CURRICULUM VITAE

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PERSONAL DATA

Birth date: 27 February 1949
Birth place: Detroit, Michigan
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EDUCATION

University of Michigan, 1967-1971
Degree: Bachelor of Science ‘‘with High Distinction/Highest Honors in Mathematics’’, 1971
(Phi Beta Kappa, 1970)
Foreign Study: senior year (1970-1971) at the Albert-Ludwigs-Universität, Freiburg im Breisgau, West Germany.

Cornell University, 1971-1974
Degrees: Master of Science (Computer Science), 1973
Doctor of Philosophy (Computer Science), 1975
Ph.D. Thesis: Brown’s Method and Some Generalizations, with Applications to Minimization Problems
Adviser: John E. Dennis, Jr.

SCHOLARSHIPS AND FELLOWSHIPS

Honorary National Merit Scholarship, 1967
Cornell First Year Graduate Fellowship, 1971
NSF Graduate Fellowship, 1972

EMPLOYMENT

1 July 2010 – present	general roustabout and techie AMPL Optimization, Inc.
6 Oct. 2003 – 17 June 2010	PMTS Sandia National Laboratories, Albuquerque, NM
1 Aug. 1997 – 13 July 2001	Distinguished Member of Technical Staff Bell Laboratories, Lucent Technologies
9 Nov. 1981 – 31 July 1997	Member of Technical Staff Bell Laboratories (AT&T, Lucent)
1 July 1979 – 31 Oct. 1981	Principal Research Associate Center for Computational Research in Economics and

Management Science
Massachusetts Institute of Technology

1 March 1979 – 31 August 1979	Assistant Scientist Mathematics Research Center University of Wisconsin-Madison (on leave of absence from M.I.T.)
1 Feb. 1978 – 30 June 1979	Research Associate Center for Computational Research in Economics and Management Science Massachusetts Institute of Technology
1 Sept. 1975 – 31 Jan. 1978	Senior Research Associate Computer Research Center for Economics and Management Science National Bureau of Economic Research
1 Sept. 1974 – 31 May 1975	Assistant Professor of Computer Science University of Texas at Austin

PROFESSIONAL SOCIETIES

Association for Computing Machinery
INFORMS
INFORMS Computing Society
INFORMS Optimization Society
Mathematical Programming Society
Treasurer Aug. 2001 – Aug. 2010
Society for Industrial and Applied Mathematics
Activity Group on Optimization

REPORTS AND PUBLICATIONS

1973: ‘‘On Scolnik’s Proposed Polynomial-Time Linear Programming Algorithm’’, Technical Report TR 73–190, Computer Science Dept., Cornell Univ. Reprinted in *SIGMAP Newsletter* **16**, pp. 15–21, April 1974.

1974: ‘‘More Remarks on Scolnik’s Approach to Linear Programming’’, Technical Report TR 74–207, Computer Science Dept., Cornell Univ. Reprinted in *SIGMAP Newsletter* **17**, pp. 38–49, November 1974.

1975: ‘‘Brown’s Method and Some Generalizations, with Applications to Minimization Problems’’, Ph.D. Thesis and Technical Report TR 75–225, Computer Science Dept., Cornell Univ.

‘‘Implementing Brown’s Method’’, Technical Report CNA–109, Center for Numerical Analysis, Univ. of Texas at Austin.

1976: ‘‘Representing Symmetric Rank 2 Updates’’, NBER Working Paper No. 124.

1977: ‘‘Comment on ‘Nonlinear Estimation by an Efficient Numerical Search Method’ ’’, manuscript.

‘‘Modifying Singular Values: Existence of Solutions to Systems of Nonlinear Equations Having a Possibly Singular Jacobian Matrix’’, *Math. Comput.*, **31**, pp. 962–973. This is a revised version of NBER Working Paper No. 125.

(Joint with J. E. Dennis, Jr. and R. E. Welsch): ‘‘An Adaptive Nonlinear Least-Squares Algorithm’’, NBER Working Paper No. 196.

1978: (Joint with R. B. Schnabel): ‘‘Solving Systems of Nonlinear Equations by Broyden’s Method with Projected Updates’’, pp. 245–281 of *Nonlinear Programming 3*, edited by O. L. Mangasarian, R. R. Meyer, and S. M. Robinson, Academic Press, New York.

