comparison of global mRNA expression from multiple organisms, *PLoS ONE* 6(12): e28072 (2011). doi : 10.1371/journal.pone.0028072, 11 pp.

### Submitted Journal Articles

- [SJ1] 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 constrained optimization, *Mathematical Programming*, accepted 2000 subject to revision, 19 pp.
- [SJ2] **D. Kourounis**, L. N. Gergidis, and M. A. Saunders, Compile-time symbolic differentiation using C++ expression templates, *ACM Trans. Math. Softw.*, submitted 25 Feb 2008, revised 24 Mar 2009, 27 pp.
- [SJ3] **S.-C. Choi**, C. C. Paige, and M. A. Saunders, ALGORITHM xxx: MINRES-QLP for singular symmetric and Hermitian linear equations and least-squares problems, *ACM Trans. Math. Software*, submitted Aug 2011, 14 pp.
- [SJ4] **S. Akle**, O. Dalal, R. M. T. Fleming, M. A. Saunders, N. A. Taheri, and Y. Ye, Existence of positive steady states for mass conserving mass-action chemical reaction networks with a single terminal-linkage class, *J. Mathematical Biology*, submitted 25 Oct 2011, 16 pp.

### Refereed Conference Proceedings

- [C1] G. H. Golub and M. A. Saunders, Linear least squares and quadratic programming, in J. Abadie (ed.), *Integer and Nonlinear Programming*, North-Holland, Amsterdam, 229–256 (1970).
- [C2] R. H. Bartels, G. H. Golub, and M. A. Saunders, Numerical techniques in mathematical programming, in J. B. Rosen, O. L. Mangasarian, and K. Ritter (eds.), *Nonlinear Programming*, Academic Press, London and New York, 123–176 (1970).
- [C3] M. R. Osborne and M. A. Saunders, Descent methods for minimization, in R. S. Anderssen, L. S. Jennings, and D. M. Ryan (eds.), *Optimization*, University of Queensland Press, Queensland, 221–237 (1972).
- [C4] M. A. Saunders, Numerical stability in large-scale linear programming, in F. R. deHoog and C. L. Jarvis (eds.), *Error, Approximation and Accuracy*, University of Queensland Press, Queensland, 144–158 (1973).
- [C5] M. A. Saunders, The complexity of LU updating in the simplex method, in R. S. Anderssen and R. P. Brent (eds.), *The Complexity of Computational Problem Solving*, University of Queensland Press, Queensland, 214–230 (1976).
- [C6] M. A. Saunders, A fast, stable implementation of the simplex method using Bartels-Golub updating, in J. R. Bunch and D. J. Rose (eds.), *Sparse Matrix Computations*, Academic Press, London and New York, 213–226 (1976).
- [C7] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Methods for large-scale nonlinear optimization, in A. M. Erisman, K. W. Neves, and M. H. Dwarakanath (eds.), *Electric Power Problems: The Mathematical Challenge*, SIAM, Philadelphia, 352–377 (1980).