1979: ‘‘On Combining the Schemes of Reid and Saunders for Sparse LP Bases’’, pp. 313–334 of *Sparse Matrix Proceedings 1978*, edited by I. S. Duff and G. W. Stewart, SIAM, Philadelphia.

‘‘Some Convergence Properties of Broyden’s Method’’, *SIAM J. Numer. Anal.*, **16**, pp. 623–630.

(Joint with J. E. Dennis, Jr. and R. E. Welsch): ‘‘An Adaptive Nonlinear Least-Squares Algorithm’’, Technical Report #TR–1, M.I.T./CCREMS. (This is an extensively revised version of NBER Working Paper No. 196, corresponding to an almost completely rewritten version of the nonlinear least-squares solver NL2SOL.)

‘‘On Solving Robust and Generalized Linear Regression Problems’’, Technical Summary Report No. 2000, Math. Research Center, Univ. of Wisconsin–Madison; also (with gratuituously added typos) pp. 55–83 of *Ottimizzazione non lineare e applicazioni*, edited by S. Incerti and G. Treccani, Quaderni dell’Unione Matematica Italiana 17, Pitagora Editrice, Bologna, Italy (1980).

1980: ‘‘Using Scalar and Vector Majorizing Equations to Bound Solution Sets of Nonlinear Algebraic Equation Systems’’, pp. 329–339 of *Interval Mathematics 1980*, edited by K. L. E. Nickel, Academic Press, New York.

‘‘Some Tips for Writing Portable Software’’, Technical Report #TR–14, M.I.T./CCREMS.

1981: ‘‘Computing Optimal Locally Constrained Steps’’, *SIAM J. Sci. Statist. Computing*, **2**, pp. 186–197.

‘‘Perturbation Bounds for Nonlinear Equations’’, *SIAM J. Numer. Anal.*, **18**, pp. 654–663.

‘‘Comparing Algorithmic Variations’’, Technical Report #TR–28, M.I.T./CCREMS; reprinted in *COAL Newsletter No. 6* (1981), pp. 10–24.

1981: ‘‘Solving Interval Linear Equations’’, *SIAM J. Numer. Anal.*, **19**, pp. 858–870.

(Joint with J. E. Dennis, Jr. and R. E. Welsch): ‘‘An Adaptive Nonlinear Least-Squares Algorithm’’, *ACM Trans. Math. Software*, **7**, pp. 348–368 and 369–383. (This is an extensively revised version of CCREMS Technical Report #TR–1.)

1982: ‘‘On Convergence Testing in Model/Trust-Region Algorithms for Unconstrained Optimization’’, Computing Science Technical Report No. 104, AT&T Bell Laboratories.

1983: ‘‘Remark on Algorithm 573. NL2SOL — An Adaptive Nonlinear Least-Squares Algorithm’’, *ACM Trans. Math. Software*, **9**, p. 139.

‘‘Computing Perturbation Bounds for Nonlinear Algebraic Equations’’, *SIAM J. Numer. Anal.*, **20**, pp. 638–651.

‘‘ALGORITHM 611—Subroutines for Unconstrained Minimization Using a Model/Trust-Region Approach’’, *ACM Trans. Math. Software* **9**, pp. 503–524.

1984: ‘‘A Trust-Region Approach to Linearly Constrained Optimization’’, pp. 72–105 of *Numerical Analysis. Proceedings, Dundee 1983*, edited by D. F. Griffiths, Lecture Notes in Mathematics 1066, Springer-Verlag.

(Joint with W. J. Cody, J. T. Coonen, K. Hanson, D. Hough, W. Kahan, R. Karpinski, J. Palmer, R. N. Ris, D. Stevenson): ‘‘A Proposed Radix- and Word-length-independent Standard for Floating-point Arithmetic’’, *IEEE Micro* **4**, pp. 86–100.

1985: (Joint with K. B. McAfee, Jr., K. L. Walker and R. S. Hozack): ‘‘Thermodynamic Stability and Incorporation of Phosphorus into Germanium-Doped Silica Glass’’, *J. Amer. Ceramic Soc.* **68**, pp. 359–362.

‘‘Electronic Mail Distribution of Linear Programming Test Problems’’, *COAL Newsletter No. 13*, pp. 10–12.

1986: (Joint with R. E. Welsch): ‘‘Maximum Likelihood and Quasi-Likelihood for Nonlinear Exponential Family Models’’, pp. 277-284 of*Computer Science and Statistics: Proceedings of the 18th Symposium on the Interface*, edited by Thomas J. Boardman, American Statistical Assoc., Washington, D.C.