- [C8] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, A numerical investigation of ellipsoid algorithms for large-scale linear programming, in G. B. Dantzig, M. A. H. Dempster, and M. Kallio (eds.), *Large-scale Linear Programming*, IIASA, Laxenburg, Austria, 487–509 (1981).
- [C9] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, QP-based methods for large-scale nonlinearly constrained optimization, in O. L. Mangasarian, R. R. Meyer, and S. M. Robinson (eds.), *Nonlinear Programming 4*, Academic Press, London and New York, 57–98 (1981).
- [C10] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Linearly constrained optimization, in M. J. D. Powell (ed.), *Nonlinear Optimization 1981*, Academic Press, London and New York, 123–139 (1982).
- [C11] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Software for constrained optimization, in M. J. D. Powell (ed.), *Nonlinear Optimization 1981*, Academic Press, London and New York, 381–393 (1982).
- [C12] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Sequential quadratic programming methods for nonlinear programming, in E. J. Haug (ed.), *Computer Aided Analysis and Optimization of Mechanical System Dynamics*, NATO ASI Series F: Computer and Systems Sciences 9, 679–697 (1984).
- [C13] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Software and its relationship to methods, in P. T. Boggs, R. H. Byrd, and R. B. Schnabel (eds.), *Numerical Optimization 1984*, SIAM, Philadelphia, 139–159 (1985).
- [C14] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Model building and practical aspects of nonlinear programming, in K. Schittkowski (ed.), *Computational Mathematical Programming*, NATO ASI Series F: Computer and Systems Sciences 15, Springer-Verlag, Berlin and New York, 209–247 (1985).
- [C15] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Considerations of numerical analysis in sequential quadratic programming methods, in J. P. Hennart (ed.), *Numerical Analysis*, Lecture Notes in Mathematics 1230, Springer-Verlag, New York and London, 46–62 (1986).
- [C16] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, A Schur-complement method for sparse quadratic programming, in M. G. Cox and S. Hammarling (eds.), *Reliable Numerical Computation*, Oxford University Press, Oxford and New York, 113–138 (1990).
- [C17] Y. Y. Shi, R. Nelson, D. H. Young, P. E. Gill, W. Murray, and M. A. Saunders, The application of nonlinear programming and collocation to optimal aeroassisted orbital transfers, Proceedings of 30th Aerospace Sciences Meeting, American Institute of Aeronautics and Astronautics, Reno, Nevada (1992).
- [C18] P. E. Gill, W. Murray, D. B. Ponceleón, and M. A. Saunders, Solving reduced KKT systems in barrier methods for linear programming, in G. A. Watson and D. Griffiths (eds.), *Numerical Analysis 1993*, Pitman Research Notes in Mathematics 303, Longmans Press, 89–104 (1994).
- [C19] P. E. Gill, W. Murray, and M. A. Saunders, Large-scale SQP methods and their application in trajectory optimization, in R. Bulirsch and D. Kraft (eds.), *Control Applications of Optimization*, International Series of Numerical Mathematics, Vol. 115, Birkhäuser Verlag, Basel, Boston, Stuttgart, 29–42 (1994).
- [C20] M. A. Saunders, Cholesky-based methods for sparse least squares: The benefits of regularization, in L. Adams and J. L. Nazareth (eds.), *Linear and Nonlinear Conjugate Gradient-Related Methods*, SIAM, Philadelphia, 92–100 (1996).

- [C21] **C.-M. Fransson**, B. Lennartson, T. Wik, K. Holmström, M. Saunders, and P.-O. Gutman. Global controller optimization using Horowitz bounds, *The 15th IFAC World Congress*, Barcelona, Spain, 2420–2425 (2002).
- [C22] **C.-M. Fransson** and M. A. Saunders, A bisection algorithm for the mixed  $\mu$  upper bound and its supremum, Proceedings of the 2004 American Control Conference, Boston, MA, Vol. 3, 2665–2670 (2004).

## Unrefereed Conference Proceedings

- [U1] M. A. Saunders, Sparse least squares by conjugate gradients: a comparison of preconditioning methods, in J. F. Gentleman (ed.), *Computer Science and Statistics: 12th Annual Symposium on the Interface*, University of Waterloo, Waterloo, Ontario, Canada, 15–20 (1979).
- [U2] P. E. Gill, W. Murray, and M. A. Saunders, Fortran software for optimization, Proceedings of the NSF Design, Manufacturing and Industrial Innovation Grantees Meeting, University of California, San Diego, CA, Jan 4–6, 1995, 2 pp.
- [U3] P. E. Gill, W. Murray, and M. A. Saunders, SQP methods for large-scale optimization, Proceedings of the NSF Design, Manufacturing and Industrial Innovation Grantees Meeting, University of New Mexico, Albuquerque, NM, Jan 3–5, 1996, 2 pp.
- [U4] P. E. Gill, W. Murray, and M. A. Saunders, SNOPT: A Fortran software package to solve large-scale optimization problems, Proceedings of the NSF Design, Manufacturing and Industrial Innovation Grantees Meeting, Monterrey, Mexico, Jan 5–8, 1998, 2 pp.

## Computer Software User's Guides

- [G1] B. A. Murtagh and M. A. Saunders, MINOS User's Guide, Report SOL 77-9, Dept of Operations Research, Stanford University (1977), 127 pp.
- [G2] M. A. Saunders, MINOS System Manual, Report SOL 77-31, Dept of Operations Research, Stanford University (1977), 136 pp.
- [G3] B. A. Murtagh and M. A. Saunders, MINOS/AUGMENTED User's Manual, Report SOL 80-14, Dept of Operations Research, Stanford University (1980), 51 pp.
- [G4] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, User's Guide for SOL/QPSOL: a Fortran package for quadratic programming, Report SOL 82-7, Dept of Operations Research, Stanford University (1982), 32 pp.
- [G5] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Documentation for FDCALC and FDCORE, Report SOL 83-6, Dept of Operations Research, Stanford University (1983), 21 pp.
- [G6] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, User's Guide for SOL/QPSOL (revised), Report SOL 83-7, Dept of Operations Research, Stanford University (1983), 36 pp.
- [G7] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, User's Guide for SOL/QPSOL (revised), Report SOL 83-7, Dept of Operations Research, Stanford University (1983), 36 pp.
- [G8] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, User's Guide for SOL/NPSOL, Report SOL 83-12, Dept of Operations Research, Stanford University (1983), 36 pp.
- [G9] B. A. Murtagh and M. A. Saunders, MINOS 5.0 User's Guide, Report SOL 83-20, Dept of Operations Research, Stanford University (1983), 118 pp.

- [G10] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, User's Guide for SOL/QPSOL (revised), Report SOL 84-6, Dept of Operations Research, Stanford University (1984), 36 pp.
- [G11] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, User's Guide for SOL/NPSOL (revised), Report SOL 84-7, Dept of Operations Research, Stanford University (1984), 36 pp.
- [G12] P. E. Gill, S. J. Hammarling, W. Murray, M. A. Saunders, and M. H. Wright, User's Guide for LSSOL (Version 1.0): a Fortran package for constrained linear least-squares and convex quadratic programming, Report SOL 86-1, Dept of Operations Research, Stanford University (1986), 38 pp.
- [G13] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, User's Guide for NPSOL (Version 4.0): a Fortran package for nonlinear programming, Report SOL 86-2, Dept of Operations Research, Stanford University (1986), 54 pp.
- [G14] B. A. Murtagh and M. A. Saunders, MINOS 5.1 User's Guide, Report SOL 83-20R, Dept of Operations Research, Stanford University (1987), 122 pp.
- [G15] B. A. Murtagh and M. A. Saunders, MINOS 5.4 User's Guide, Report SOL 83-20R, Dept of Operations Research, Stanford University (Revised Feb 1995), 135 pp.
- [G16] P. E. Gill, W. Murray, and M. A. Saunders, User's guide for QPOPT 1.0: A Fortran package for quadratic programming, Report SOL 95-4, Dept of Operations Research, Stanford University (1995), 38 pp.
- [G17] B. A. Murtagh and M. A. Saunders, MINOS 5.5 User's Guide, Report SOL 83-20R, Dept of Operations Research, Stanford University (Revised Jul 1998), 145 pp.
- [G18] P. E. Gill, W. Murray, and M. A. Saunders, User's guide for SQOPT 5.3: A Fortran package for large-scale linear and quadratic programming, Report NA 97-4, Dept of Mathematics, University of California, San Diego (1997), 55 pp.
- [G19] P. E. Gill, W. Murray, and M. A. Saunders, User's guide for SNOPT 5.3: A Fortran package for large-scale nonlinear programming, Report NA 97-5, Dept of Mathematics, University of California, San Diego (Revised May 1998), 67 pp.
- [G20] P. E. Gill, W. Murray, and M. A. Saunders, User's guide for SQOPT version 7: Software for large-scale quadratic programming, <http://ccom.ucsd.edu/~peg> (2006), 64 pp.
- [G21] P. E. Gill, W. Murray, and M. A. Saunders, User's guide for SNOPT version 7: Software for large-scale nonlinear programming, <http://ccom.ucsd.edu/~peg> (2006), 116 pp.
- [G22] P. E. Gill, M. A. Saunders, and COMSOL staff, Optimization Lab User's Guide for COMSOL Script and COMSOL Multiphysics version 3.3, COMSOL AB, Stockholm, Sweden (2006).

## Computer Software

- [S1] Co-author, licensed software: LSSOL, MINOS, NPSOL, QPOPT, SNOPT, SQOPT  
<http://www.sbsi-sol-optimize.com>
- [S2] Co-author, free software: Atomizer  
<http://www-stat.stanford.edu/~atomizer>
- [S3] Co-author, free software: cgLanczos, LSMR, LSQR, LUMOD, LUSOL, MINRES, MINRES-QLP, PDCO, SYMMLQ  
<http://www.stanford.edu/group/SOL/software.html>