(Joint with N. K. Karmarkar and K. G. Ramakrishnan): ‘‘The Karmarkar Algorithm: Adding Wings to Linear Programming’’, *The AT&T Bell Laboratories Record*, March 1986, pp. 4–10.

(Joint with K. B. McAfee, Jr., R. S. Hozack, R. A. Laudise, G. Schwartz and W. A. Sunder): ‘‘Thermodynamic Considerations in the Synthesis and Crystal Growth of GaSb’’, *J. Crystal Growth* **76**, p. 263–271.

(Joint with K. B. McAfee, Jr. and R. S. Hozack): ‘‘Multi-Phase Equilibria in GaSb Using the Gibbs-Helmholtz Approach’’, submitted.

1987: ‘‘Using a Large Library on a Small Machine’’, pp. 80–91 of *New Computing Environments: Microcomputers in Large-Scale Computing*, edited by A. Wouk, SIAM.

(Joint with R. Fourer and B. W. Kernighan): ‘‘AMPL: A Mathematical Programming Language’’, Computing Science Technical Report No. 133, AT&T Bell Laboratories (revised June 1989; shortened form appears in *Management Science*: see 1990).

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''A Variant of Karmarkar's Linear Programming Algorithm for Problems in Standard Form'', *Mathematical Programming* **37**, pp. 81–90.

1988: (Joint with K. B. McAfee, Jr., R. S. Hozack, R. A. Laudise and W. A. Sunder): ''Thermodynamic Stability and Reactivity of AlSb and their Relationship to Crystal Growth'', *Journal of Crystal Growth* **88**, pp. 488–498.

''Interval Least Squares — a Diagnostic Tool'', pp. 183–205 of *Reliability in Computing: the Role of Interval Methods in Scientific Computing* (edited by Ramon E. Moore; Academic Press, San Diego).

''Massive Memory Buys Little Speed for Complete, In-Core Sparse Cholesky Factorizations'', Numerical Manuscript 88–04, AT&T Bell Laboratories, Murray Hill, NJ.

(Joint with Roy E. Welsch): ''Maximum Likelihood and Quasi-Likelihood for Nonlinear Exponential Family Regression Models'', *J. Amer. Statist. Assoc.* **83**, pp. 990–998.

1990: (Joint with R. Fourer and B. W. Kernighan): ''A Modeling Language for Mathematical Programming'', *Management Science* **36**#5, pp. 519–554.

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''Usage Summary for Selected Optimization Routines'', Computing Science Technical Report No. 153, AT&T Bell Laboratories.

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1991: ''Stopping Tests That Compute Optimal Solutions for Interior-Point Linear Programming Algorithms'', pp. 17–42 of *Advances in Numerical Partial Differential Equations and Optimization*, edited by S. Gómez, J. P. Hennart and R. A. Tapia, SIAM.

''Massive Memory Buys Little Speed for Complete, In-Core Sparse Cholesky Factorizations on Some Scalar Computers'', *Linear Algebra and Its Applications* **152**, pp. 291–314.

(Joint with L. Kaufman): ''Tradeoffs in Algorithms for Separable Nonlinear Least Squares'', pp. 157–158 of *IMACS '91*, Proceedings of the 13th World Congress on Computational and Applied Mathematics, edited by R. Vichnevetsky and J. J. H. Miller, Criterion Press, Dublin.

''Automatic Differentiation of Nonlinear AMPL Models'', pp. 61–73 of *Automatic Differentiation of Algorithms: Theory, Implementation, and Application*, edited by A. Griewank and G. Corliss, SIAM.

1992: (Joint with Teresa Head-Gordon, Frank H. Stillinger, and Margaret H. Wright): ''An Application of Constrained Optimization in Protein Folding: The Poly-L-Alanine Hypothesis'', *Forefronts* **8**#2, pp. 4–6 (Cornell Theory Center).

(Joint with Teresa Head-Gordon, Frank H. Stillinger, and Margaret H. Wright): ''Poly(L-alanine) as a Universal Reference Material for Understanding Protein Energies and Structures'', *Proc. Natl. Acad. Sci. USA* **89**, pp. 11513–11517.

1993: (Joint with Robert Fourer and Brian W. Kernighan): *AMPL: A Modeling Language for Mathematical Programming*, The Scientific Press.