## Technical Reports

- [R1] M. A. Saunders, Large-scale linear programming using the Cholesky factorization, Report STAN-CS-72-252, Computer Science Dept, Stanford University (1972), 60 pp.
- [R2] M. A. Saunders, Product form of the Cholesky factorization for large-scale linear programming, Report STAN-CS-72-301, Computer Science Dept, Stanford University (1972), 38 pp.
- [R3] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Two steplength algorithms for numerical optimization, Report SOL 79-25, Dept of Operations Research, Stanford University (1979), 8 pp.
- [R4] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, Computing finite-difference approximations to derivatives for numerical optimization, Report SOL 80-6, Dept of Operations Research, Stanford University (1980), 26 pp.
- [R5] P. E. Gill, N. I. M. Gould, W. Murray, M. A. Saunders, and M. H. Wright, Range-space methods for convex quadratic programming, Report SOL 82-14, Dept of Operations Research, Stanford University (1982), 20 pp.
- [R6] P. E. Gill, N. I. M. Gould, W. Murray, M. A. Saunders, and M. H. Wright, A range-space method for quadratic programming problems with bounds and general constraints, Report SOL 82-15, Dept of Operations Research, Stanford University (1982), 15 pp.
- [R7] P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright, A note on nonlinear approaches to linear programming, Report SOL 86-7, Dept of Operations Research, Stanford University (1986), 12 pp.
- [R8] P. E. Gill, W. Murray, and M. A. Saunders, A single-phase dual barrier method for linear programming, Report SOL 88-10, Dept of Operations Research, Stanford University (1988), 20 pp.
- [R9] P. E. Gill, W. Murray, and M. A. Saunders, Interior-point methods for LP: A challenge to the simplex algorithm, Report SOL 88-14, Dept of Operations Research, Stanford University (1988), 14 pp.
- [R10] P. E. Gill, W. Murray, D. B. Ponceleón, and M. A. Saunders, Primal-dual methods for linear programming, Report SOL 91-3, Dept of Operations Research, Stanford University (1991), 21 pp.
- [R11] P. E. Gill, W. Murray, D. B. Ponceleón, and M. A. Saunders, Solving reduced KKT systems in barrier methods for linear and quadratic programming. Report SOL 91-7, Dept of Operations Research, Stanford University (1991), 26 pp.
- [R12] F. Jarre and M. A. Saunders, Practical aspects of an interior-point method for convex programming, Report SOL 91-9, Dept of Operations Research, Stanford University (1991), 20 pp.
- [R13] P. E. Gill, M. A. Saunders, and J. R. Shinnerl, On the numerical stability of quasi-definite systems, Report SOL 93-4, Dept of Operations Research, Stanford University (1993), 8 pp.
- [R14] H. Chen, P. M. Pardalos, and M. A. Saunders, The simplex algorithm with a new primal and dual pivot rule, Report SOL 93-5, Dept of Operations Research, Stanford University (1993), 8 pp.
- [R15] M. A. Saunders, Solution of sparse rectangular systems using LSQR and CRAIG, Report SOL 94-4, Dept of Operations Research, Stanford University (1994), 14 pp.
- [R16] M. A. Saunders, Cholesky-based methods for sparse least squares: The benefits of regularization, Report SOL 95-1, Dept of Operations Research, Stanford University (1995), 10 pp.

- [R17] M. A. Saunders, Computation of projections using LSQR, Report SOL 96-1, Dept of Operations Research, Stanford University (1996), 8 pp.
- [R18] M. A. Saunders and J. A. Tomlin, Stable reduction to KKT systems in barrier methods for linear and quadratic programming, Report SOL 96-3, Dept of Engineering-Economic Systems and Operations Research, Stanford University (1996), 9 pp.
- [R19] M. A. Saunders and J. A. Tomlin, Solving regularized linear programs using barrier methods and KKT systems, Report SOL 96-4, Dept of Engineering-Economic Systems and Operations Research, Stanford University (1996), 12 pp.
- [R20] P. E. Gill, W. Murray, and M. A. Saunders, SNOPT: An SQP algorithm for large-scale constrained optimization, Report SOL 97-3, Dept of Engineering-Economic Systems and Operations Research, Stanford University (1997), 37 pp.
- [R21] 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 constrained optimization, Report SOL 97-6, Dept of Engineering-Economic Systems and Operations Research, Stanford University (1997), 19 pp.
- [R22] 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 constrained optimization: the complete results, Report SOL 97-7, Dept of Engineering-Economic Systems and Operations Research, Stanford University (1997), 50 pp.
- [R23] M. A. Saunders, Solution of sparse linear equations using Cholesky factors of augmented systems, Report SOL 99-1, Dept of Engineering-Economic Systems and Operations Research, Stanford University (1999), 9 pp.
- [R24] **M. J. O'Sullivan** and M. A. Saunders, Stabilizing policy improvement for large-scale infinite-horizon dynamic programming, Report SOL 2006-1, Dept of Management Science and Engineering, Stanford University (2006), 19 pp.
- [R25] J. F. Grcar, M. A. Saunders, and **Z. Su**, Estimates of optimal backward perturbations for linear least squares problems, Report SOL 2007-1, Dept of Management Science and Engineering, Stanford University (2007), 21 pp.
- [R26] E. Kostina, M. A. Saunders, and I. Schierle, Computation of covariance matrices for constrained parameter estimation problems using LSQR, Report SOL 2009-1, Dept of Management Science and Engineering, Stanford University, 11 pp.
- [R27] V. Pereyra, M. A. Saunders, and J. Castillo, Equispaced Pareto front construction for constrained biobjective optimization, Report SOL 2010-1, Dept of Management Science and Engineering, Stanford University (2010), 15 pp.
- [R28] **D. C.-L. Fong** and M. A. Saunders, LSMR: An iterative algorithm for sparse least-squares problems, Report SOL 2010-2, Dept of Management Science and Engineering, Stanford University (2010), 23 pp.
- [R29] **S.-C. Choi**, C. C. Paige, and M. A. Saunders, MINRES-QLP: a Krylov subspace method for indefinite or singular symmetric systems, Report SOL 2010-3, Dept of Management Science and Engineering, Stanford University (2010), revised 30 Mar 2011, 26 pp.
- [R30] R. M. T. Fleming, **C. M. Maes**, M. A. Saunders, Y. Ye and B. Ø. Palsson, A variational principle for computing nonequilibrium fluxes and potentials in genome-scale biochemical networks, Report SOL 2011-1, Dept of Management Science and Engineering, Stanford University (2011), 17 pp. Submitted 5 Apr 2011 to *J. of Theoretical Biology*, accepted 26 Sep 2011.

- [R31] **D. C.-L. Fong** and M. A. Saunders, CG versus MINRES: An empirical comparison, Report SOL 2011-2, Dept of Management Science and Engineering, Stanford University (2011), Submitted to *SQU Journal for Science*, revised 9 Dec 2011, 17 pp.
- [R32] **S. Akle**, O. A. Dalal, R. M. T. Fleming, M. A. Saunders, N. A. Taheri, and Y. Ye, Existence of positive steady states for mass conserving and mass-action chemical reaction networks with a single terminal-linkage class, Report SOL 2011-3, Dept of Management Science and Engineering, Stanford University (2011). Submitted 25 Oct 2011 to *J. of Mathematical Biology*, 16 pp.

## Plenary Talks since 1991

- [P1] Plenary speaker, Householder Symposium XII, Lake Arrowhead, California, Jun 13–18, 1993.
- [P2] Plenary speaker, “Least Squares Methods: Theory, Algorithms and Applications”, International conference in celebration of Åke Björck’s 60th Birthday, Linköping University, Sweden, Jan 9–10, 1995.
- [P3] Distinguished lecturer, Mathematics Dept, University of California, San Diego, La Jolla, CA, Mar 6–10, 1995.
- [P4] Plenary speaker, Householder Symposium XIII, Pontresina, Switzerland, Jun 17–21, 1996.
- [P5] Keynote speaker, 33rd Annual Conference, Operational Research Society of New Zealand, Auckland, New Zealand, Aug 31–Sep 1, 1998.
- [P6] Keynote speaker, Symposium on Optimisation and Data Analysis in honor of Michael Osborne’s 70th birthday, Canberra, ACT, Australia, Sep 21–23, 2005.
- [P7] Plenary speaker, MOPTA 06: Modeling and Optimization: Theory and Applications, University of Waterloo, Waterloo, ON, Canada, Jul 24–27, 2006.
- [P8] Dash Optimization lecturer, Center for Applied Optimization, University of Florida, Gainesville, FL, Feb 15, 2007.
- [P9] PIMS distinguished speaker, Computer Science Dept, University of British Columbia, Canada, Aug 7, 2008.
- [P10] Plenary speaker (with **C. M. Maes**), Advanced methods and perspectives in nonlinear optimization and control, RTRA STAE Workshop, Toulouse, France, Feb 3–5, 2010.
- [P11] Plenary speaker (with **D. C.-L. Fong**), 2nd International Conference on Numerical Linear Algebra and Optimisation, University of Birmingham, UK, Sep 13–15, 2010.
- [P12] Keynote speaker (with **C. M. Maes**), OPTEC Workshop on Large-Scale Convex Quadratic Programming — Algorithms, Software, and Applications, Katholieke Universiteit Leuven, Leuven, Belgium, Nov 25–26, 2010.
- [P13] Plenary speaker (with **D. C.-L. Fong**), Second International Conference on Numerical Analysis and Optimization, Sultan Qaboos University, Muscat, Oman, Jan 3–6, 2011.