(Joint with David S. Bunch and Roy E. Welsch): ‘‘Algorithm 717: Subroutines for Maximum Likelihood and Quasi-Likelihood Estimation of Parameters in Nonlinear Regression Models’’, *ACM Trans. Math. Software* **19**, pp. 109–130.

‘‘Hooking Your Solver to AMPL’’, Numerical Analysis Manuscript No. 93-10 (revised 1997), AT&T Bell Laboratories.

1994: (Joint with Robert Fourer): ‘‘Experience with a Primal Presolve Algorithm’’, pp. 135–154 of *Large Scale Optimization: State of the Art*, edited by W. W. Hager, D. W. Hearn, and P. M. Pardalos, Kluwer Academic Publishers.

(Joint with Robert Fourer and Brian W. Kernighan): ‘‘An Introduction to the AMPL Modeling Language for Mathematical Programming’’, *Mathematech* **1**#1, pp. 49–56.

1995: (Joint with Steven J. Fortune, Brian W. Kernighan, Olando Landron, Reinaldo A. Valenzuela and Margaret H. Wright): ‘‘WISE Design of Indoor Wireless Systems: Practical Computation and Optimization’’, *IEEE Computational Science & Engineering* **2**#1, pp. 58–68.

(Joint with Robert Fourer): ‘‘Expressing Special Structures in an Algebraic Modeling Language for Mathematical Programming’’, *ORSA J. Computing* **7**#2, pp. 166–190.

1996: ‘‘More AD of Nonlinear AMPL Models: Computing Hessian Information and Exploiting Partial Separability’’, pp. 173–184 of *Computational Differentiation : Techniques, Applications, and Tools*, edited by Martin Berz, Christian Bischof, George Corliss, and Andreas Griewank, SIAM.

1998: (Joint with Michael L. Overton and Margaret H. Wright): ‘‘A Primal-Dual Interior Method for Nonconvex Nonlinear Programming’’, *Advances in Nonlinear Programming*, edited by Ya-xiang Yuan, Kluwer Academic Publishers, ISBN 0-7923-5053-7, pp. 31–56.

1999: (Joint with Eric Grosse): ‘‘Comment on Algorithm 528’’, *ACM Trans. Math. Software* **25**#1, pp. 123–126.

(Joint with Michael C. Ferris and Robert Fourer): ‘‘Expressing Complementarity Problems in an Algebraic Modeling Language and Communicating Them to Solvers’’, *SIAM J. Optimization* **9**#4, pp. 991–1009.

2000: (Joint with Robert Fourer): ‘‘Conveying Problem Structure to Optimization Algorithms’’, in *Computing Tools for Modeling, Optimization and Simulation*, edited by Manuel Laguna and José Luis González-Velarde, Kluwer Academic Publishers, pp. 75–89.

2001: ‘‘Symbolic-Algebraic Computations in a Modeling Language for Mathematical Programming’’, in *Symbolic Algebraic Methods and Verification Methods*, edited by Götz Alefeld, Jiří Rohn, and Tetsuro Yamamoto, Springer-Verlag, pp. 99–106.

2002: (Joint with Robert Fourer): ‘‘Extending an Algebraic Modeling Language to Support Constraint Programming’’, *INFORMS Journal on Computing* **14**#4, pp. 322–344.

(Joint with Horand I. Gassmann): ‘‘An Integrated Modelling Environment for Stochastic Programming’’, in *Applications of Stochastic Programming*, edited by Stein Wallace and William Ziemba, SIAM, Philadelphia, to appear.

2003: (Joint with Robert Fourer and Brian W. Kernighan): *AMPL: A Modeling Language for Mathematical Programming*, second edition, Duxbury Press, ISBN 0-534-38809-4.

(Joint with Robert Fourer): ‘‘Numerical Issues and Influences in the Design of Algebraic Modeling Languages for Optimization’’, pp. 39–51 of *Proceedings of the 20th Biennial Conference on Numerical Analysis*, edited by D. F. Griffiths and D. A. Watson, `http://www.maths.dundee.ac.uk/~naconf/proc03/fourer.pdf`.

2004: (Joint with Robert Fourer and Brian W. Kernighan): ‘‘Design Principles and New Developments in the AMPL Modeling Language’’, pp. 105–135 of *Modeling Languages in Mathematical Optimization*, edited by Josef Kallrath, Kluwer Academic Publishers, ISBN 1-4020-7547-2.