## Invited Presentations since 1991

- [I1] Invited speaker, 14th International Symposium on Mathematical Programming, Amsterdam, The Netherlands, Aug 5–9, 1991.
- [I2] Speaker and session organizer, TIMS/ORSA Joint National Meeting, San Francisco, California, Nov 2–4, 1992.

- [I3] Invited speaker, Conference on Large-Scale Optimization, University of Florida, Gainesville, FL, Feb 15–17, 1993.
- [I4] Invited speaker, The RAND Corporation, Santa Monica, California, Apr 29, 1993.
- [I5] Invited speaker, Workshop on Operations Research for Managers, Stanford University, Sep 9–11, 1993.
- [I6] Colloquium speaker, Dept of Operations Research, Stanford University, Nov 17, 1993.
- [I7] Minisymposium speaker, Cornelius Lanczos International Centenary Conference, University of North Carolina, Raleigh, North Carolina, Dec 12–17, 1993.
- [I8] Invited speaker, Sparse Days at St Girons, International meeting on Sparse Matrix Methods, St Girons, France, Jul 10–16, 1994.
- [I9] Invited speaker and session organizer, 15th International Symposium on Mathematical Programming, Ann Arbor, Michigan, Aug 15–19, 1994.
- [I10] Speaker, Tenth Annual Operations Research Symposium for Industrial Affiliates and Corporate Friends, Dept of Operations Research, Stanford University, Jan 30, 1995.
- [I11] Distinguished lecturer, Mathematics Dept, University of California, San Diego, La Jolla, CA, Mar 6–10, 1995.
- [I12] Invited speaker, AMS-IMS-SIAM Summer Research Conference on Linear and Nonlinear Conjugate Gradient-Related Methods, University of Washington, Seattle, Jul 9–13, 1995.
- [I13] Speaker, 32nd Australasian Applied Mathematics Conference, Masterton, New Zealand, Feb 4–8, 1996.
- [I14] Minisymposium speaker, 5th SIAM Conference on Optimization, Victoria, BC, May 20–22, 1996.
- [I15] Invited speaker, International Symposium on Optimization and Computation, Hayama, Kanagawa, Japan, Aug 12–16, 1996.
- [I16] Colloquium speaker, Dept of EESOR, Stanford University, Jan 15, 1997.
- [I17] Invited speaker, WSC97-HK, Workshop on Scientific Computing, Chinese University of Hong Kong, Mar 10–12, 1997.
- [I18] Invited speaker, Post-conference of WSC97-HK, Chinese Academy of Sciences, Beijing, Mar 14, 1997.
- [I19] Invited speaker (with P. E. Gill), 16th International Symposium on Mathematical Programming, Lausanne, Switzerland, Aug 24–29, 1997.
- [I20] Colloquium speaker (with W. Murray), Dept of EESOR, Stanford University, Oct 14, 1997.
- [I21] Colloquium speaker, Mathematics Dept, University of Waterloo, Canada, Apr 22, 1998.
- [I22] Invited speaker, 3rd International Conference on High Performance Optimization Techniques, Rotterdam, The Netherlands, Jun 17–19, 1998.
- [I23] Invited speaker, 8th Stockholm Optimization Days, KTH, Stockholm, Sweden, Jun 25–26, 1998.
- [I24] Colloquium speaker, Applied Computational and Industrial Mathematics Seminar, Dept of Mathematics, University of Auckland, New Zealand, Oct 7, 1998.
- [I25] Seminar speaker, Courant Institute, New York University, Mar 12, 1999.

- [I26] Colloquium speaker, Dept of EESOR, Stanford University, Apr 21, 1999.
- [I27] Seminar speaker, Dept of Mathematics, Linköping University, Sweden, Aug 17, 1999.
- [I28] Seminar speaker, Center for Mathematical Modeling, Mälardalen University, Sweden, Aug 20, 1999.
- [I29] Invited speaker, Third Scandinavian Workshop on Linear Programming, Danish Technical University, Lyngby, Aug 26–28, 1999.
- [I30] Colloquium speaker, NERSC, Lawrence Berkeley Laboratory, Berkeley, CA, Oct 29, 1999.
- [I31] Invited speaker, Pacific-West Algorithmic Science Meeting, Washington State University, Pullman, WA, Apr 8, 2000.
- [I32] Invited speaker (with **M. P. Friedlander**), 17th International Symposium on Mathematical Programming, Atlanta, GA, Aug 6–11, 2000.
- [I33] Minisymposium talk (with **M. P. Friedlander**), SIAM Conference on Optimization, Toronto, Canada, May 20–22, 2002.
- [I34] Minisymposium speaker (with **M. J. O’Sullivan**), SIAM Conference on Optimization, Toronto, Canada, May 20–22, 2002.
- [I35] Invited speaker (with **M. J. O’Sullivan**), Householder Symposium XV on Numerical Linear Algebra, Peebles, Scotland, Jun 17–21, 2002.
- [I36] Invited speaker (with Y. Sun and G. H. Golub), Conference on Sparse Matrices and Grid Computing, St Giron, France, Jun 10–13, 2003.
- [I37] Invited paper (with **M. P. Friedlander**), 18th International Symposium on Mathematical Programming, Copenhagen, Denmark, Aug 18–22, 2003.
- [I38] Invited speaker, Sandia CSRI workshop on Solution Methods for Saddle Point Systems in Computational Mechanics, Santa Fe, NM, Dec 3–6, 2003.
- [I39] Invited speaker (with **M. P. Friedlander**), International Conference on Continuous Optimization (ICCOPT 1), RPI, Troy, NY, Aug 2–4, 2004.
- [I40] Invited speaker, Optimization and Transportation Scheduling Workshop, Mount Ruapehu, New Zealand, Sep 8–10, 2004.
- [I41] Invited speaker, Workshop on Optimization and Applications, Oberwolfach, Germany, Jan 9–15, 2005.
- [I42] Invited speaker (with **M. P. Friedlander**), SIAM Conference on Optimization, Stockholm, Sweden, May 15–19, 2005.
- [I43] Invited paper (with U. Ringertz and P. E. Gill), SIAM Conference on Optimization, Stockholm, Sweden, May 15–19, 2005.
- [I44] Invited speaker (with **M. J. O’Sullivan**), IFORS Triennial Conference, Honolulu, HI, Jul 11–15, 2005.
- [I45] Invited paper (with **H. H. Jin** and M. W. Carter), IFORS Triennial Conference, Honolulu, HI, Jul 11–15, 2005.
- [I46] Seminar speaker, Linear Algebra/Optimization seminar, SCCM, Stanford University, Feb 8, 2006.
- [I47] Invited speaker (with **H. M. Huynh**), SIAM Conference on Parallel Processing for Scientific Computing, San Francisco, CA, Feb 22–24, 2006.

- [I48] Invited speaker, Sparse Days at CERFACS, Toulouse, France, Jun 15–16, 2006.
- [I49] Invited speaker (with **H. M. Huynh**), 19th International Symposium on Mathematical Programming, Rio de Janeiro, Brazil, Jul 30–Aug 4, 2006.
- [I50] Invited paper (with **H. H. Jin**), 19th International Symposium on Mathematical Programming, Rio de Janeiro, Brazil, Jul 30–Aug 4, 2006.
- [I51] Invited paper (with **L. Tenenblat**), 19th International Symposium on Mathematical Programming, Rio de Janeiro, Brazil, Jul 30–Aug 4, 2006.
- [I52] ICME seminar speaker, Stanford University, Oct 23, 2006.
- [I53] Invited speaker (with **L. Tenenblat**), INFORMS Annual Meeting, Pittsburgh, PA, Nov 5–8, 2006.
- [I54] Seminar speaker, Numerical Analysis History @ Stanford series, SCCM, Stanford University, Mar 14, 2007.
- [I55] Invited speaker (with **M. P. Friedlander**), West Coast Optimization meeting, University of Washington, Apr 28–29, 2007.
- [I56] Invited speaker (with **S.-C. Choi**), ICIAM 07, 6th International Congress on Industrial and Applied Mathematics, Zurich, Switzerland, Jul 16–20, 2007.
- [I57] Linear Algebra and Optimization seminar speaker, ICME, Stanford University, Oct 3, 2007.
- [I58] Linear Algebra seminar speaker, Mathematics Dept, University of California, Berkeley, Oct 31, 2007.
- [I59] Linear Algebra and Optimization seminar speaker, ICME, Stanford University, Jan 23, 2008.
- [I60] Invited speaker, Symposium on Gene Golub’s Legacy: Matrix Computations – Foundation and Future, Stanford University, Mar 1, 2008.
- [I61] Optimization seminar speaker, IWR, University of Heidelberg, Germany, Jun 12, 2008.
- [I62] Invited presentation (with **H. H. Jin**), MMDS08: Workshop on Algorithms for Modern Massive Data Sets, Stanford University, Jun 25–28, 2008.
- [I63] Minisymposium speaker (with **H. H. Jin**), SIAM Annual Meeting, San Diego, Jul 7–11, 2008.
- [I64] Seminar speaker, School of Computer Science, McGill University, Canada, Nov 14, 2008.
- [I65] Seminar speaker, School of Computer Science, McGill University, Canada, Nov 17, 2008.
- [I66] Invited presentation (with **C. M. Maes**), BIRS Workshop 09w5101, Advances and Perspectives on Numerical Methods for Saddle Point Problems, Banff, Alberta, Canada, Apr 12–17, 2009.
- [I67] Invited presentation, Sparse Matrices for Scientific Computation: In Honour of John Reid’s 70th Birthday, Abingdon, Oxfordshire, UK, Jul 15–16, 2009.
- [I68] Seminar speaker, Dept of Computer Science, Katholieke Universiteit Leuven, Leuven, Belgium, Jul 22, 2009.
- [I69] Invited presentation (with J. Tomlin and V. Bharadwaj), 2009 INFORMS Annual Meeting, San Diego, CA, Oct 11–14, 2009.
- [I70] Invited presentation (with **C. M. Maes**), 2009 SIAM Conference on Applied Linear Algebra, Monterey, CA, Oct 26–29, 2009.