2005: (Joint with Horand I. Gassmann): ‘‘An Integrated Modeling Environment for Stochastic Programming’’, pp. 159–175 of *Applications of Stochastic Programming*, MPS-SIAM Book Series on Optimization, SIAM.

‘‘Semiautomatic Differentiation for Efficient Gradient Computations’’, pp. 147–158 of *Automatic Differentiation: {A}pplications, Theory, and Implementations*, Lecture Notes in Computational Science and Engineering 50, Springer, `http://endo.sandia.gov/~dmgay/ad04_paper.pdf`.

(Joint with Roscoe Bartlett and Eric Phipps), ‘‘Automatic Differentiation of C++ Codes for Large-Scale Scientific Computing’’, report SAND 2005-7816C, Sandia National Labs; `http://endo.sandia.gov/~dmgay/bgp05.pdf`.

‘‘Writing **.nl** Files’’, report SAND 2005-7907P, Sandia National Labs; `http://endo.sandia.gov/~dmgay/nlwrite.pdf`.

2006: (Joint with Roscoe A. Bartlett and Eric T. Phipps): ‘‘Automatic Differentiation of C++ Codes for Large-Scale Scientific Computing’’, pp. 525–532 of *Computational Science — ICCS 2006*, edited by Vassil N. Alexandrov, Geert Dick van Albada, Peter M. A. Sloot, and Jack Dongarra, Lecture Notes in Computer Science 3994, Springer, `http://www.sandia.gov/~dmgay/bgp06.pdf`.

2007: (Joint with Eric T. Phipps, Roscoe A. Bartlett, and Robert J. Hoekstra): ‘‘Large-Scale Transient Sensitivity Analysis of a Radiation-Damaged Bipolar Junction Transistor via AD’’, to appear in the proceedings of the 5th International Conference on Automatic Differentiation (see `http://www.autodiff.org/ad08/`), `http://www.sandia.gov/~dmgay/ad08.pdf`.

2008: ‘‘Specifying and Reading Program Input with NIDR’’, report SAND2008–2261P, Sandia National Labs; `http://www.sandia.gov/~dmgay/nidr08.pdf`.

2009: ‘‘Using Expression Graphs in Optimization Algorithms’’, report SAND2009-5066C; `http://www.sandia.gov/~dmgay/ima08.pdf`. Written for a proceedings book for the IMA Workshop on Mixed-Integer Nonlinear Programming, held 17-21 November 2008 in Minneapolis, MN.

(Joint with Paul T. Boggs and J. Ray): ‘‘{Probabilistic Attack Reconstruction and Resource Estimation in ‘Reload’ Scenarios’’, in *IEEE Xplore*, Proceedings of the 2009 IEEE Homeland Security Conference.

2010: ‘‘Bounds from Slopes’’, report SAND2010-1794P; `http://www.sandia.gov/~dmgay/bounds10.pdf`.

2012: (Joint with Paul T. Boggs and Robert H. Nilson): ‘‘Network Heuristics for Initial Guesses to Nanoporous Flow Optimization Problems’’. SAND Report 2012-3681, Sandia National Laboratories, 2012; `http://www.sandia.gov/~ptboggs/pubs/SAND-net.pdf`.

(Joint with Paul T. Boggs, Stewart K. Griffiths, Robert Michael Lewis, Kevin R. Long, Stephen G. Nash, and Robert H. Nilson): ‘‘Optimization Algorithms for Hierarchical Problems, with Application to Nanoporous Materials’’, *SIAM J. Optim.* 22#4 (2012), `http://epubs.siam.org/doi/abs/10.1137/110856411`; see also `http://www.sandia.gov/~ptboggs/pubs/SAND-nano.pdf`.

2015: ‘‘The AMPL Modeling Language — an Aid to Formulating and Solving Optimization Problems’’, pp. 95–116 of *Numerical Analysis and Optimization*, edited by Mehiddin Al-Baali, Lucio Grandinetti, and Anton Purnama, Springer Proceedings in Mathematics and Statistics vol. 134, 2015. Draft available as `https://ampl.com/REFS/muscat14.pdf`.

2018: ‘‘Revisiting Expression Evaluation Representations in Nonlinear AMPL Models’’, pp. 99–118 of *Numerical Analysis and Optimization*, edited by Mehiddin Al-Baali, Lucio Grandinetti, and Anton Purnama, Springer Proceedings in Mathematics and Statistics, 2018. Draft available as `https://ampl.com/REFS/muscat17.pdf`.