- [I71] Mathematics and Systems Biology seminar, University of Iceland, Reykjavik, Iceland, Oct 4, 2010.
- [I72] Seminar (with **D. C.-L. Fong**), Delft Institute of Applied Mathematics, Delft, The Netherlands, Nov 29, 2010.
- [I73] Seminar (with **D. C.-L. Fong**), Applied Analysis and Computational Science (AACS), University of Twente, Enschede, The Netherlands, Dec 2, 2010.
- [I74] Industrial Engineering and Management Seminar, Ben Gurion University of the Negev, Israel, Jan 10, 2011.
- [I75] Optimization Day, Mechanical Engineering Affiliates and Sponsors Program, Stanford University, Feb 1, 2011.
- [I76] Invited speaker (with I. Thiele, R. M. T. Fleming, B. Ø. Palsson, Y. Ye, S. Akle, O. A. Dalal, J. A. Lerman, Y. Sun, and N. A. Taheri), DOE Genomic Science Awardee Meeting IX, Crystal City, VA, Apr 10–13, 2011.
- [I77] Invited poster presentation (with **D. C.-L. Fong** and P. C. Hansen), Householder Symposium XVIII on Numerical Linear Algebra, Tahoe City, CA, Jun 12–17, 2011.
- [I78] Invited presentation (with **D. C.-L. Fong**), Householder Symposium XVIII on Numerical Linear Algebra, Tahoe City, CA, Jun 12–17, 2011.
- [I79] Invited presentation (with **C. M. Maes**), Householder Symposium XVIII on Numerical Linear Algebra, Tahoe City, CA, Jun 12–17, 2011.
- [I80] Invited presentation (with **D. C.-L. Fong**), ICIAM 7, Vancouver, BC, Jul 18–22, 2011.
- [I81] Invited presentation (with **C. M. Maes**), ICIAM 7, Vancouver, BC, Jul 18–22, 2011.

## Contributed Presentations

- [T1] Contributed paper (with **M. P. Friedlander**), SIAM Annual Meeting, San Diego, CA, Jul 9–13, 2001.
- [T2] Contributed paper (with J. A. Tomlin), 18th International Symposium on Mathematical Programming, Copenhagen, Denmark, Aug 18–22, 2003.
- [T3] Contributed paper (with **H. H. Jin**, M. W. Carter, and Y. Ye), CORS/INFORMS Meeting, Banff, Alberta, Canada, May 16–19, 2004.
- [T4] Contributed paper (with **H. H. Jin** and M. W. Carter), INFORMS Annual Meeting, Denver, CO, Oct 24–27, 2004.
- [T5] Contributed paper (with **H. H. Jin** and M. W. Carter), SIAM Conference on Optimization, Stockholm, Sweden, May 15–19, 2005.
- [T6] Contributed paper (with **H. H. Jin**), INFORMS Annual Meeting, San Francisco, CA, Nov 13–16, 2005.
- [T7] Contributed paper (with U. Shanbhag and W. Murray), INFORMS Annual Meeting, San Francisco, CA, Nov 13–16, 2005.
- [T8] Contributed paper (with **D. C.-L. Fong**), Copper Mountain Conference on Iterative Methods, Copper Mountain, CO, Apr 5–9, 2010.